AIR QUALITY ANNUAL REPORT 2002

Fairfax County Health Department
Division of Environmental Health
10777 Main Street
Fairfax, Virginia

F O R E W O R D

This is a technical report summarizing air quality data collected during the calendar year 2002. The Division of Environmental Health of the Health Department maintains the air monitoring network in Fairfax County. The report design is intended to meet the needs of concerned County citizens and organizations and public and private administrators whose decisions must reflect air quality considerations. Air quality summary reports have been issued annually since 1973. Persons requiring additional technical information should contact the Air Quality Monitoring Program staff to see if more detailed information is available.

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ABSTRACT

The Division of Environmental Health of the Fairfax County Health Department conducts an air monitoring program that conforms to the protocol and criteria set forth in Title 40 of the Code of Federal Regulations Part 50. This annual summary primarily focuses on those air pollutants for which National Ambient Air Quality Standards (NAAQS) have been established by the U.S. Environmental Protection Agency (EPA) under the Federal Clean Air Act.

EPA has classified the Washington Metropolitan Statistical area (DC-MD-VA), which includes Fairfax County, as a severe non-attainment area for ground-level ozone. Attainment status is based on the NAAQS 1-hour standard of 0.12 parts per million (ppm). In 2002, this statistical area continued to be in non-attainment for the 1-hour ozone standard.

Fairfax County exceeded the 1-hour standard in 2002. There were 4 days in which at least one site monitoring ozone exceeded the 1-hour standard and 26 days in which at least one ozone monitoring site exceeded the 8-hour standard. There were 5 “unhealthful” days in 2002, as classified by EPA’s Air Quality Index. There has been a downward trend in ozone levels averaged across all monitoring sites.

Overall, air quality in Fairfax County has been improving. Analysis of pollutant trends since the 1980 time period reveal a steady downward trend in pollutant concentrations for all six criteria pollutants (Carbon Monoxide, Sulfur Dioxide, Nitrogen Dioxide, Ozone, Particulate Matter 10 Micrometers, and Lead). Fairfax County is in attainment with the National Ambient Air Quality Standards for all criteria pollutants except ozone. Ozone levels in Fairfax County have improved over past years. Citizens in the county are exposed to fewer unhealthful ozone days and generally lower concentrations on those days.

AMBIENT AIR QUALITY

A. OVERVIEW

The Division of Environmental Health of the Fairfax County Health Department is authorized by the Fairfax County Code, Chapter 103, in cooperation with Federal and State agencies, to conduct an air monitoring program. The primary purpose of the air monitoring program is to measure the levels of air quality to ensure the protection of human health, welfare and safety, and to the greatest degree feasible, prevent injury to plant and animal life and property. The ambient air monitoring stations are sited in such a manner as to indicate residential, health based pollution concentrations. The objective of this monitoring network is to track ambient air pollutant levels to indicate compliance or non-compliance with Federal standards, to observe effects on pollutant levels from regulatory controls on sources, to develop data for trend analysis, and to provide data for the air quality index and forecasts.

The air quality monitoring program consists of monitoring for the U.S. Environmental Protection Agency (EPA) criteria pollutants, ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), and particulate matter (PM_{10} and $PM_{2.5}$). In addition, other non-criteria pollutants, total suspended particulates (TSP), nitric oxide (NO), and meteorological parameters, wind direction, wind speed, temperature, and rainfall are monitored.

The air quality monitoring network consists of the following stations for 2002:

5 Continuous monitoring stations for gaseous pollutants* (Mount Vernon, Franconia, Cub Run, Lewinsville, Mason)
7 High volume particulate/lead samplers
5 Fractional particulate samplers of 10 micrometers (PM_{10})
2 Fractional particulate samplers and 1 continuous particulate sampler of 2.5 micrometers ($PM_{2.5}$)
1 Acid deposition station
3 Meteorological stations

**Ozone is the only criteria pollutant monitored at the Mount Vernon site and Carbon Monoxide is the only pollutant monitored at the Franconia site. Mason is a new site located in Annandale that began operation in May 2002.*

The data are reduced to both monthly and annual terms and are shown in both tabular and graphical forms to reveal seasonal and short-term changes that would be obscured by longer term averaging. Comparisons with applicable standards are emphasized. The Air Quality Annual Report is supplemented with two appendices. Appendix A contains a trend analysis and a set of graphs showing multi-year trends for several air pollutants and several independent factors. Appendix B provides a table and a map of the monitoring stations, which includes the location and descriptive information of each of the stations.

Data reduction is done in-house, and the data are placed in a computer database for use in assessing current air quality, identifying air quality trends, and analyzing periods of elevated concentrations. Pollutant data are sent to the U.S. Environmental Protection Agency (EPA) for incorporation into the Aerometric Information Retrieval System (AIRS) database, and the Virginia Department of Environmental Quality (VDEQ).

The National Ambient Air Quality Standards (NAAQS), as defined in Title 40 of the Code of Federal Regulations, Part 50, provide a basis for evaluating air quality in Fairfax County. The primary standards define the levels of air quality necessary to protect the public health with an adequate margin of safety. The secondary standards define levels of air quality necessary to prevent any degradation or harm to the total environment.

For this report, gaseous pollutant concentrations are expressed in parts per million (ppm); particulate matter and lead concentrations are expressed in micrograms per cubic meter ($\mu g/m^3$).

B. QUALITY ASSURANCE PROGRAM

A quality assurance/control program is maintained based on requirements stated in Title 40 of the Code of Federal Regulations, Part 58, Appendix A. This quality assurance (QA) program is used to assure that the monitoring data is of the highest quality and to minimize the loss of data due to instrument malfunctions or out of range operating conditions. A database of the precision, accuracy and audit results are maintained on a microcomputer using software developed by EPA, and are submitted on a quarterly basis to the EPA and VDEQ. The Air Quality Monitoring Program also participates in the EPA National Performance Audit program.

C. CRITERIA POLLUTANTS

1. Ozone (O_3)

Ozone is not emitted directly from pollution sources (i.e. smokestacks, tailpipes), but is formed by a complex series of reactions among nitrogen oxides (NO_x) and volatile organic compounds (VOCs) under the influence of solar ultraviolet radiation (sunlight). Two significant sources are the incomplete combustion of gasoline from motor vehicles and emissions from stationary sources such as factories, printers, dry cleaners, and paint shops. Ozone is shorter lived than its precursors, which may build up and redistribute geographically over an extended period of calm wind conditions (air stagnation). Therefore, ozone concentrations show a very strong diurnal (daily) and seasonal cyclical character, with the height of the cycles controlled almost entirely by meteorological conditions.

Ozone is an irritant to the respiratory system and causes health problems because it damages lung tissue, reduces lung function and sensitizes the lung to other irritants. Individuals with existing respiratory impairments such as asthmatics have increased sensitivity to the effects of ozone. Healthy adults and children that engage in moderate physical activity are susceptible to the effects of ozone. In addition to health effects, ozone can have an adverse effect on vegetation.

The 1-hour National Ambient Air Quality Standard (NAAQS) for ozone is defined in terms of the daily maximum hourly average. The primary and secondary standards for ozone are 0.12 ppm hourly average concentration. The data is rounded to two decimal places (fractional parts equal to 0.005 are rounded up). The standard is attained when over the three most recent calendar years the average number of exceedant days is not greater than one. An exceedant day is one during which one or more observed hourly concentrations exceeds 0.12 ppm. The 8-hour standard for ozone is defined in terms of the daily maximum eight-hour average. To attain the standard, the 3-year average of the fourth-highest daily maximum 8-hour average of continuous ambient air monitoring data over each year must not exceed 0.08 ppm.

The United States Environmental Protection Agency (EPA) promulgated new National Ambient Air Quality Standards for ozone on July 19, 1997. The new primary standard provides increased protection to the public, especially children and at-risk populations. The secondary standard provides protection for vegetation. EPA replaced the current 1-hour NAAQS with an 8-hour standard at a level of 0.08 parts per million (ppm). In 1999 this revised standard was challenged in court by private industry. In February 2001, the U.S. Supreme Court decided to uphold the new ozone standard declaring that EPA's interpretation was in adherence to the constitutionality of the Clean Air Act. On January 24, 2003, EPA reclassified the Metropolitan Washington area from serious to severe nonattainment for the ozone standard. Initially EPA had given the area additional time to meet the standard; however, this was challenged in court and the attainment status was changed to severe.

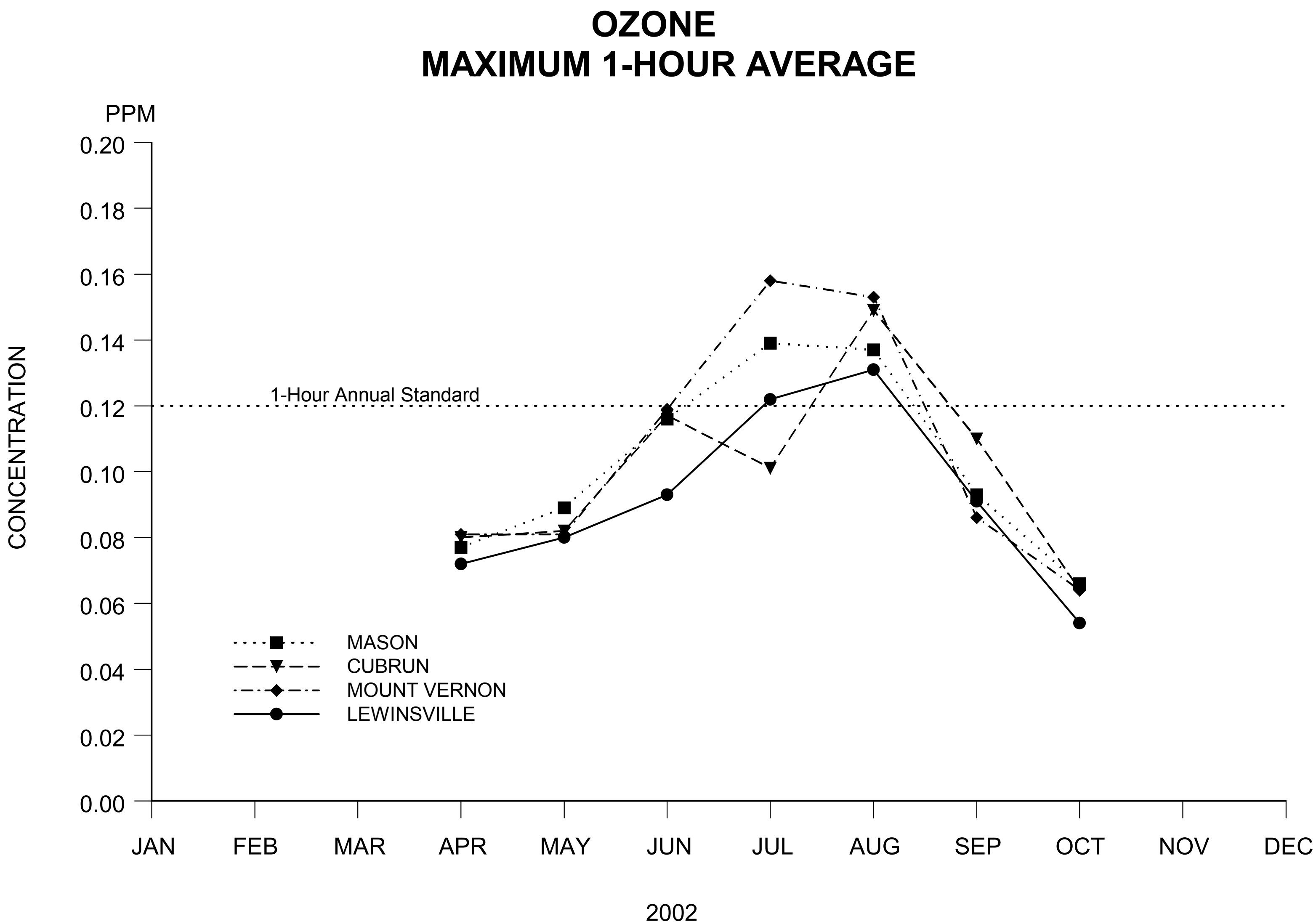
Table 1: Ozone 1-hour

	MOUNT VERNON[1]	CUB RUN[1]	LEWINSVILLE[1]	MASON[1,2]
Highest daily max 1-hr conc., ppm	0.158	0.149	0.131	0.139
2nd highest daily max 1-hr conc., ppm	0.153	0.117	0.122	0.137
99th percentile conc., ppm of all 1-hr measurements	0.098	0.089	0.089	0.103
Number of 1-hr measurements	5362	7730	7157	5307
Number of hours above 0.12 ppm	10	2	2	6
Number of exceedant days, 2002	3	1	1	2
Average no. of exceedant days, 2000-2002	1.3	.3	0.7	---[2]

1. These stations are operational only during the ozone season from April through October
2. Mason is a new station which began operation during the 2002 season.

Table 2: Ozone 8-hour

	MOUNT VERNON[2]	CUB RUN	LEWINSVILLE	FRANCONIA[1,2]
Highest daily max 8-hr conc., ppm	0.127	0.099	0.104	0.122
4th highest daily max 8-hr conc., ppm	0.106	0.092	0.099	0.108
99th percentile 8-hr conc., ppm	0.089	0.090	0.079	0.093
Number of days with 8-hr conc. greater than 0.08 ppm, 2002	16	12	7	19
Average of 4th highest 8-hr conc., ppm, 2000-2002	0.106	0.092	0.099	0.108


OZONE
MAXIMUM 1-HOUR AVERAGE
PPM
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
CONCENTRATION
1-Hour Annual Standard
MASON
CUBRUN
MOUNT VERNON
LEWINSVILLE
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
2002

2. Carbon Monoxide (CO)

Carbon monoxide is a colorless, odorless gas produced by incomplete combustion of carbon compounds in fuels. The primary source of carbon monoxide is motor vehicle exhaust, although other fuel combustion processes such as wood burning stoves, incinerators and industrial sources may be important. Diurnal and seasonal patterns of carbon monoxide concentrations can be detected which correspond to human activities and meteorological factors. Concentrations are generally higher in vicinities of heavy vehicular traffic and fall off rapidly as the distance from a roadway increases. Elevated levels of CO are a winter time phenomena due to inefficient fuel combustion and weather conditions that hamper dispersion. CO is also known to be a participant in the photochemical reactions of ozone formation.

The NAAQS for CO specifies upper limits for one-hour and eight-hour averages. The primary and secondary standards for the 1-hr level are 35 ppm and the 8-hr level is 9 ppm, neither is to be exceeded more than once per year. The 8-hr standard is generally more restrictive.

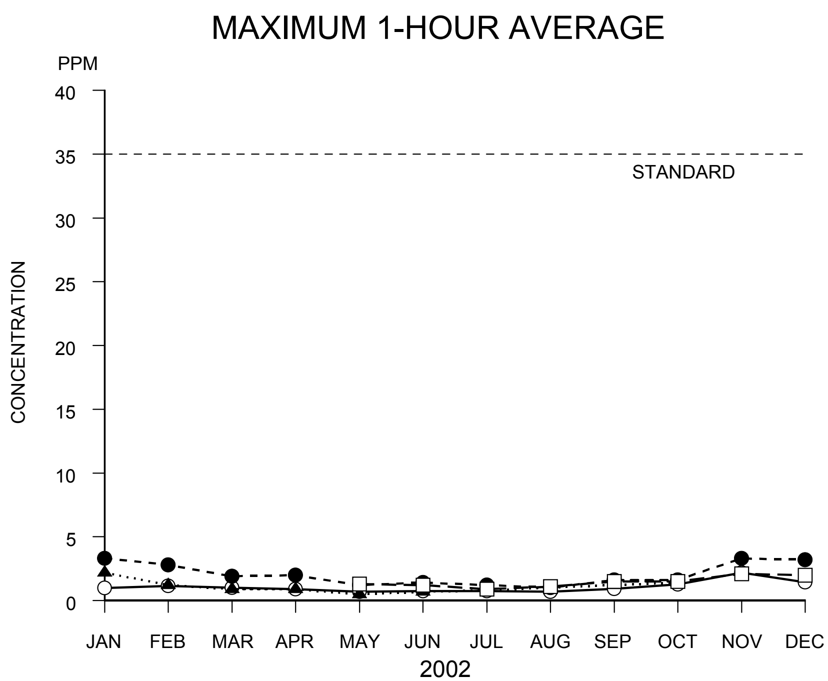
Carbon monoxide enters the blood stream and reacts chemically with hemoglobin, thereby reducing delivery of oxygen to the body's tissues and organs. The heart and central nervous system are dependent on oxygen utilization; therefore, these are the organ systems most affected by CO exposure. The effects of CO can worsen the conditions of people with chronic heart disease. Other groups more susceptible to the effects of CO are individuals with anemia, pregnant women, infants, elderly people, and fetuses. Low levels of CO exposure may produce symptoms of headache, dizziness, impairment of visual perception, mental function and manual dexterity. High levels may be fatal; however, high exposure levels are unlikely in ambient conditions.

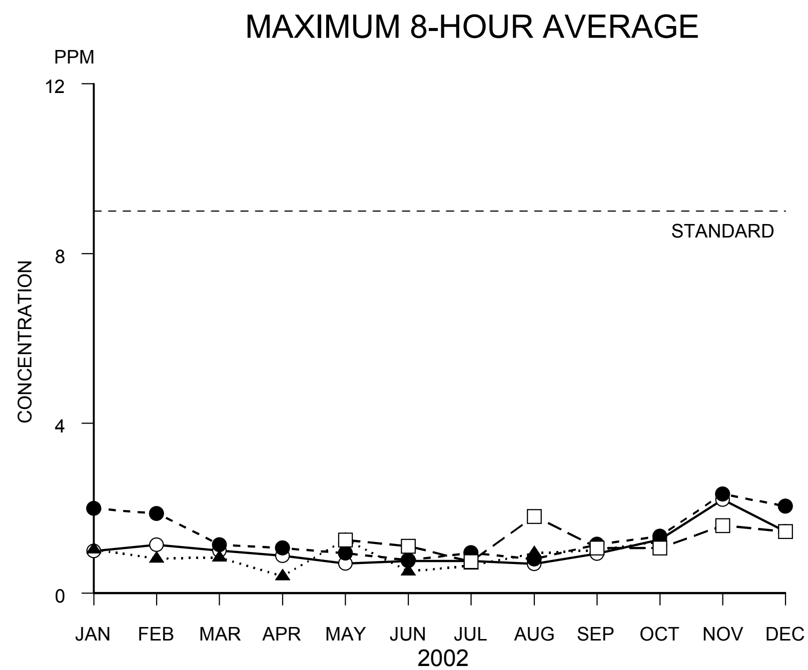
Inside view of monitoring station

Table 3: Carbon Monoxide

	FRANCONIA	LEWINSVILLE	CUB RUN	MASON
Annual arithmetic mean, ppm	0.46	0.52	0.39	0.52
Maximum 8-hr conc., ppm	2.20	2.33	1.26	1.81
2nd highest 8-hr conc., ppm	1.45	2.26	1.22	1.59
Maximum 1-hr conc., ppm	2.7	3.3	2.2	2.1
2nd highest 1-hr conc., ppm	2.7	3.3	1.4	2.0
99th percentile 1-hr conc., ppm	1.2	1.7	1.1	1.2
Number of 1-hr measurements	8692	8551	6924	5944
Number of 8-hr conc. above 9 ppm	0	0	0	0

CARBON MONOXIDE





FEDERAL,STATE, AND COUNTY STANDARDS:

PRIMARY: 1) 35 PPM MAXIMUM 1-HOUR CONCENTRATION,

NOT TO BE EXCEEDED MORE THAN ONCE PER YEAR.

2) 9 PPM MAXIMUM 8-HOUR CONCENTRATION,

NOT TO BE EXCEEDED MORE THAN ONCE PER YEAR.

SECONDARY: SAME AS PRIMARY.

FRANCONIA
LEWINSVILLE
CUBRUN
MASON

3. Sulfur Dioxide (SO_2)

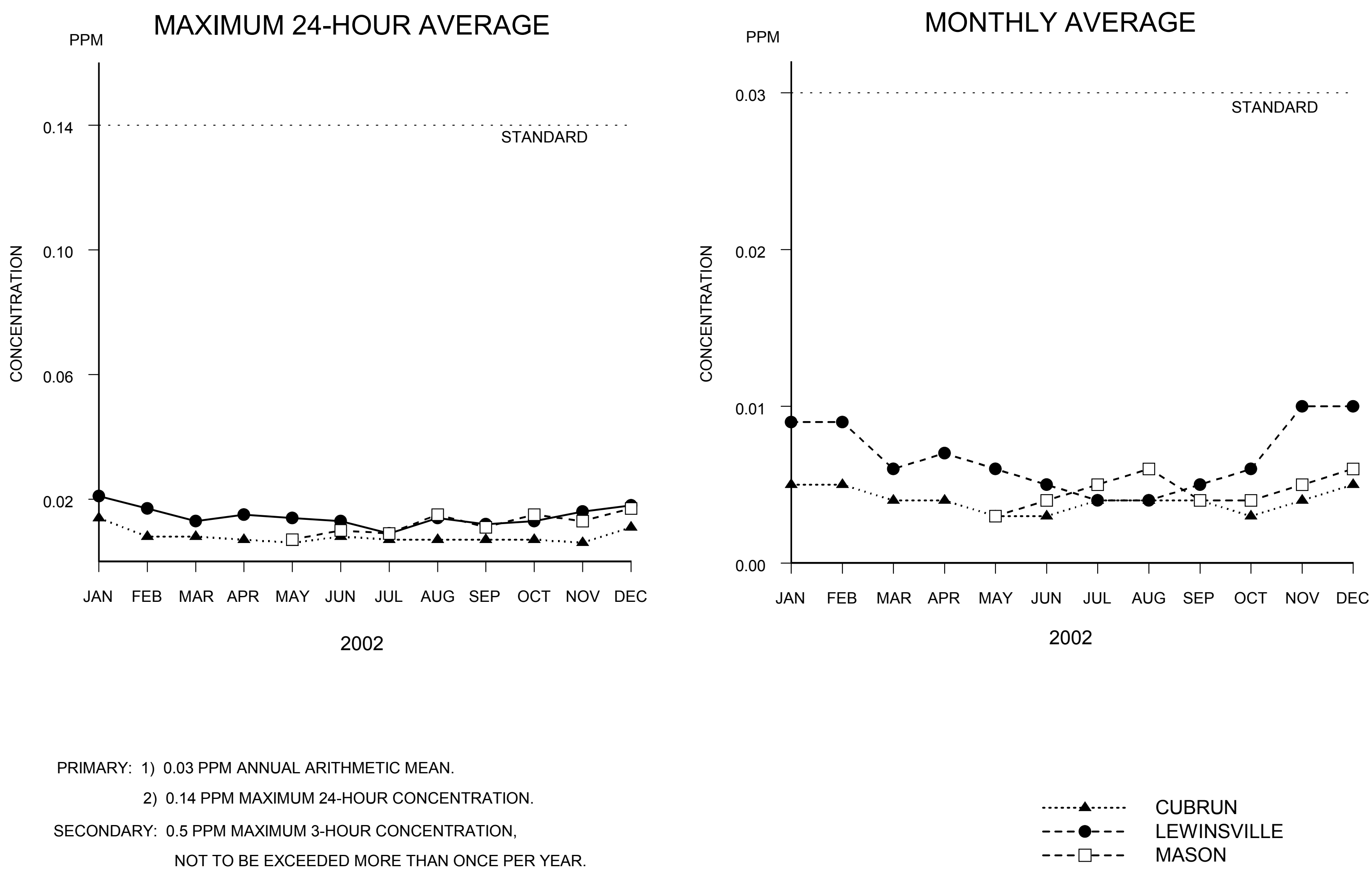
Sulfur dioxide is formed by the combustion of sulfur containing fossil fuels. SO_2 is produced primarily from coal and oil combustion sources such as electric utilities, steel mills, refineries, pulp and paper mills and nonferrous smelters. Sulfur dioxide is an irritant to the nose, throat, lungs, and eyes. Health effects of SO_2 exposure are highly correlated with particulate pollution. High concentrations may affect breathing and aggravate existing respiratory and cardiovascular disease. Subgroups of the population that are especially susceptible to the effects of SO_2 include asthmatics, individuals with bronchitis or emphysema, children and the elderly. Sulfur dioxide is a primary contributor to acid deposition, through atmospheric chemical conversions, causing acidification of water systems, and damage to trees, crops, buildings and statues.

The NAAQS for sulfur dioxide are defined in terms of the annual arithmetic mean concentration, the maximum 24-hour concentration and the maximum 3-hour concentration. The primary standards are expressed in terms of the annual arithmetic mean, set at 0.03 ppm, and the maximum 24-hour concentration, set at 0.14 ppm, which are not to be exceeded more than once per year. The secondary standard is expressed in terms of maximum 3-hour concentration, which is set at 0.5 ppm and is not to be exceeded more than once per year.

Table 4: Sulfur Dioxide

	LEWINSVILLE	CUB RUN	MASON
Annual arithmetic mean, ppm	0.007	0.004	0.005
Maximum 24-hr conc., ppm	0.021	0.014	0.017
2^{nd} highest 24-hr conc., ppm	0.018	0.011	0.015
Maximum 3-hr conc., ppm	0.038	0.026	0.058
2^{nd} highest 3-hr conc.,ppm	0.033	0.021	0.048
99^{th} percentile 1-hr conc., ppm	0.023	0.014	0.022
Number of 1-hr measurements	8655	8706	5870
Number of 24-hr averages above 0.14 ppm	0	0	0

SULFUR DIOXIDE



PRIMARY: 1) 0.03 PPM ANNUAL ARITHMETIC MEAN.

2) 0.14 PPM MAXIMUM 24-HOUR CONCENTRATION.

SECONDARY: 0.5 PPM MAXIMUM 3-HOUR CONCENTRATION,

NOT TO BE EXCEEDED MORE THAN ONCE PER YEAR.

4. Oxides of Nitrogen (NO & NO_2)

Oxides of nitrogen are formed by high temperature combustion in both mobile and stationary sources such as electric utility and industrial boilers. Nitric oxide is produced in abundance by these sources and under the influence of sunlight it reacts with certain organic compounds to both generate and destroy ozone and NO_2. The NO concentration is highly variable and strongly seasonal in character (high in winter). The NO_2 concentration is more stable and shows little seasonal influence.

Nitrogen dioxide is a highly reactive oxidant and has a greater toxic potential than NO. Exposure to ambient concentrations of NO_2 may cause changes in airway responsiveness, lower resistance to respiratory infections, and reduce pulmonary function. Subgroups of the population that are especially susceptible to the effects of NO_2 exposure include children and persons with existing respiratory illness, i.e. asthmatics, emphysema and chronic bronchitis. Studies are not definitive for health effects in healthy individuals. Nitrogen oxides injure vegetation, cause fabrics and dyes to deteriorate, and contribute to metal corrosion. They are important participants in photochemical reactions of ozone formation and acid deposition.

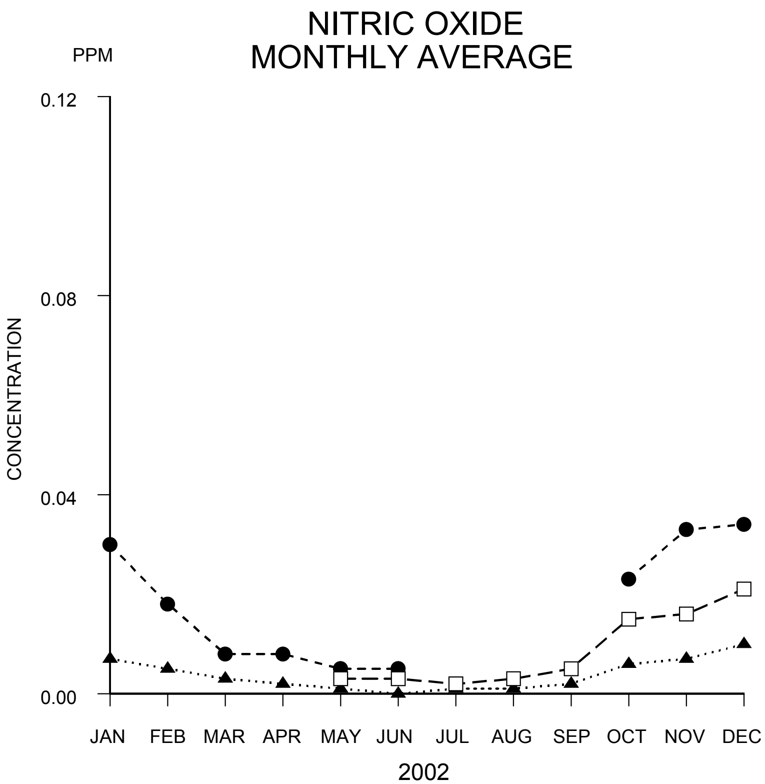
The NAAQS for nitrogen dioxide are defined in terms of the annual arithmetic mean concentration. The primary and secondary standards are 0.053 ppm. No NAAQS have been established for nitric oxide.

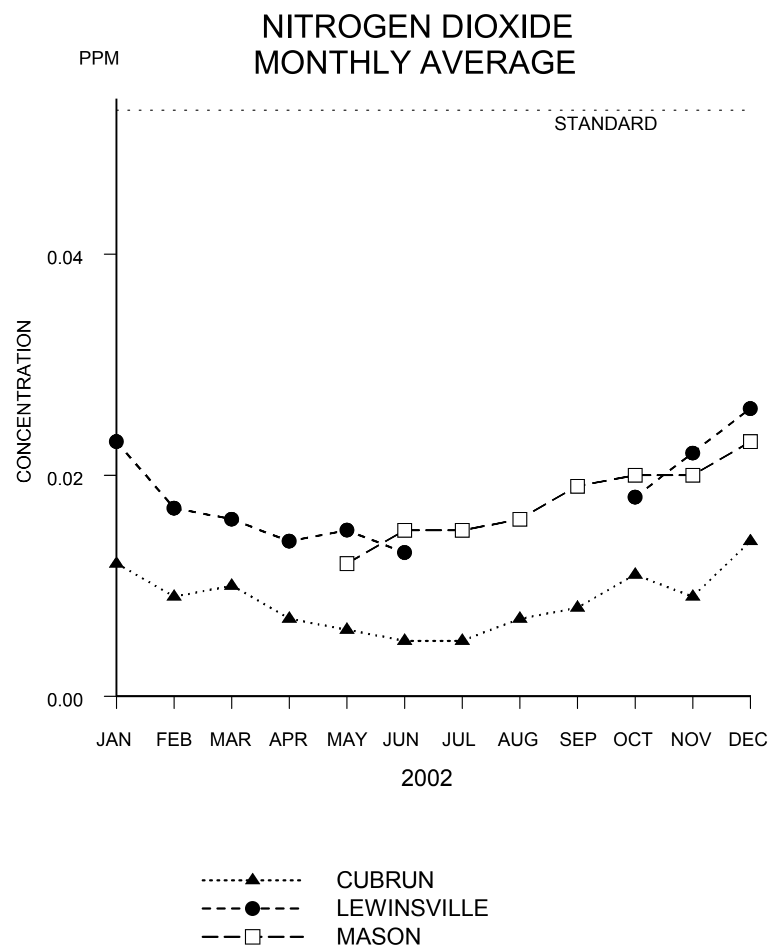
Table 5: Oxides of Nitrogen

	CUB RUN	LEWINSVILLE[1]	MASON
NITRIC OXIDE (NO)			
Annual arithmetic mean, ppm	0.004	0.020	0.009
99^{th} percentile 1-hr conc., ppm	0.051	0.199	0.094
Number of 1-hr measurements	8477	5831	5669
NITROGEN DIOXIDE (NO_2)			
Annual arithmetic mean, ppm	0.009	0.019	0.018
99^{th} percentile 1-hr conc., ppm	0.031	0.047	0.051
Number of 1-hr measurements	8476	5831	5669

[1] Lewinsville did not have data from June – September due to an instrument malfunction.

OXIDES OF NITROGEN





FEDERAL, STATE, AND COUNTY STANDARDS:

NITROGEN DIOXIDE:

PRIMARY: 0.053 PPM ANNUAL ARITHMETIC MEAN.

SECONDARY: SAME AS PRIMARY

NITRIC OXIDE: NO STANDARD ESTABLISHED.

5. Particulate Matter

Particulate matter consists of dust, smoke, and other solid or liquid particles small enough to suspend readily in the air. The particles range in size from very fine (a fraction of a micrometer) to the very coarse (about 1000 micrometers). The chemical and physical properties of particulate matter can vary greatly with time, region, meteorology, and type of source. Particulate matter has been associated with increased respiratory symptoms and illnesses in children and adults, and at very high levels has been shown to produce mortality in the elderly and ill.

The Environmental Protection Agency (EPA) revised the NAAQS for particulate matter on July 18, 1997. EPA added standards for particulate matter 2.5 micrometers and below ($PM_{2.5}$) and revised the form of the 24-hour standard for particulate matter 10 micrometers and below (PM_{10}). $PM_{2.5}$ standards are intended to protect against exposures to fine fraction particle pollution and the PM_{10} standards are intended to protect against coarse fraction particles. The constitutionality of these revised standards was challenged by private industry in the Courts in 1999. On February 27, 2001, the U.S. Supreme Court issued a ruling to vacate the revised PM_{10} standard. The Court ruled that the new $PM_{2.5}$ should remain in place, however, this standard could be vacated if "if the presence of this standard threatens a more imminent harm". The "harm" refers to the burden on sources complying with the regulations.

Fairfax County has retained the standard for total suspended particulate (TSP), which is used to evaluate nuisance impacts that cause damage, annoyance, or unreasonable interference with the enjoyment of life and property.

a. Total Suspended Particulate (TSP)

The TSP measure is the weight of material in a unit volume of air, without regard to the size of the particles. The TSP sampler collects particulate matter up to a nominal size (aerodynamic diameter) of 50 micrometers. Each sample is collected during a 24-hour period, midnight to midnight. A maximum of 61 samples was scheduled for each station during 2002.

County primary and secondary standards are 60 $\mu g/m^3$ for annual geometric mean and 150 $\mu g/m^3$ for maximum 24-hour concentration, the 24-hour concentration is not to be exceeded more than once per year.

TSP colocated samplers at Gunston

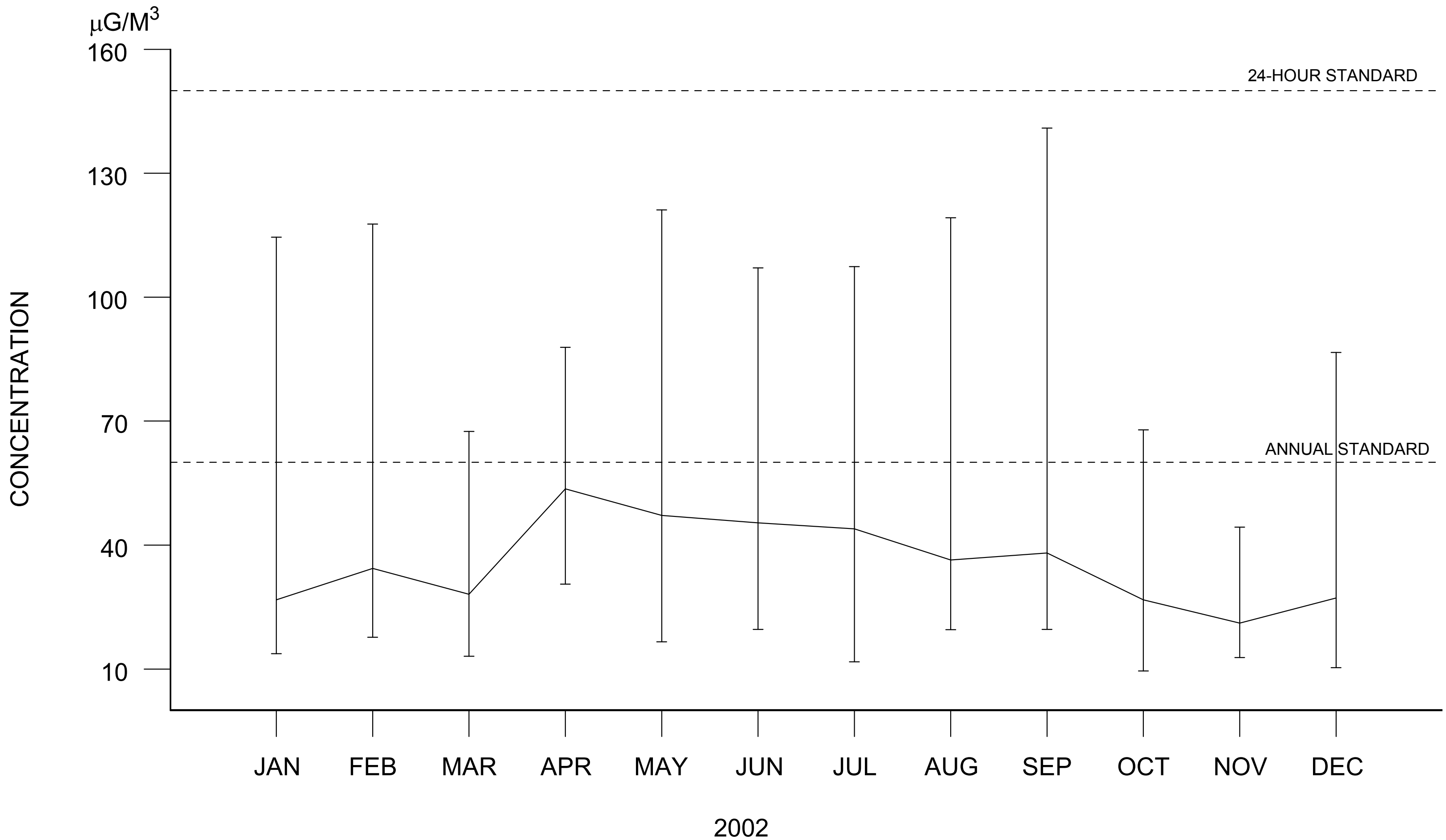
Table 6: Total Suspended Particulates

	BUSH HILL	CLERMONT	THOMAS EDISON	GUNSTON	I-95	OCCOQUAN HILL	SPRINGFIELD	ALL STATIONS
Number of samples	61	60	51	58	57	61	59	409
Annual geometric mean, µg/m3	32.14	27.61	29.92	28.58	48.92	40.97	35.16	36.78
Maximum 24-hr sample, µg/m3	121.1	85.4	80.7	87.9	119.2	140.9	83.5	138.6
2nd highest 24-hr sample, µg/m3	120.5	71.0	78.7	77	119	110.5	78.7	127.6

Table 7: Total Suspended Particulates
Monthly Geometric Mean, $\mu g/m^3$

	BUSH HILL	CLERMONT	THOMAS EDISON	GUNSTON	I-95	OCCOQUAN HILL	SPRINGFIELD	ALL STATIONS
January	21.65	20.65	---	17.74	41.18	32.21	32.08	35.03
February	26.57	29.08	35.39	26.67	58.59	38.71	33.28	29.70
March	22.53	21.40	28.11	23.44	47.46	33.32	27.34	38.36
April	47.88	53.54	54.47	52.61	61.82	50.53	54.15	42.06
May	98.74	30.57	36.13	42.11	57.42	53.53	34.43	40.70
June	42.38	36.73	---	40.03	61.08	51.14	44.45	42.33
July	36.03	33.25	---	33.37	66.63	49.62	53.04	32.87
August	29.73	28.51	36.23	35.06	48.17	45.37	---	45.14
September	33.00	30.15	35.93	30.96	51.96	57.64	36.43	29.60
October	28.99	19.81	25.30	21.83	37.36	31.85	25.32	37.16
November	18.35	18.54	19.51	16.74	30.47	26.01	21.37	53.37
December	24.46	23.17	28.21	21.99	---	36.36	30.35	23.68

TOTAL SUSPENDED PARTICULATES MONTHLY GEOMETRIC MEAN WITH MAXIMUM / MINIMUM 24-HOUR SAMPLES



COMPOSITE AVERAGE

COUNTY STANDARDS:

60 $\mu G/M^3$ ANNUAL GEOMETRIC MEAN.

150 $\mu G/M^3$ MAXIMUM 24-HOUR CONCENTRATION, NOT TO BE EXCEEDED MORE THAN ONCE PER YEAR.

b. Particulate Matter 10 Micrometers (PM_{10})

The PM_{10} measurement is a size specific indicator of particulate matter in the ambient air. The PM_{10} sampler collects particulates with an aerodynamic diameter less than or equal to a nominal 10 micrometers. The PM_{10} measure is the weight of this size specific material in a unit volume of air.

The NAAQS are defined in terms of the 24-hour average concentration and the annual arithmetic mean. The primary standard for 24-hour average concentration is 150 $\mu g/m^3$. The standard is attained when the expected number of days per calendar year with a concentration above 150 $\mu g/m^3$ is equal to or less than one. The primary standard for annual arithmetic mean is 50 $\mu g/m^3$. The standard is attained when the 3-year average of the annual arithmetic PM_{10} concentrations at each monitor within an area is less than or equal to 50 $\mu g/m^3$.

PM_{10} sampler at Occoquan Hill site

PM_{10} with filter exposed

Table 8: Particulate Matter 10 Micrometers

	CUB RUN	LUCK	MOUNT VERNON	OCCOQUAN HILL	SPRINGFIELD	ALL STATIONS
Number of samples	54	54	54	60	58	274
Annual arithmetic mean, $\mu g/m^3$	17.33	18.85	19.14	15.81	18.99	17.98
Maximum 24-hr sample, $\mu g/m^3$	57.1	55.6	46.0	59.4	59.6	59.6
99^{th} percentile of 24-hr samples, $\mu g/m^3$	57.1	55.6	46.0	59.4	59.6	57.92
24-hr samples above 150 $\mu g/m^3$	0	0	0	0	0	0

Table 9: Particulate Matter 10 Micrometers

Monthly Arithmetic Mean, $\mu g/m^3$

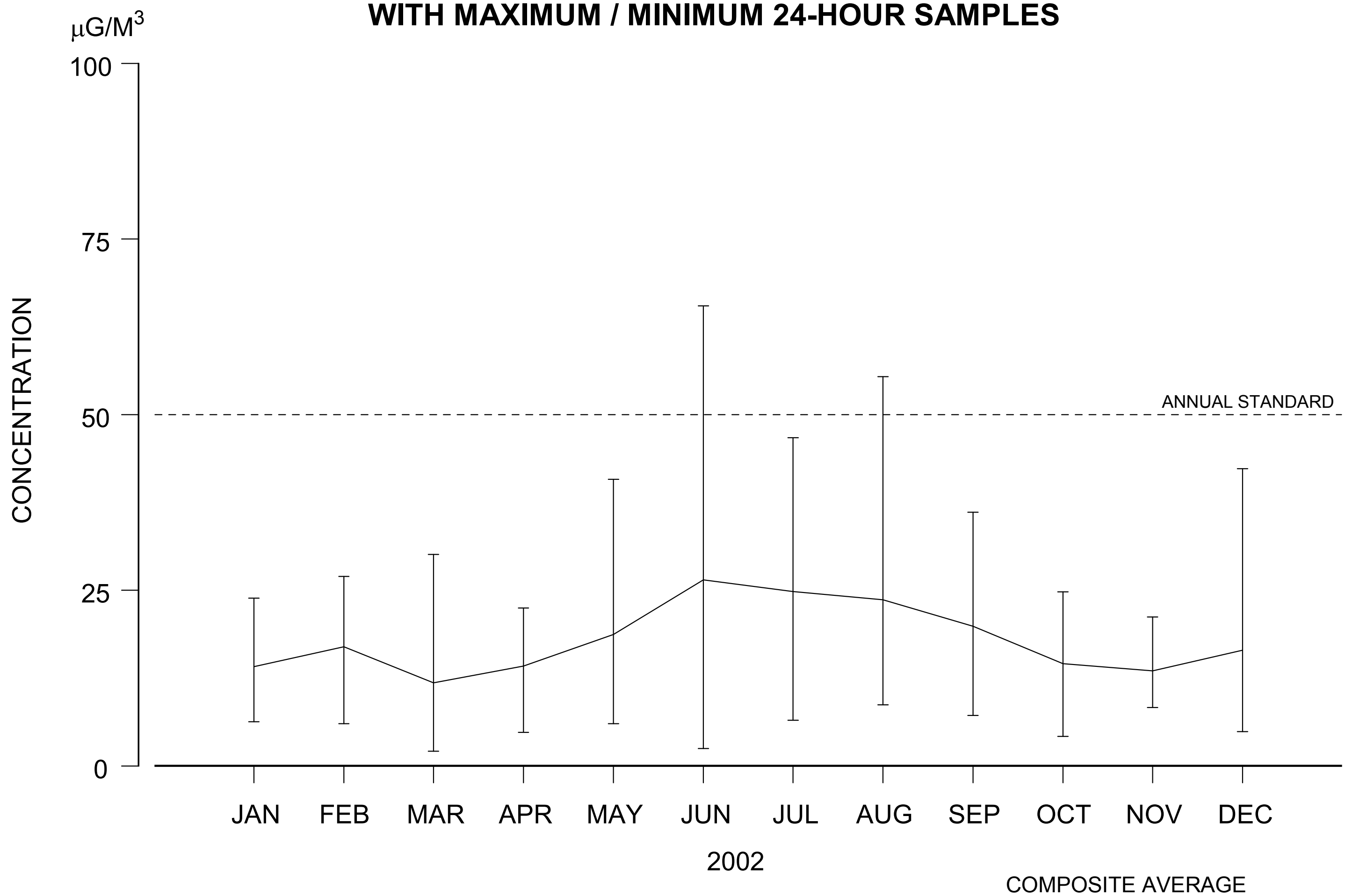
[1]This is a composite average of the regular & colocated samplers

*Not enough data for a valid monthly average

	CUB RUN	LUCK	MOUNT VERNON[1]	OCCOQUAN HILL	SPRINGFIELD	ALL STATIONS
January	10.98	15.48	19.24	9.30	15.70	14.14
February	11.48	---	17.84	15.78	20.42	16.96
March	11.30	10.68	14.24	9.48	13.38	11.82
April	13.04	15.07	17.46	10.78	15.72	14.24
May	19.64	20.18	17.96	17.26	18.55	18.73
June	27.25	28.30	18.17	23.80	27.86	26.49
July	27.40	26.03	26.53	24.70	24.42	24.85
August	24.88	25.10	---*	22.52	25.20	23.63
September	20.92	22.84	21.87	16.24	19.40	19.89
October	15.46	16.88	13.38	13.28	15.72	14.58
November	14.20	11.60	14.30	11.62	15.88	13.55
December	12.20	18.86	18.04	14.94	15.80	16.48

PARTICULATE MATTER PM_{10} MONTHLY ARITHMETIC MEAN

WITH MAXIMUM / MINIMUM 24-HOUR SAMPLES



PRIMARY: 50 $\mu G/M^3$ ANNUAL ARITHMETIC MEAN, 3-YEAR AVERAGE OF ANNUAL VALUES
MUST BE LESS THAN OR EQUAL TO 50 $\mu G/M^3$.
150 $\mu G/M^3$ 24-HOUR CONCENTRATION, EXPECTED NUMBER OF DAYS PER CALENDAR YEAR
WITH A CONCENTRATION ABOVE 150 $\mu g/m^3$ IS EQUAL TO OR LESS THAN ONE.

c. Particulate Matter 2.5 Micrometers ($PM_{2.5}$)

The $PM_{2.5}$ measurement is a size specific indicator of particulate matter in the ambient air. The $PM_{2.5}$ sampler collects particulates with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers. The $PM_{2.5}$ measurement is the weight of this size specific material in a unit volume of air.

The new primary annual $PM_{2.5}$ standard is set at 15 $\mu g/m^3$, annual arithmetic mean. The annual standard is attained when the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations is less than or equal to 15 $\mu g/m^3$ from single or multiple community-oriented monitors. The new primary 24-hour $PM_{2.5}$ standard is set at 65 $\mu g/m^3$. The 24-hour $PM_{2.5}$ standard is attained when the 3-year average of the 98th percentile of the 24-hour $PM_{2.5}$ at each population-oriented monitor within an area is less than or equal to 65 $\mu g/m^3$.

The $PM_{2.5}$ monitoring network has been put in place in Fairfax County and quality assurance procedures for the samplers developed by EPA and the Virginia Department of Environmental Quality (VADEQ) have been implemented. Sampling for $PM_{2.5}$ started in January 1999.

PM 2.5 sampler

Table 10: Particulate Matter 2.5 Micrometers

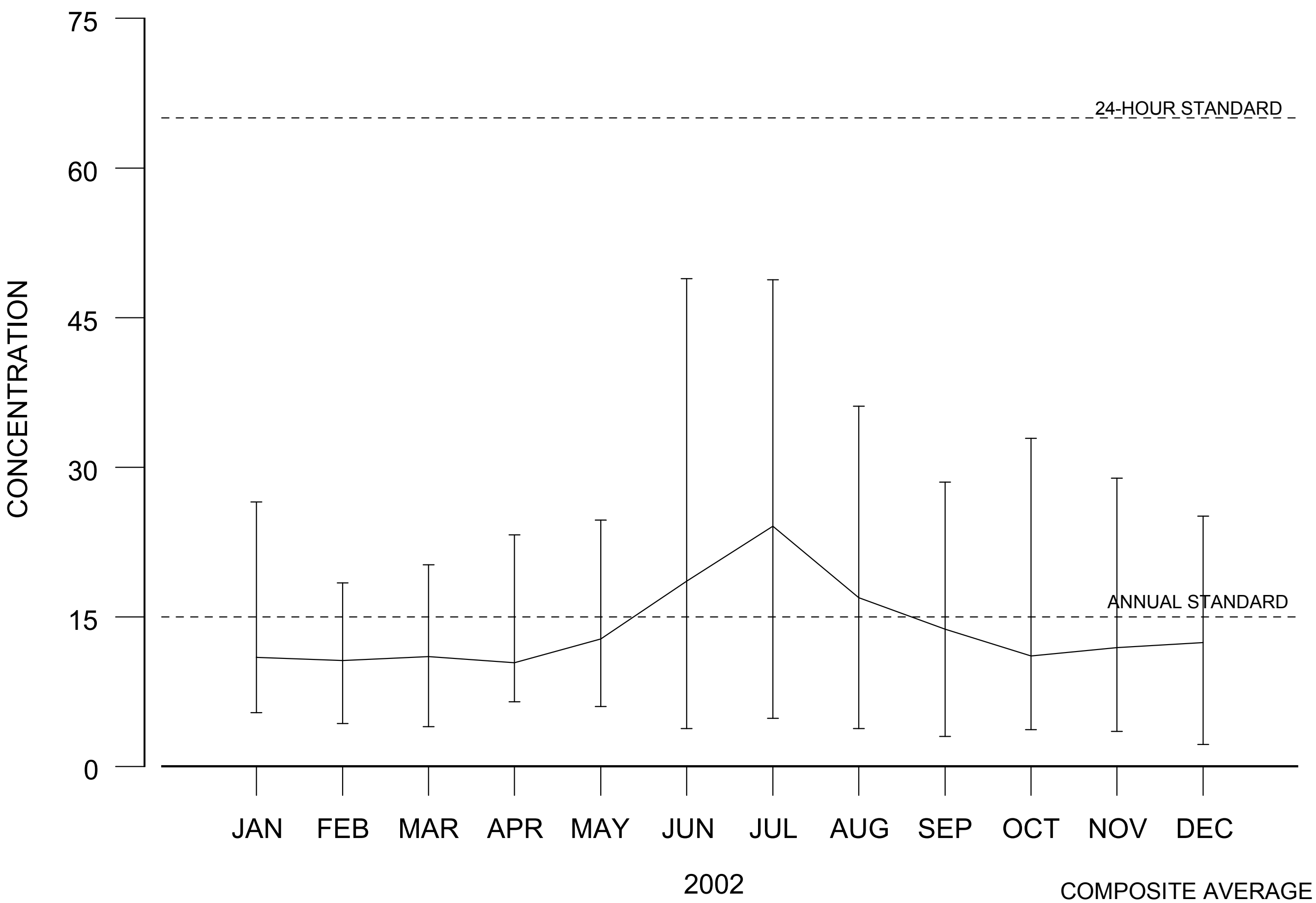
Monthly Arithmetic Mean, $\mu g/m^3$

	FRANCONIA	LEWINSVILLE	MASON
January	10.3	11.6	
February	9.7	11.5	
March	10.8	11.2	
April	10.1	10.7	
May	12.0	13.0	13.4
June	16.7	20.0	19.0
July	23.2	23.2	25.8
August	17.0	17.7	16.0
September	12.6	15.2	13.5
October	12.0	10.2	11.0
November	11.5	12.2	12.1
December	11.7	13.3	12.3
Number of Observations	349	112	85
Maximum Value	48.9	48.9	48.0
Annual Mean	13.3	14.2	15.4*

*Annual mean based on incomplete data for 2002, station operational May 2002.

PARTICULATE MATTER$_{2.5}$ MONTHLY ARITMETIC MEAN

WITH MAXIMUM / MINIMUM 24-HOUR SAMPLES



PRIMARY: 15 μG/M^3 ANNUAL ARITHMETIC MEAN, 3-YEAR AVERAGE OF ANNUAL VALUES
MUST BE LESS THAN OR EQUAL TO 15 μG/M^3 FROM SINGLE OR MULTIPLE COMMMUNITY ORIENTED MONITORS.
65 μG/M^3 24-HOUR CONCENTRATION, 3-YEAR AVERAGE OF THE 98th PERCENTILE
AT EACH POPULATION-ORIENTED MONITOR IS LESS THAN 65 μG/M^3
SECONDARY: SAME AS PRIMARY.

6. Lead (Pb)

Lead is emitted into the atmosphere by certain industries such as smelters and battery manufacturers. Airborne lead is associated with particles ranging between 0.1 and 5.0 micrometers in diameter. Particle size and shape are important factors in determining the deposition and suspension of lead in the atmosphere and the retention and absorption of lead into the human lung.

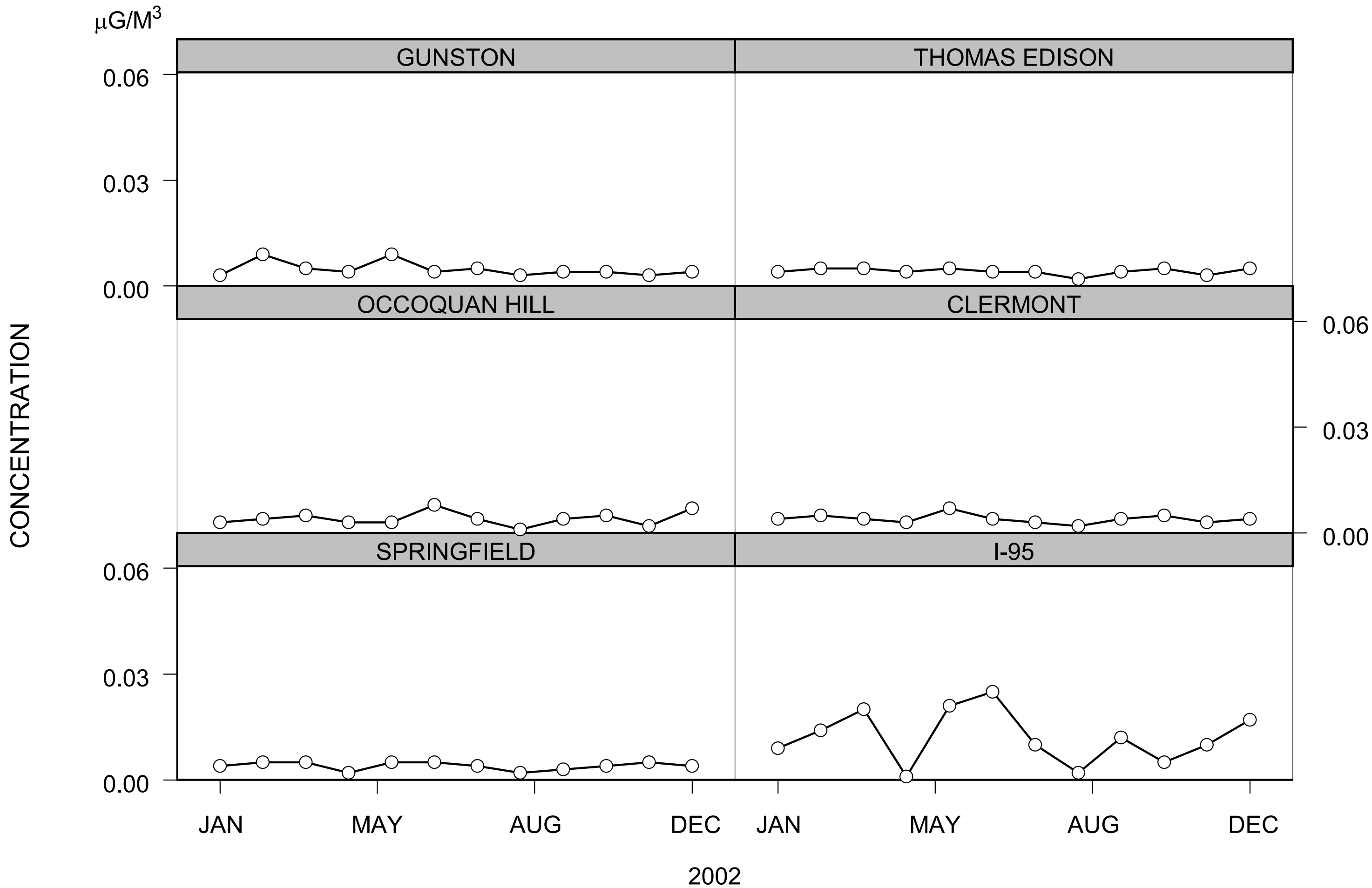
Lead interferes with the blood forming system, the nervous system, the renal system, vitamin D metabolism, and can affect the normal functions of the reproductive and cardiovascular systems. Certain subgroups of the population are more susceptible to the effects of lead. Low levels of lead absorption by young children can cause permanent mental retardation. Lead has also been associated with high blood pressure in adults.

The NAAQS for lead are defined in terms of the quarterly arithmetic mean. The primary and secondary standards for lead are 1.5 $\mu g/m^3$ quarterly arithmetic mean.

Table 11: Lead

	BUSH HILL	CLERMONT	GUNSTON	I-95	OQQOQUAN HILL	SPRINGFIELD	THOMAS EDISON
Number of 24-hr measurements	61	60	58	57	61	59	48
Maximum 24-hr sample, $\mu g/m^3$	0.037	0.020	0.023	0.036	0.019	0.012	0.009
Maximum monthly average, $\mu g/m^3$	0.008	0.007	0.009	0.025	0.008	0.005	0.005
Maximum quarterly average, $\mu g/m^3$	0.005	0.005	0.006	0.016	0.005	0.005	0.005
2^{nd} highest quarterly average, $\mu g/m^3$	0.005	0.004	0.006	0.014	0.005	0.004	0.004

LEAD MONTHLY MEAN



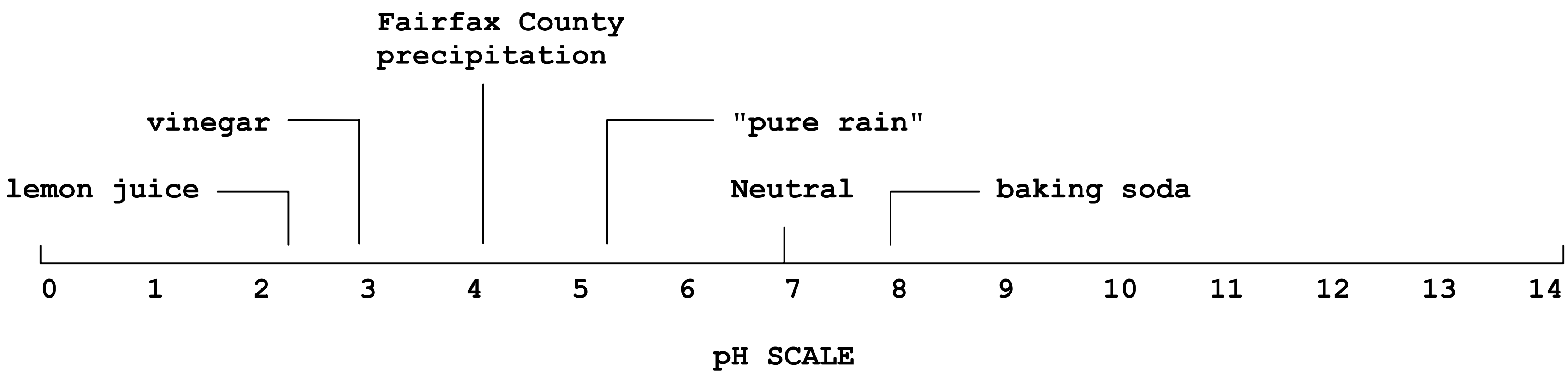
FEDERAL, STATE, AND COUNTY STANDARDS:

PRIMARY: 1.5 $\mu G/M^3$ MAXIMUM ARITHMETIC MEAN
PER CALENDAR QUARTER.

SECONDARY: SAME AS PRIMARY

D. Acid Deposition

Acidic precipitation is a phenomenon resulting primarily from the reaction of sulfur oxides and nitrogen oxides which in combination with atmospheric oxygen and moisture form sulfuric and nitric acids. These acids can then be deposited by wet deposition (rain, snow, ice, and fog). Rain and snow are the two primary mechanisms of deposition. In the absence of moisture intermediate products, sulfates, nitrates, and other aerosols are formed and deposited in dry form. The amount of acidity in precipitation can be determined by measuring the pH of a sample. pH is based on a logarithmic scale. A pH of 7.0 is neutral, less than 7.0 is acidic, and greater than 7.0 is basic. Since the scale is logarithmic, a pH change from 7.0 to 6.0 is a ten-fold increase in acidity.



In sensitive areas of the country, acidic precipitation has caused acidification of freshwater ecosystems such that aquatic life can no longer survive. Acidic precipitation is also suspected to be a corrosive which can damage statuary, stone structures, and automobile finishes. Direct effects upon humans have not been established.

Rain and snow samples are collected from our monitoring station at Occoquan, Virginia on a weekly basis. The samples are returned to our laboratory in Fairfax and are analyzed for pH and conductivity. The Virginia Consolidated Laboratories (DCLS) conducts further analysis on our samples for cations and anions, and determines the anion-cation balance.

No standards have been established but "pure rain" should have a pH in the range of 5.2 to 5.6 due to its mixing with atmospheric carbon dioxide and other natural atmospheric constituents.

Table 12: Acid Deposition Occoquan Hill Site
Monthly Volumetric Weighted Average

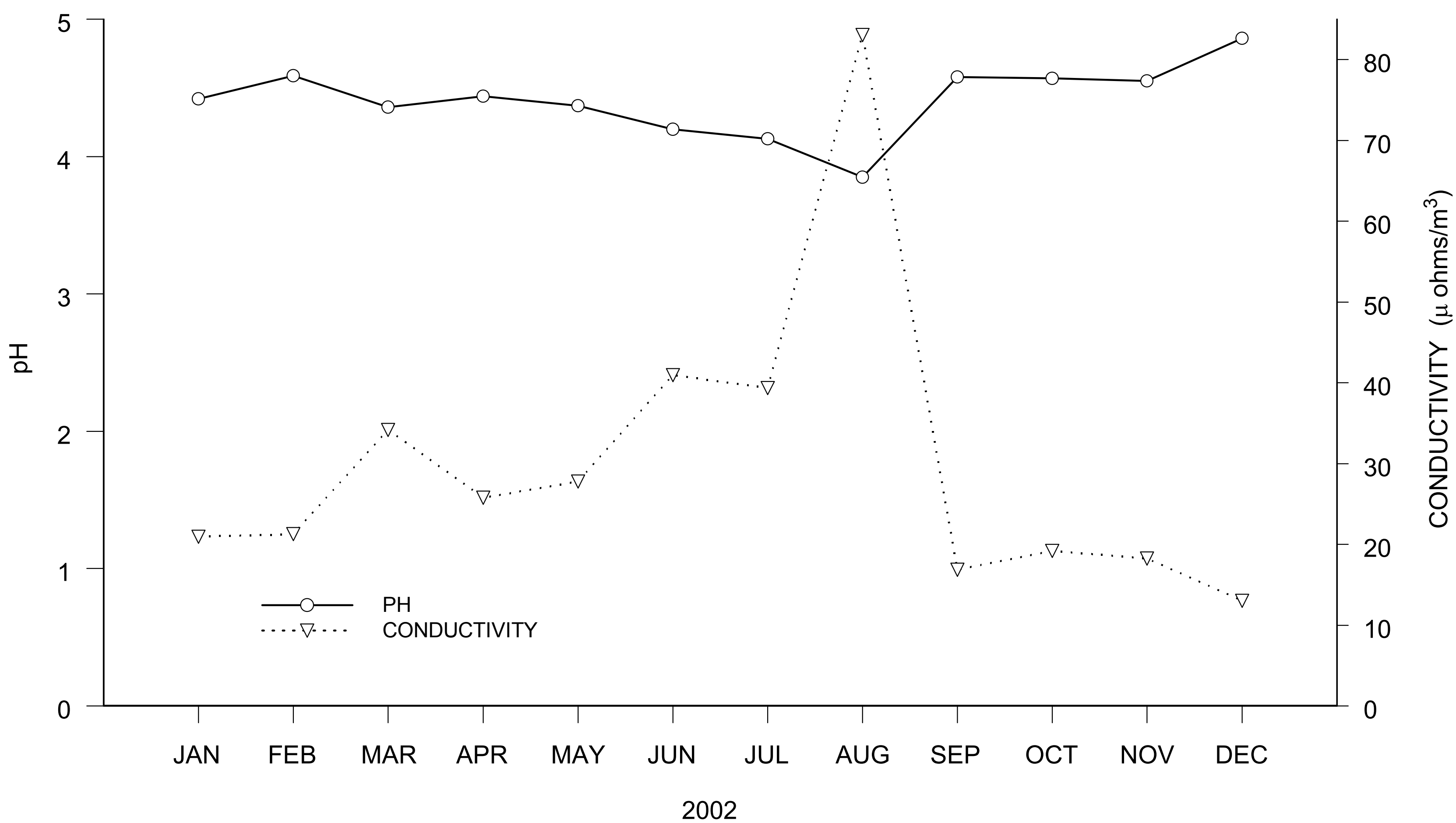
	pH*	CONDUCTIVITY* (µMHO)	TOTAL RAINFALL
January	4.42	20.95	0.32
February	4.59	21.29	0.10
March	4.36	34.16	0.70
April	4.44	25.78	1.06
May	4.37	27.77	0.58
June	4.20	40.94	0.91
July	4.13	39.37	0.34
August	3.85	83.03	0.28
September	4.58	16.87	0.98
October	4.57	19.20	0.96
November	4.55	18.23	1.38
December	4.86	13.02	0.86

Table 13: Acid Deposition Occoquan Hill Site
Quarterly And Annual Volumetric Weighted Average

	pH*	CONDUCTIVITY* (µMHO)
First Quarter	4.40	28.83
Second Quarter	4.35	31.12
Third Quarter	4.36	33.20
Fourth Quarter	4.65	17.09
Annual 2002	4.47	25.73

* Volume weighted average indicates what the level would be if all samples had been mixed together.

ACID DEPOSITION
OCCOQUAN HILL



ph and Conductivity monthly values are volume weighted averages.

Acid rain sampler at Occoquan Hill monitoring station

E. Regional Air Quality

1. Air Quality Index

The U.S. Environmental Protection Agency (EPA) requires the use of an Air Quality Index (AQI) for reporting air quality levels to the general public. The AQI is a system which condenses five air pollutant concentration values (PM_{10}, SO_2, CO, O_3, and NO_2) into a single number as an indicator of air quality. The index values are then grouped into air quality descriptor categories as shown in Table 14. The EPA adopted changes to this index, formerly named the Pollutant Standards Index (PSI), which became effective October 4, 1999. Some of the changes to this index are the addition of another descriptor category for "unhealthy for sensitive groups", new breakpoints for the ozone sub-index in terms of 8-hour, and reporting this index in a color format to the public.

Table 14: Air Quality Index

Index Value	Descriptor Category	Color
0-50	Good	Green
51-100	Moderate	Yellow
101-150	Unhealthy for sensitive groups	Orange
151-200	Unhealthy	Red
201-300	Very unhealthy	Purple
301-500	Hazardous	Maroon

The Metropolitan Washington Council of Governments (COG) is responsible for reporting daily air quality levels to the public in this region. COG. collects air quality data from selected monitoring stations on a daily basis, calculates a maximum index value and forecasts the air quality levels for the following day, and reports this by color format to the media for dissemination to the public. During regional air pollution advisories, COG. collects hourly air quality data from these monitoring stations throughout the region as a basis for continuing or canceling the advisory. When the index exceeds or will probably exceed 100, and when specific weather conditions exist, a Health Advisory may be issued by COG. This Health Advisory is directed towards sensitive populations such as the elderly and those with respiratory disorders. There were 12 Code Red Days and 3 Code Orange Days announced by COG during 2002.

2. Regional Ozone Exceedances

The Washington DC, Maryland, and Virginia air quality control region is classified as a serious non-attainment area for ozone. This region had until 1999 to attain the 1-hour ozone NAAQS, but did not achieve it. Washington, D.C., Maryland, and Virginia petitioned EPA and was granted an extension until 2005. This extension was challenged in court and on January 24, 2003, EPA reclassified the Metropolitan Washington area to severe nonattainment for the ozone standard.

An exceedant day is a day when an ozone monitoring site exceeds the NAAQS of 0.12 ppm for at least one hour. There were nine ozone exceedant days in the air quality control region in 2002. Fairfax County had four ozone exceedant days in 2002. The details are shown in Table 15a below.

Violations of the 8-hour standard are reported , although there are no designated 8-hour non-attainment areas at this time. These violations are shown in Table 15b. Fairfax County had nineteen 8-hour exceedant days in 2002.

TABLE 15a: REGIONAL OZONE EXCEEDANCES 1-HOUR AVERAGE

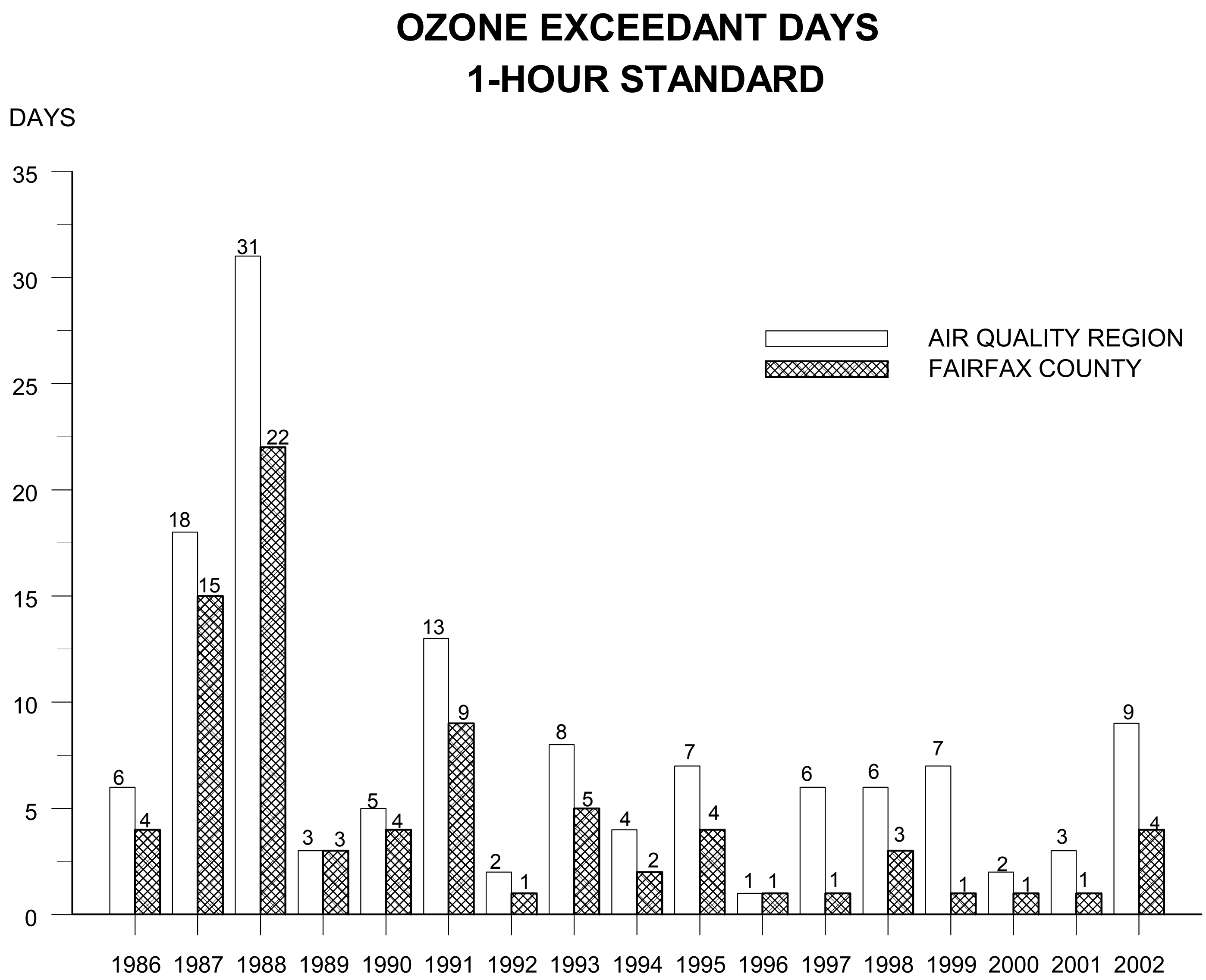
DATE	LOCATION	MAXIMUM 1 HOUR OZONE (PPM)
June 10, 2002	McMillan Reservoir,D.C.	0.125
June 11, 2002	McMillan Reservoir, D.C.	0.126
June 25, 2002	McMillan Reservoir, D.C.	0.151
	River Terrace. D.C.	0.140
	Takoma School, D.C.	0.138
	Alexandria City, VA	0.143
	Arlington, VA	0.150
	Franconia, VA	0.126
July 2. 2002	McMillan Reservoir. D.C.	0.143
	River Terrace, D.C.	0.151
	Alexandria City, VA	0.145
	Arlington, VA	0.151
	Franconia, VA	0.137
	Mason Government Center, VA	0.139
	Mount Vernon, VA	0.145
August 2, 2002	McMillan Reservoir, D.C.	0.125
	Alexandria City, VA	0.127
	Cub Run, VA	0.149
	Franconia, VA	0129
	Lewinsville, VA	0.131
	Mason Government Center, VA	0.137
August 3, 2002	McMillan Reservoir, D.C.	0.126
August 12, 2002	Arlington, VA	0.131
	Mount Vernon, VA	0.130
August 13, 2002	Greenbelt, MD	0.132
	Franconia, VA	0.148
	Mount Vernon, VA	0.153
	Stafford, VA	0.149
September 10, 2002	Ashburn, VA	0.132
	Long Park, VA	0.129

TABLE 15b: REGIONAL OZONE EXCEEDANCES 8-HOUR AVERAGE

DATE	NUMBER OF STATIONS THAT EXCEEDED THE STANDARD (Total of 18 Stations)	MAX VALUE IN METRO STATISTICAL AREA (ppm)
June 05, 2002	1	.091
June 10, 2002	13	.109
June 11, 2002	13	.100
June 21, 2002	2	.094
June 22, 2002	4	.108
June 24, 2002	12	.111
June 25, 2002	13	.120
June 30, 2002	1	.087
July 01, 2002	7	.100
July 02, 2002	15	.134
July 03, 2002	7	.102
July 04, 2002	2	.089
July 08, 2002	3	.094
July 09, 2002	8	.099
July 12, 2002	5	.095
July 16, 2002	3	.091
July 17, 2002	1	.100
July 18, 2002	12	.100
July 19, 2002	2	.092

DATE	NUMBER OF STATIONS THAT EXCEEDED THE STANDARD (Total of 18 Stations)	MAX VALUE IN METRO STATISTICAL AREA (ppm)
July 20, 2002	2	.089
July 21, 2002	2	.089
July 22, 2002	1	.085
July 31, 2002	1	.087
August 01, 2002	8	.108
August 02, 2002	14	.113
August 03, 2002	2	.091
August 04, 2002	4	.096
August 05, 2002	4	.097
August 10, 2002	5	.094
August 11, 2002	13	.106
August 12, 2002	16	.115
August 13, 2002	14	.128
August 14, 2002	12	.100
August 19, 2002	1	.098
August 21, 2002	1	.089
August 22, 2002	1	.095
September 09, 2002	2	.090
September 10, 2002	3	.119

The following graph is a comparison of the number of ozone exceedant days observed in the air quality control region including Fairfax County with those observed just in Fairfax County.



F. METEOROLOGY

1. Overview

Pertinent and representative localized meteorological data are an essential and ongoing integral part of the County's air quality monitoring program. Continuous and accurate observations of local conditions relating to temperature, wind flow (speed and direction) and precipitation are fundamental elements used in the day to day evaluation and understanding of air quality conditions and assessment of long-term trends within the County.

The County's meteorological observing equipment has evolved from simple battery powered, mechanical recorder devices requiring manual reduction of data to more modern electronic sensors and data average devices capable of real-time call up and output of instantaneous values or hourly and daily averages of temperature, wind and precipitation. The meteorological sensors are employed in close proximity with the air quality monitors to assure representative data.

Some meteorological data produced by other agencies at nearby locations are acquired and used by the agency. Data from Dulles and Washington National Airports, although tailored for aviation support, are particularly useful in establishing long term averages, for quality control work, and to compliment agency data. Therefore, some of the pertinent airport data are tabulated and displayed in this report.

County and agency computers, data loggers, and other electronic devices are exploited in the acquisition, reduction and processing of meteorological data. For this report, the data, unless otherwise described, is processed, tabulated and displayed in a manner similar to that done for the air quality pollutant data. In addition, data for this and all prior years are archived in electronic format and is readily available for interested County and other governmental agencies, contractors, and Fairfax County citizens.

2. Temperature

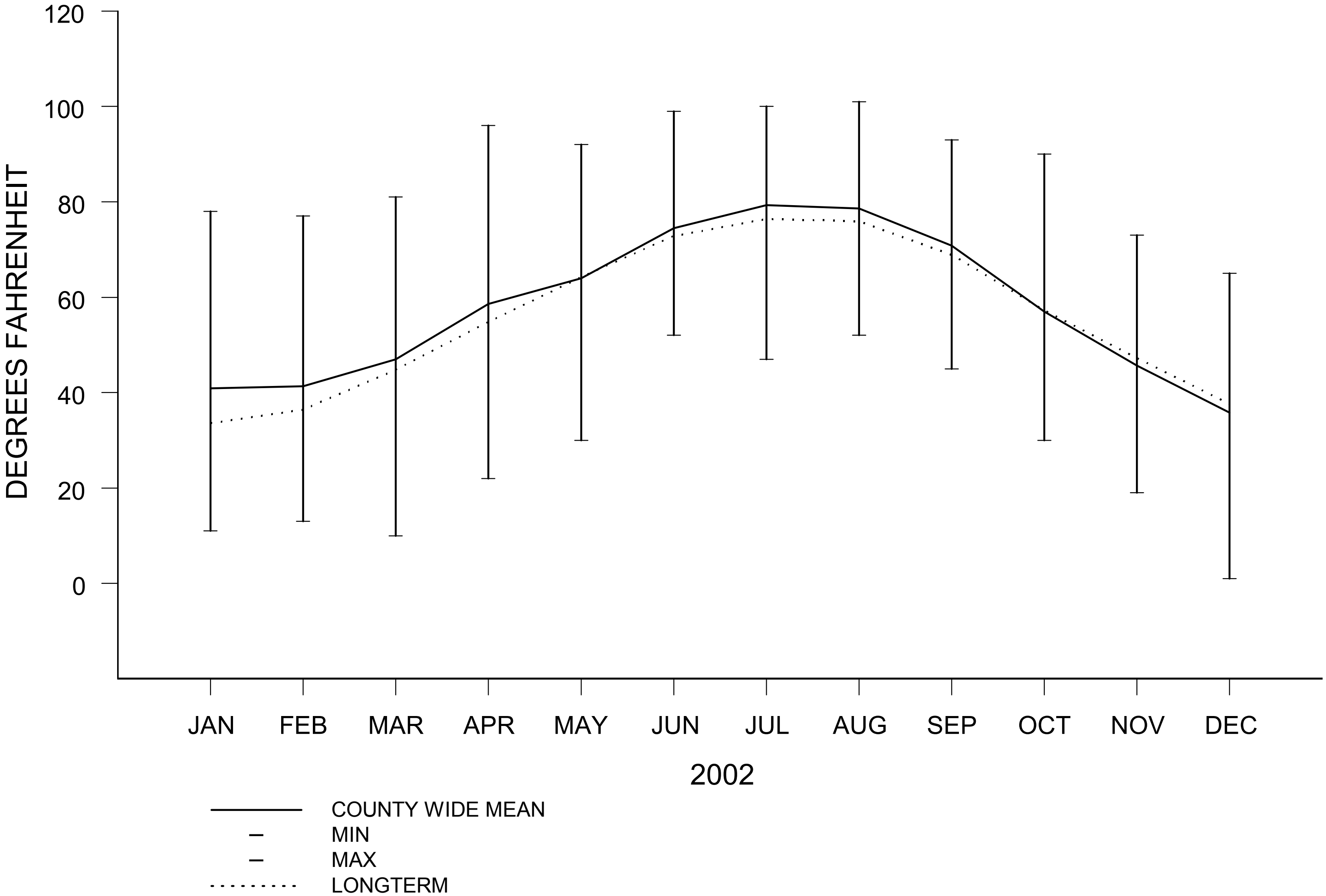
The annual average maximum or minimum temperature is obtained by averaging all daily maximum or minimum temperatures. The annual mean value is the average of all hourly average temperature observations, and is independent of any recorded or calculated maximum or minimum.

Table 16: Temperature

	Annual Average Daily Maximum °F	Annual Mean Temperature °F	Annual Average Daily Minimum °F
	Maximum	Mean	Minimum
COUNTY STATIONS			
Lewinsville	68.2	58.8	49.6
Mount Vernon	69.2	58.4	48.1
Occoquan Hill	67.8	58.5	49.0
Luck Quarry	68.0	56.1	44.8
AIRPORTS			
Dulles	67.1	56.4	45.0
National	68.2	59.2	50.5

MONTHLY MEAN TEMPERATURE

WITH MAXIMUM AND MINIMUM DAILY EXTREMES



3. Rainfall

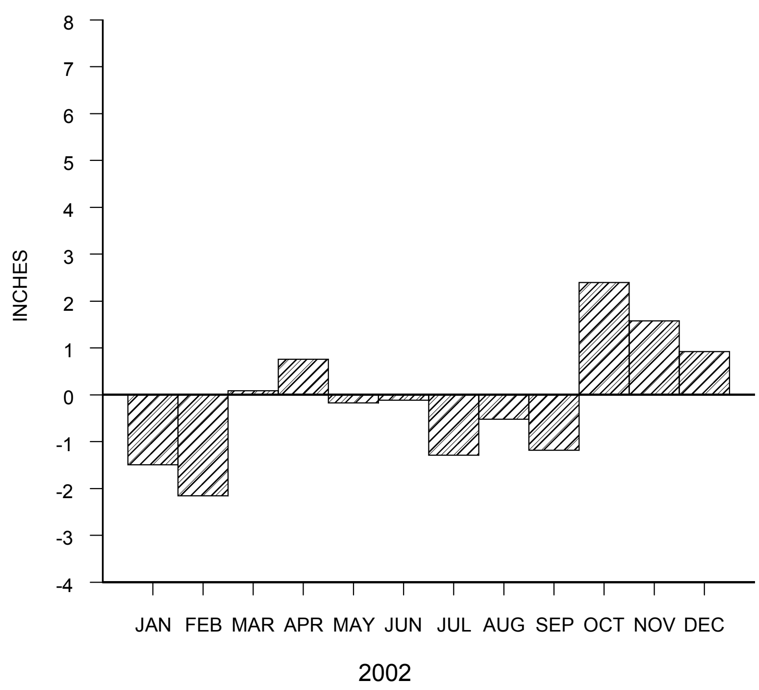
Rainfall is stated as the accumulated depth in inches as measured by county and airport rain gauges. Rainfall was below normal (1.13 inches) in 2002.

Table 17: Rainfall

	RAINFALL (inches)
COUNTY STATIONS	
Cub Run	39.95
Lewinsville	38.32
Mount Vernon	39.32
Occoquan Hill	37.83
Luck Quarry	38.01
AIRPORTS	
Dulles	38.12
National	34.33
ANNUAL COUNTYWIDE MEAN	38.59
LONG TERM MEAN FROM TWO AIRPORT SITES	39.72

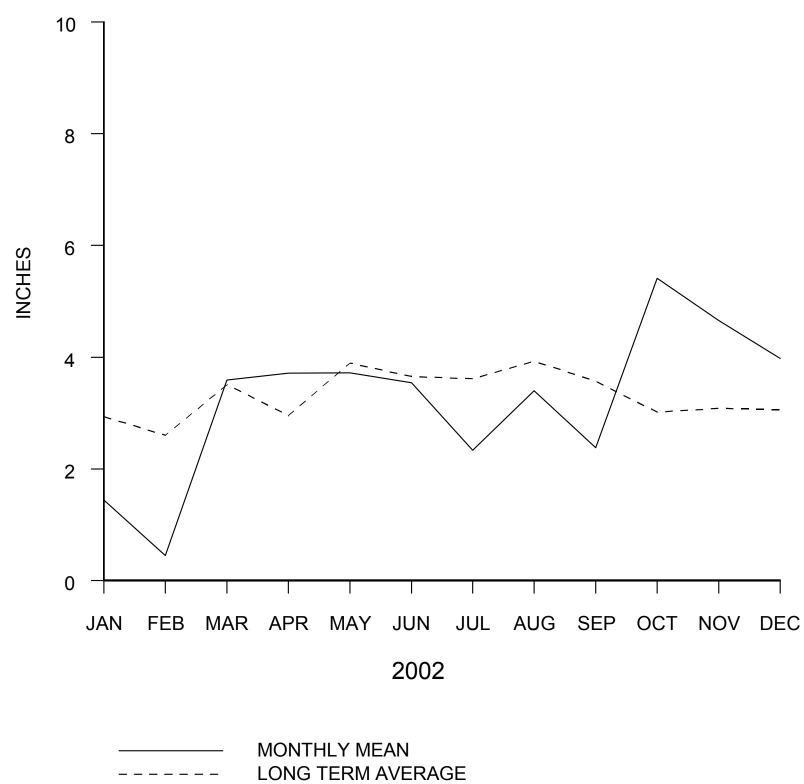
RAINFALL

DEPARTURE



DEPARTURE: THE DIFFERENCE BETWEEN THE LONG
TERM 2 AIRPORT AVERAGE AND THE AVERAGE
OF THE OBSERVED AMOUNTS AT ALL STATIONS.

DEPTH



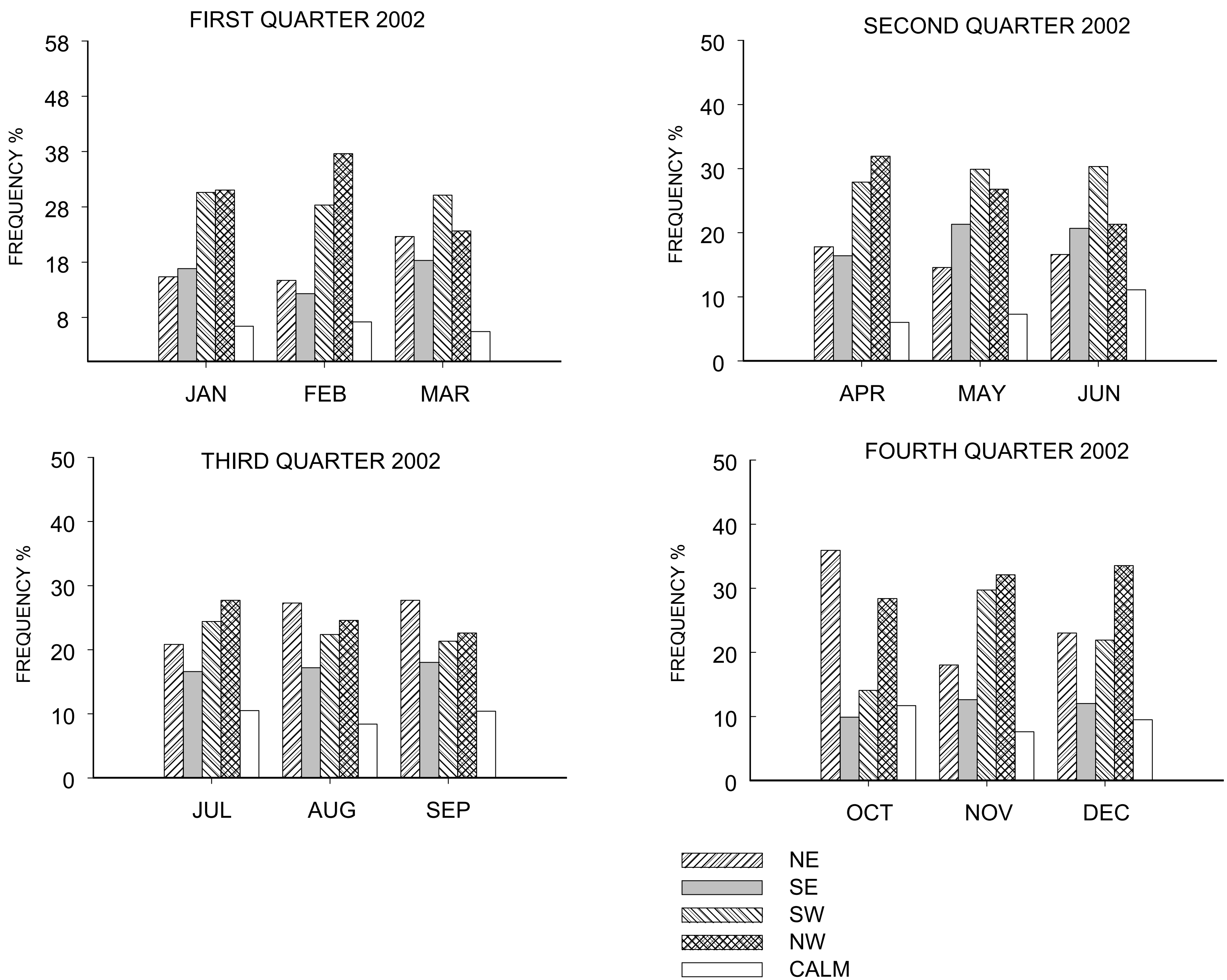
4. Wind

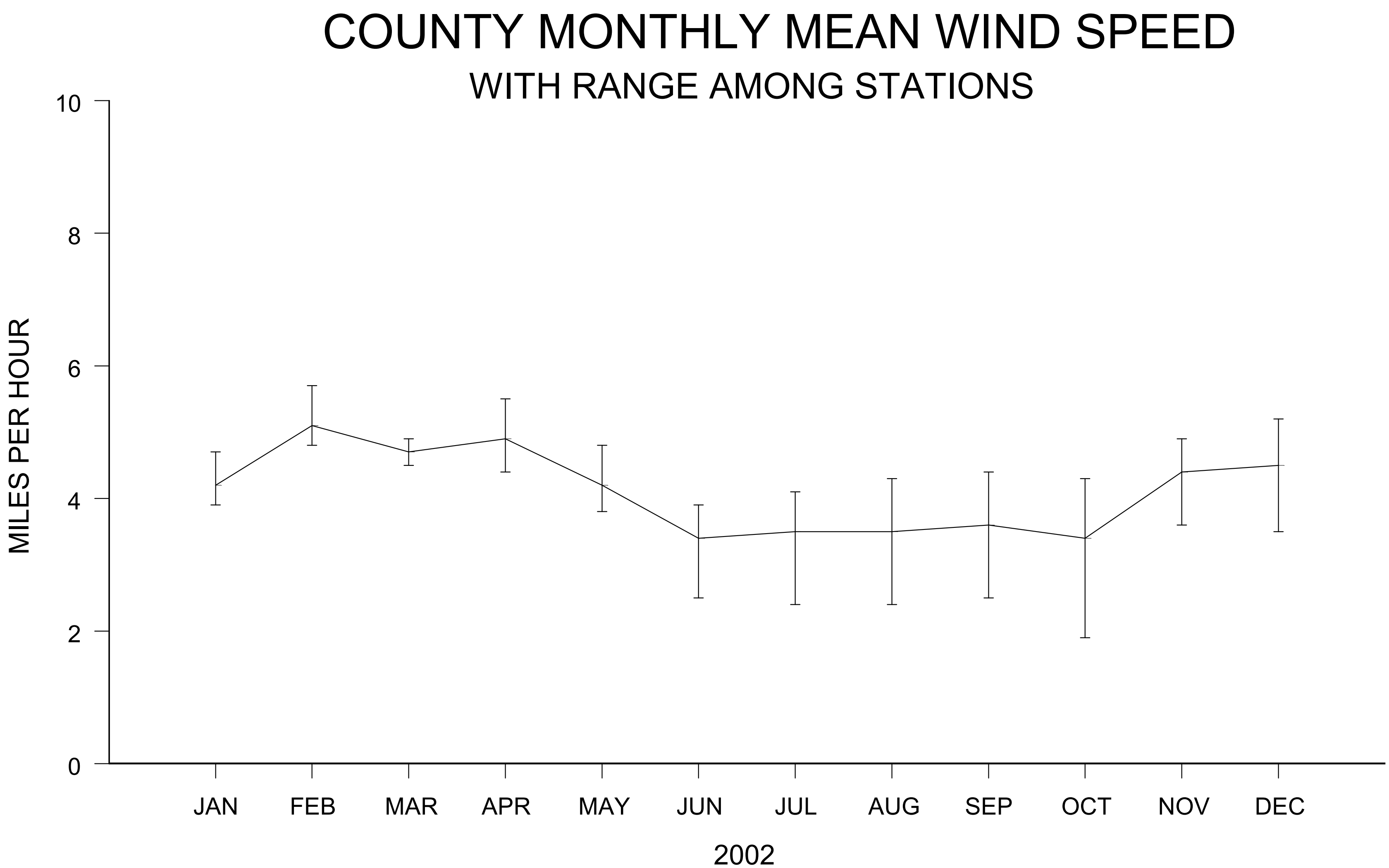
Wind direction observations are grouped by quadrant as follows: All occurrences of wind from 349^{o} true through 078^{o} true inclusive are classed as northeast winds; similarly winds from 079^{o} through 168^{o} true are southeast; winds from 169^{o} through 258^{o} true are southwest; and winds from 259^{o} through 348^{o} true are northwest. Frequency is the number of hourly observations in a quadrant stated as a percentage of all wind observations. Similarly, the mean wind speed for a quadrant is the average of all hourly wind speeds whose associated directions fall within the quadrant.

Table 18: Wind Direction and Mean Wind Speed
Table Format: Frequency (percent of time)/Speed (miles per hour

	NORTHEAST	SOUTHEAST	SOUTHWEST	NORTHWEST	CALM
COUNTY STATIONS					
Lewinsville	33.6/4.8	27.6/4.0	21.1/3.3	17.7/3.5	-
Luck Quarry	16.3/3.2	12.9/3.0	25.0/4.8	30.9/4.2	14.9
Mount Vernon	25.2/3.6	18.7/3.7	26.5/4.7	29.6/5.1	0.1
Occoquan Hill	13.7/4.9	19.1/3.4	18.9/4.4	41.5/6.1	6.9
AIRPORTS					
Dulles	15.1/9.2	7.0/7.2	27.3/9.5	27.4/11.7	23.2
National	24.0/10.9	10.2/8.8	36.3/10.5	23.1/13.9	6.3

WIND SPEED AND DIRECTION




COUNTY MONTHLY MEAN WIND SPEED
WITH RANGE AMONG STATIONS
MILES PER HOUR
10
8
6
4
2
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
2002

Weather station at Occoquan Hill

Rain gauge sampler

APPENDIX A
ANNUAL TREND ANALYSIS AND GRAPHS

In this Section, monitoring data for a number of pollutants are aggregated on an annual basis and plotted against time to indicate long-term trends. A trend is a broad long-term movement in the time sequence of air quality measurements.

Comparable data on several factors known to influence air quality are also plotted for ease of comparison. Some caution in making comparisons is urged however, because the nature and strength of the causal relationships, if any, are somewhat speculative.

A1. PARTICULATE MATTER (PM_{10})

Particulate matter (PM_{10}) is emitted directly by mobile and industrial sources or is formed in the atmosphere by reaction with sulfur dioxide, nitrogen oxides, and volatile organic compounds.

In the Group A graphs, the composite average annual arithmetic mean PM_{10} concentrations are compared with traffic and rainfall deficit. There has been a significant long-term downward trend in the PM_{10} composite average (-54.2%) since 1986. The 1-year change between 2001 and 2002 was –7.1 percent. The traffic graph is used as an indicator of vehicle travel growth as measured by vehicle miles traveled. The rainfall deficit graph is a plot of the percentage difference above or below normal. Rainfall deficit is plotted with "below normal rainfall" as a positive percentage for ease of comparison with the PM_{10} graph.

Vehicle travel growth and development activities have the effect of increasing the amount of dust in the air. Pollution emissions from automobiles are declining despite increases in vehicle miles traveled each year. PM_{10} levels continued a yearly decline since 1989, -56.7%. PM_{10} trends are highly associated with the trends in sulfur dioxide and nitrogen oxides. PM_{10} levels seem to be affected more by reductions in sulfur dioxide, nitrogen oxides, and volatile organic compound emissions than by increases in vehicle travel. Rainfall has the effect of minimizing dust re-entrainment and also cleans dust out of the air. PM_{10} levels, on an annual basis, seem to be unaffected by the amount of rainfall in a given year.

A2. OZONE

Ozone levels tend to be high during the warm months of the year. The official "Ozone Season" for the Metropolitan Washington area begins in April and continues through October of each year. The composite average tends to vary from year to year due to a number of different factors affecting ozone levels, such as changing meteorological conditions and precursor emission changes. There was a 17.4 percent increase in the second highest composite average for 2002 from that of the prior year. The second highest composite average has decreased -31.8 percent from the high reached in 1979.

The top graph of Group B-1 depicts the number of "unhealthful" days as defined by the Air Quality Index (AQI). The AQI is the national uniform index system, the use of which in this area is required by Federal regulation. (See section E.1. Air Quality Index for more information). For purposes of this report, an "unhealthful" day is defined as any day when the measurement at any Fairfax County station yields an index value greater than 100. In 1983 Fairfax County experienced 30 "unhealthful" days, in 1987 17 "unhealthful" days, and in 1988 28 "unhealthful" days. The large number of "unhealthful" days during these 3 years was due primarily to the occurrence of meteorological conditions very conducive to ozone formation. There were 5 "unhealthful" days in 2002.

The bottom left graph of Group B-1 is a plot of the 3-year running average of a composite average. The composite average is the number of exceedant days averaged across all ozone sites. An exceedant day is one in which a site had at least one hourly concentration greater than the ozone 1-hour standard. The 3-year running average is calculated by dividing the composite average for a given year plus those in the prior two years by three. In 1988 and 1989 the 3-year running average was 7.0 days, the highest value recorded, and reflects the influence of the high number of exceedant days in 1988 on the 3-year averages. The 3-year running average in 2002 was 0.75 days.

On July 18, 1997 EPA promulgated new national ambient air quality standards (NAAQS) for ozone. EPA changed the averaging time to 8 hours and changed the form of the standard from an expected exceedance form to a concentration-based form. The NAAQS for ozone are met at an ambient monitoring site when the 3-year average of the annual fourth highest daily maximum 8-hour concentration is less than or equal to 0.08 ppm. The new standards became effective on September 16, 1997, but 1-hour standards have remained in effect. EPA was waiting until the 1-hour standard had been attained before it implemented the 8-hour standard. As stated earlier in this report, the U.S. Supreme Court upheld the revised standard. At the time of this report, EPA is planning to implement the new 8-hour standard in 2004.

The graphs in Group B-2 will be used to track ozone trends associated with the new 8-hour standards. The statistics used in the plots are directly related to the form and averaging time of the new 8-hour standards. Trends in the composite average of the fourth highest daily maximum 8-hour concentration are shown in the top left graph of Group B-2. There has been a significant downward trend in the composite average, -10.6 percent since 1979. The composite average was 0.088 ppm in 2002. The top right graph is a plot of the composite average of the 3-year mean fourth highest maximum daily 8-hour concentration and is used to track compliance with the new 8-hour standard. There has been a significant downward trend in the 3-year mean composite average, - 6.4 percent, since 1979. The 2002 composite average of the 3-year mean was 0.088 ppm, down –1.1 percent from that of the prior year.

The bottom left graph is a plot of the composite average of the number of days with maximum 8-hour concentration above the 8-hour standard. It shows the year to year variability in the number days the ozone standard was exceeded. The composite average increased in 2002 to 13.5 days. The bottom right graph is a plot of the monthly frequency, in percent, of days above the 8-hour standard using ozone data from 2002. April is the earliest month in which the 1-hour standard has been exceeded, while ozone concentrations above the 8-hour standard have been observed in March. July has the greatest number of days above the 8-hour standard. There have been no exceedances of either the 1-hour standard or the 8-hour standard in October. Mount Vernon exceeded the 8-hour standard on 16 days, Cub Run on 12 days Lewinsville on 7 days, and Mason on 19 days.

Ozone in Fairfax County has improved since 1979. Citizens in the County are exposed to fewer unhealthful ozone days and generally lower ozone concentrations on those days.

A3. INDUSTRIAL AND SPACE HEATING EMISSIONS

Sulfur dioxide and nitrogen dioxide trends are shown in the set of graphs contained in Group C. These pollutants are produced by fossil-fueled space heating and electrical utility boilers as well as by internal combustion engines. In the left graph the sulfur dioxide levels are expressed in terms of the composite annual average concentration. The sulfur dioxide composite average has shown a long-term downward trend, - 50 percent, since 1974.

In the right graph the nitrogen dioxide levels are expressed in terms of the composite annual average concentration. The nitrogen dioxide composite average has shown a long-term downward trend, - 66.7 percent, since 1974.

A4. LEAD AND VEHICLE EMISSIONS

Carbon monoxide is produced principally by automotive sources and secondarily by fossil fuel space heating. At one time, the primary source of lead in ambient air in this area was the combustion of leaded fuels by automotive vehicles. Group D shows trends of these pollutants.

In the left graph the carbon monoxide levels are expressed in terms of the composite average of the second highest 8-hour average concentration. There has been a long-term downward trend, -76.9 percent, in the composite average since 1979. Carbon monoxide levels tend to be high during the colder months of the year, January, February, November, and December. High 8-hour average concentrations frequently occur in the 5pm - 1am and 6pm - 2am time frames, and are associated with emission generated by evening rush hour traffic and strong winter temperature inversions. Fairfax County has never exceeded the 1-hour standard and the last exceedance of the 8-hour standard was in 1986. Fairfax County is in attainment for the NAAQS for carbon monoxide. In the right graph of Group D, lead levels are expressed in terms of the composite average of the maximum quarterly average concentration. There has been a long-term decrease of –81.6 percent in lead levels since 1981. The 2002 composite average is 0.5 percent of the National Standard of I.5 $\mu g/M^3$. This decrease in the composite average can be attributed to the Environmental Protection Agency's (EPA) program of eliminating lead in gasoline. The EPA lowered the allowable lead content in gasoline by 50 percent on July 1, 1985. A further reduction to 0.1 grams/gal, a 90% reduction from pre-July 1985 levels, was implemented on January 1, 1986. In 1975 unleaded gasoline was introduced, which now accounts for about 99% of gasoline sales.

A5. ACID DEPOSITION

Sulfuric and nitric acids are the two major components of both wet and dry acidic deposition. Sulfur dioxide reacts with hydroxyl radicals, hydrogen peroxide and ozone to produce sulfate ions. Nitric oxide reacts with a number of different pollutants such as hydrocarbons, carbon monoxide, hydroperoxyl radicals, hydroxyl radicals, and ozone to produce nitric acid, particulate nitrate, and peroxyacetyl nitrate (PAN). The bottom left and bottom right graphs show trends in rainfall and volume weighted pH at the Occoquan Hill site. The long-term volume weighted pH average is 4.47. There was an increase in acidity of 9 percent from 1996 to 1998, and a decrease in acidity of 14.3 percent from 1998 to 2002. There is no evidence of any trends since sampling began in 1989.

A6. WEATHER

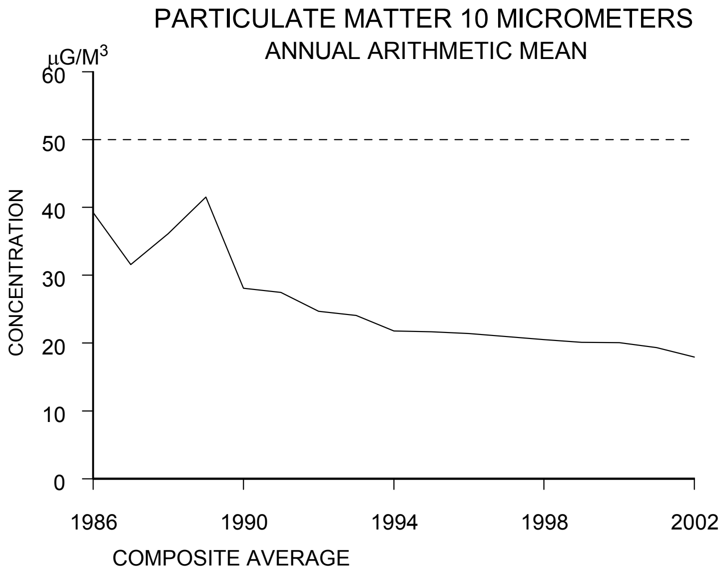
Meteorological monitoring was initiated in 1974 for wind direction, wind speed, temperature, and rainfall. Group F shows trends of rainfall and temperature.

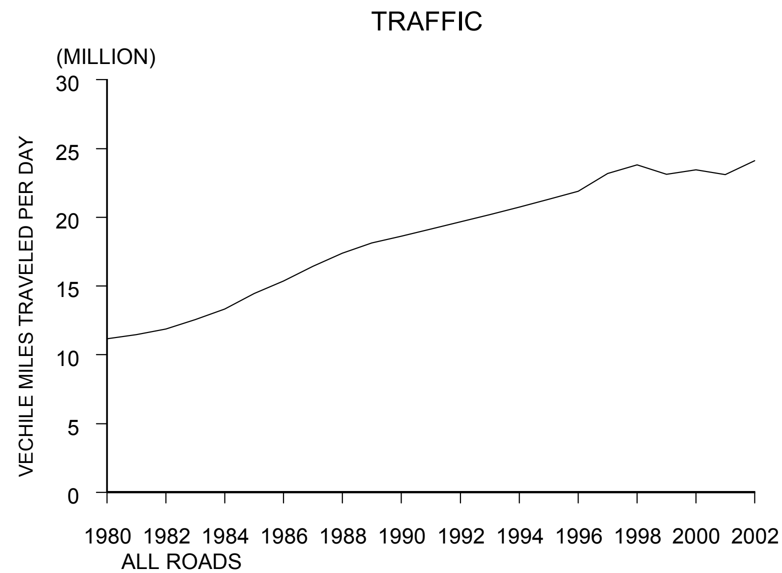
The left graph in Group F illustrates the year to year variability inherent in rainfall. The values used in this graph are obtained as follows: the observed rainfall amounts at all County stations, plus Dulles, and National airports for each month and for each year are averaged to obtain a composite county average amount, for the year of interest. The long-term average uses the climatological values from the two airports. Annual rainfall in 2002 was 38.59 inches, 1.13 inches below normal. Annual rainfall in 1996 was 55.83 inches, the wettest year since 1974. The driest year was in 1980, 29.94 inches of rainfall, 10.84 inches below normal.

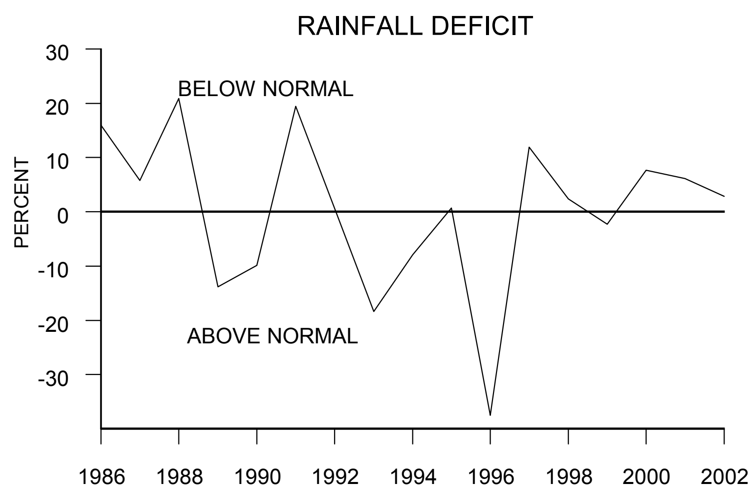
The right graph is a plot of the annual mean temperatures. The warmest annual mean temperature was set in 1998 at 59.1°F. The United States average temperature in 1998 was also one of the warmest years on record. The coolest annual mean temperature observed in the County was in 1978 (53.0°F). The annual mean temperature in 2002 was 57.6°F. There has been an upward trend in the annual mean temperature in the County since 1975. Several factors have probably influenced the apparent trend in the annual mean temperature, improvements in the temperature measurement instrumentation, changes in sample site location, and a "heat island" effect. Fairfax County has become increasingly developed over the last twenty years. There are more buildings and streets that can collect heat during the day and hold on to it longer at night, increasing the temperature of the surrounding air.

ANNUAL TRENDS

GROUP A

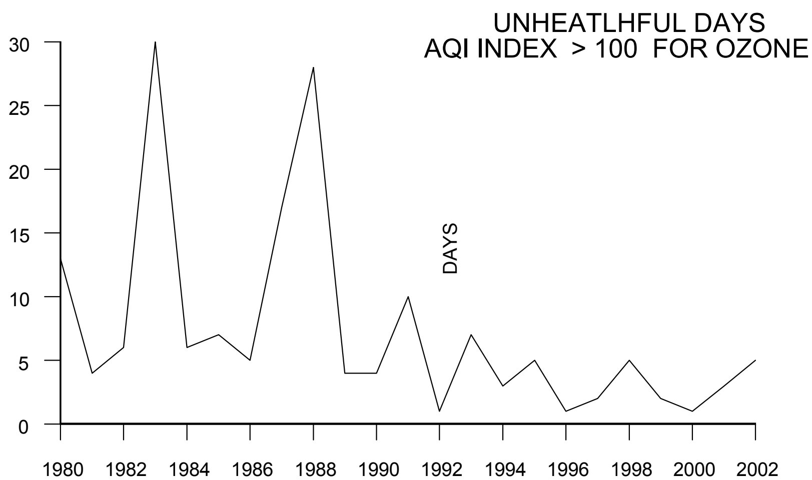


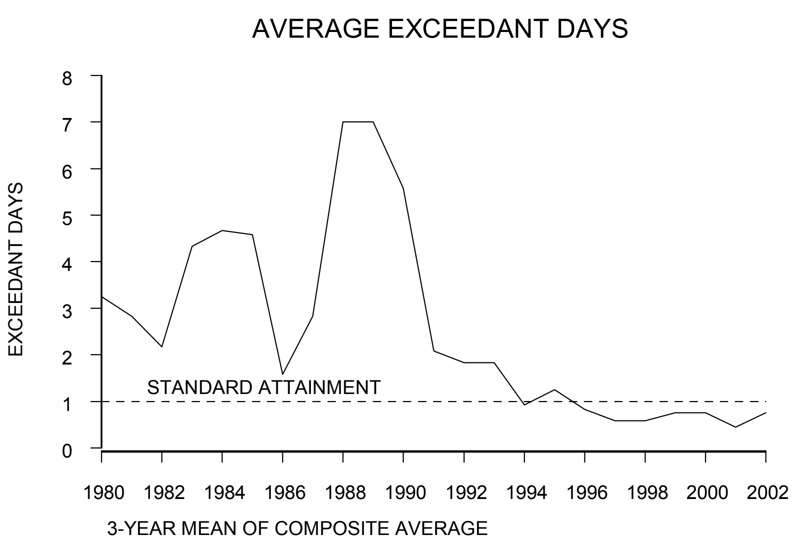


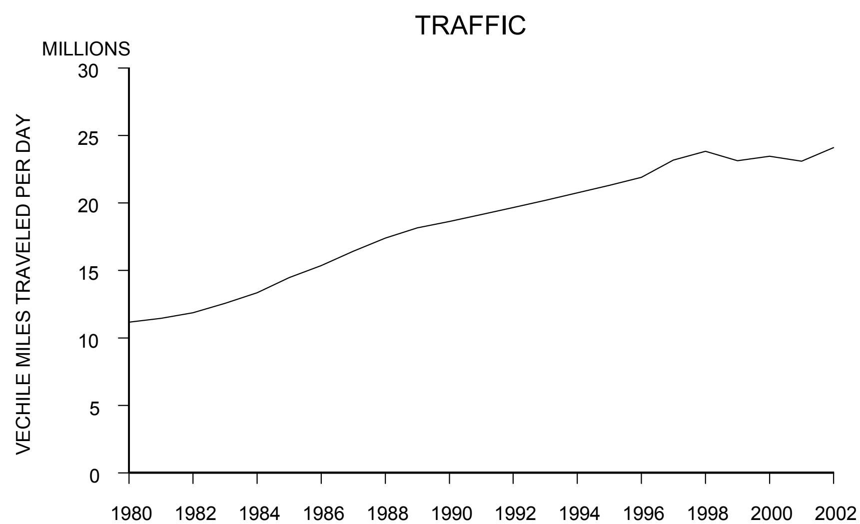


ANNUAL TRENDS

GROUP B-1







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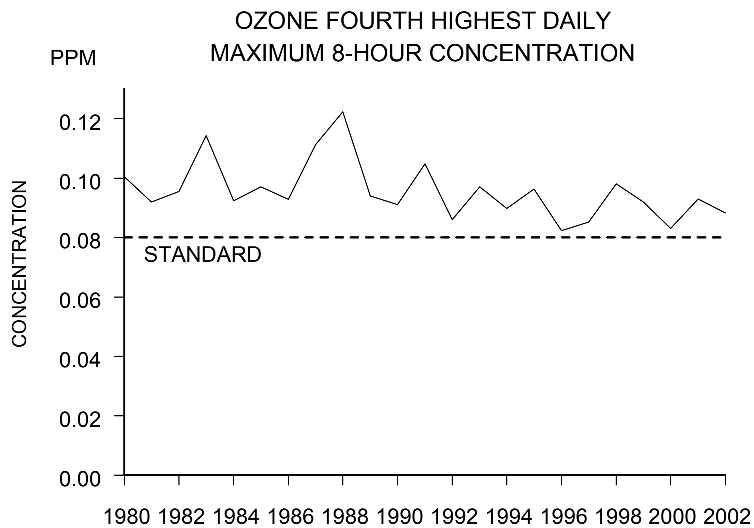

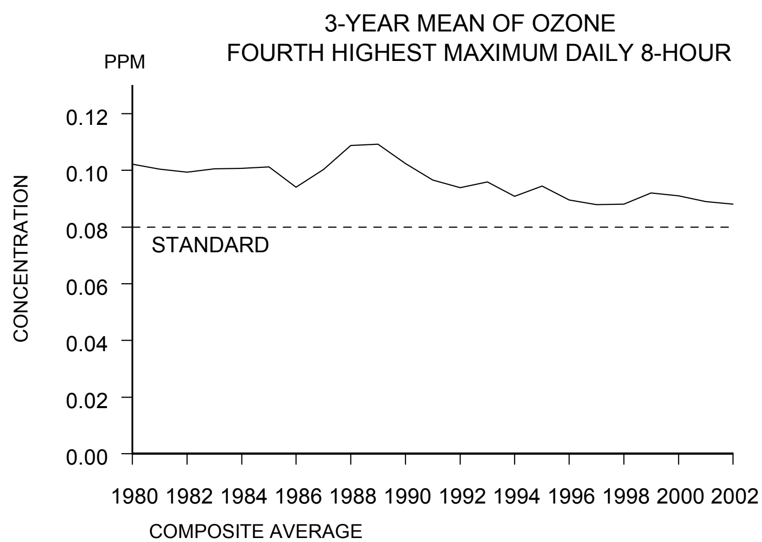

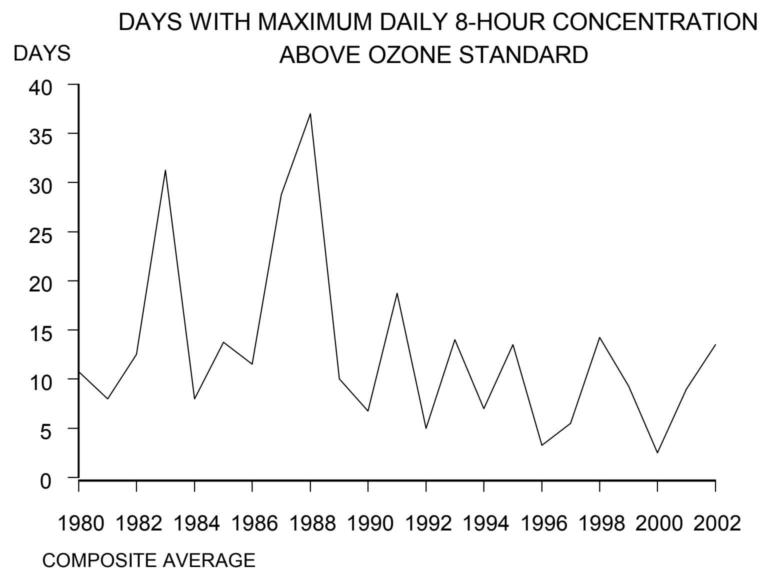

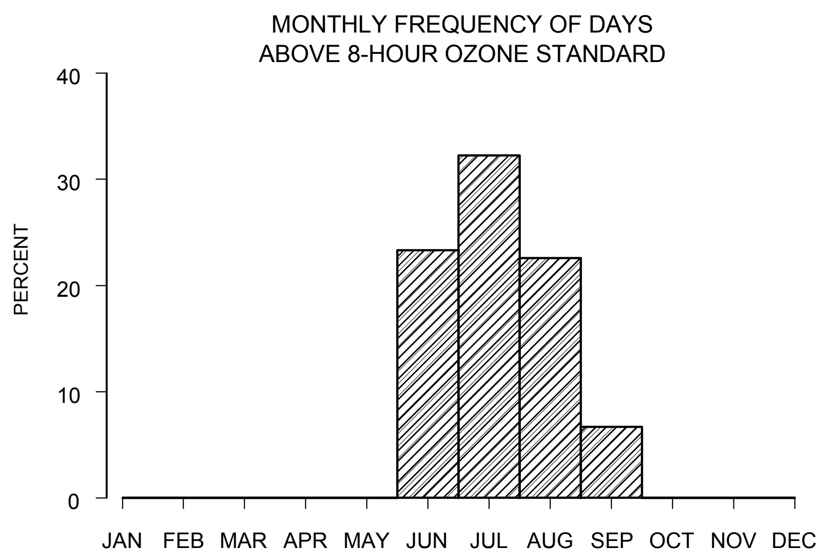

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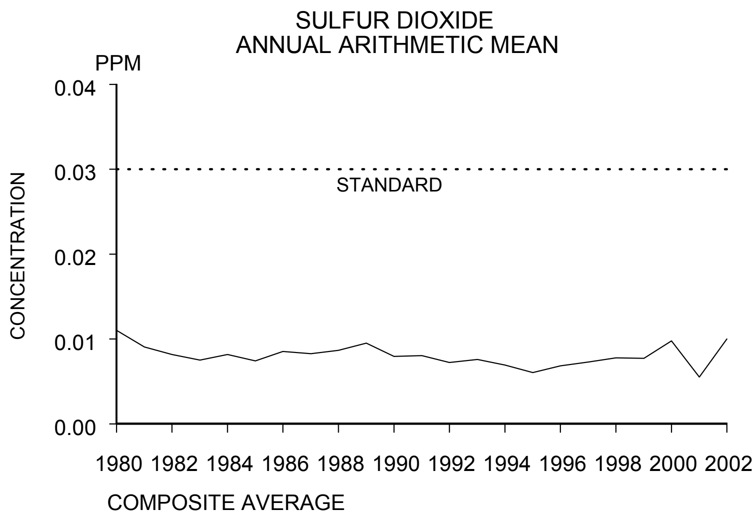

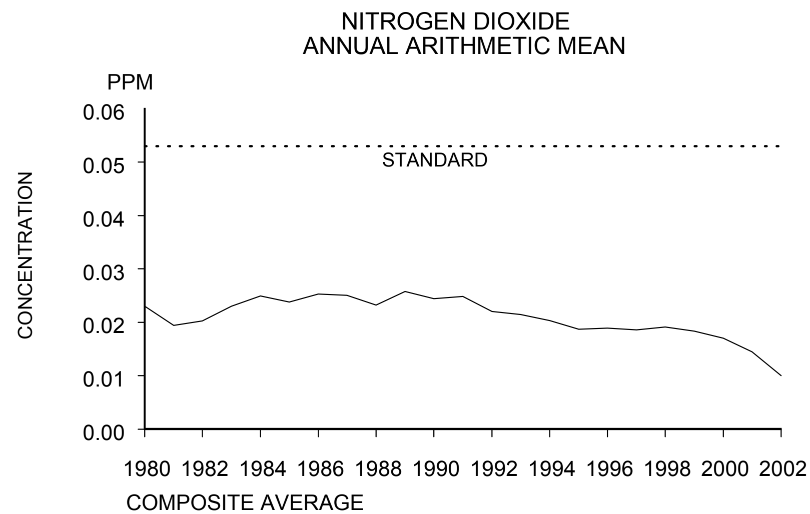

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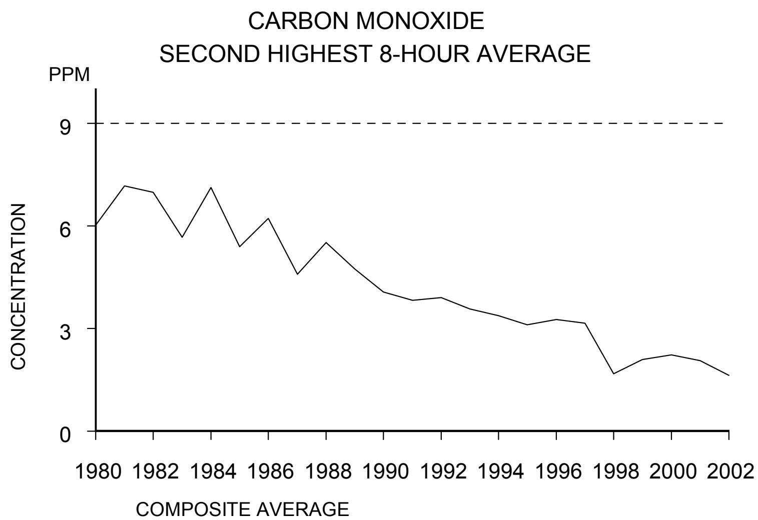
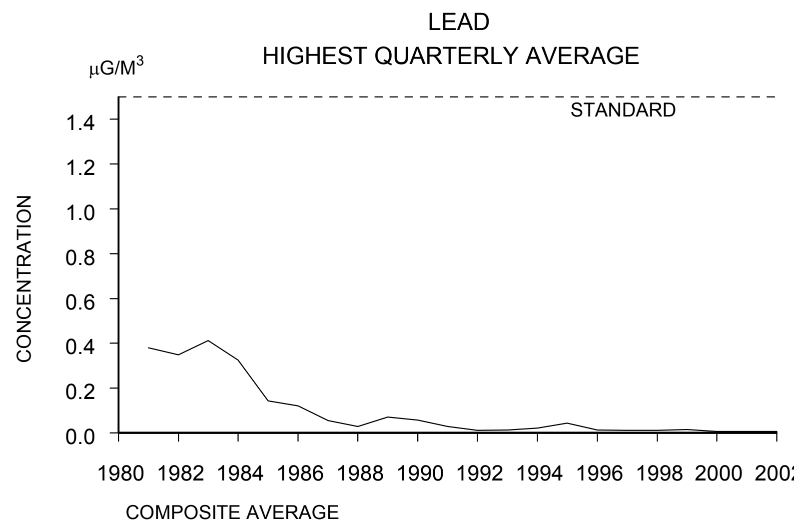
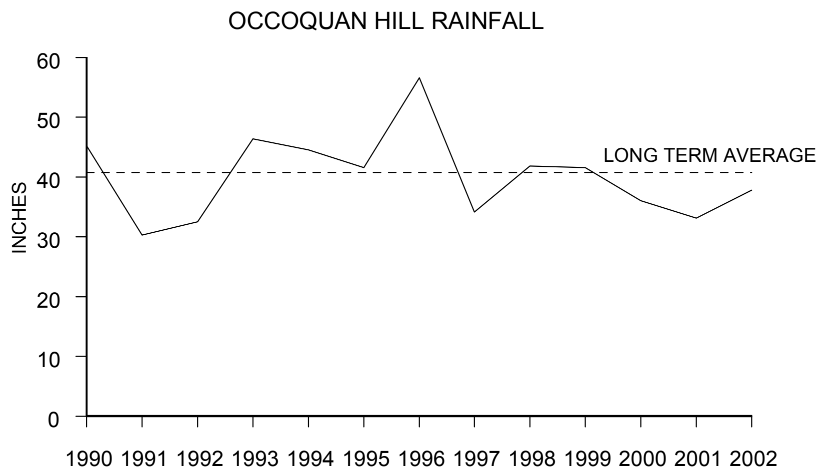
GROUP D

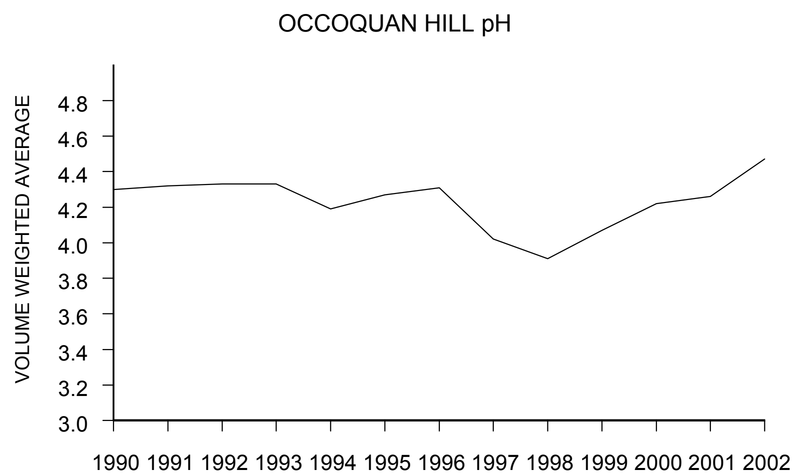




ANNUAL TRENDS

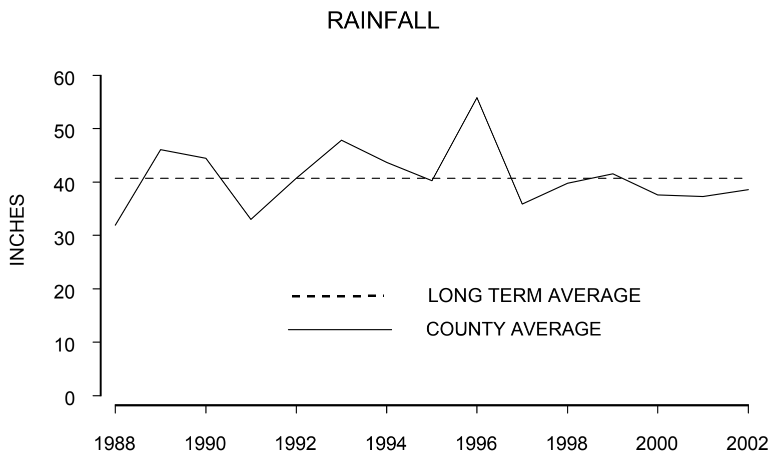
GROUP E

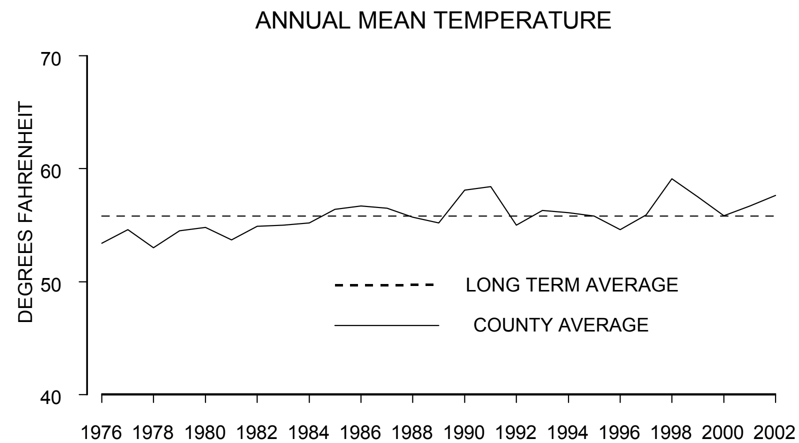




ANNUAL TRENDS

GROUP F





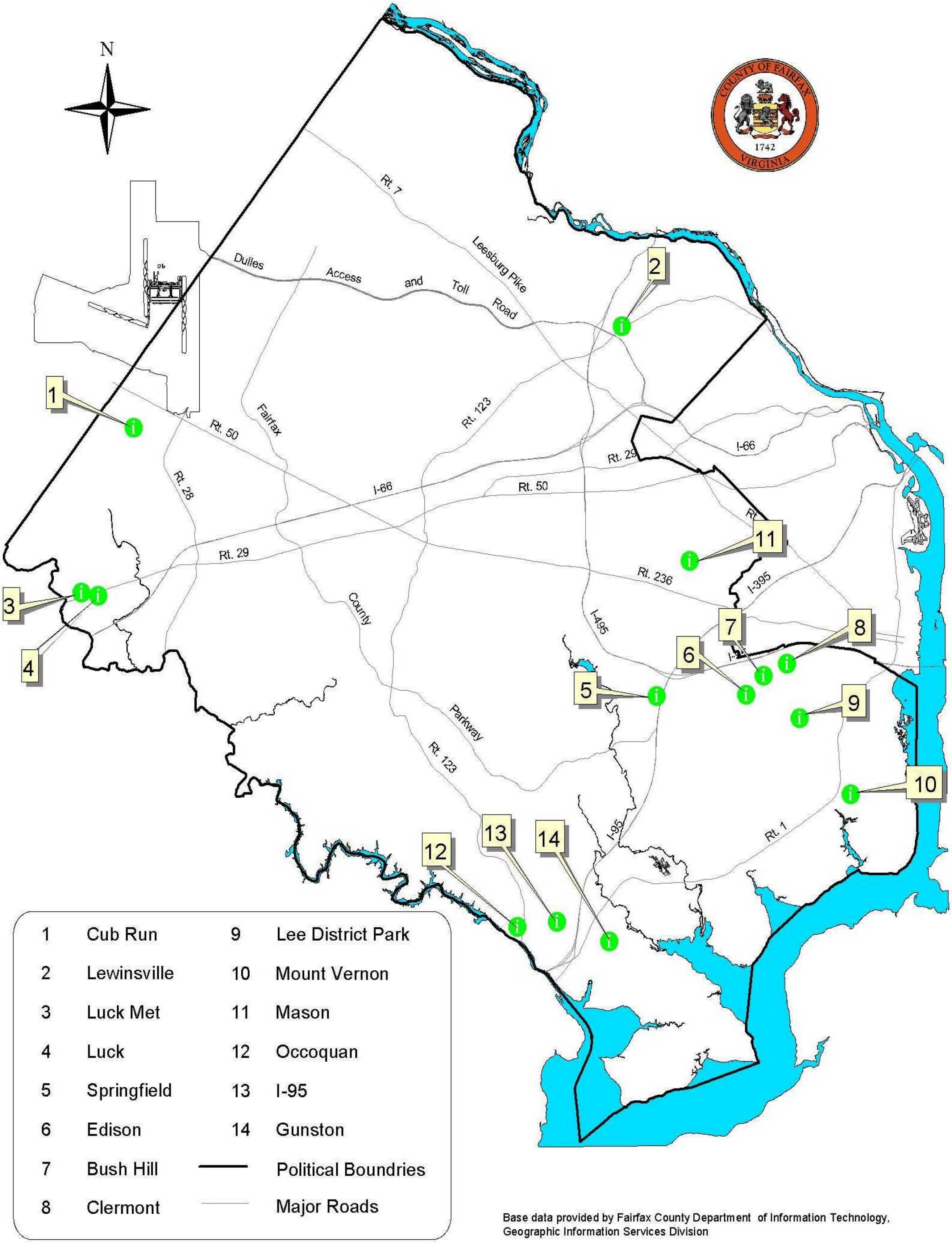
APPENDIX B

MONITORING SITES AND MAP

SITE	ADDRESS	LATITUDE	LONGITUDE	UTM COORDINATES	TAX MAP	AIR POLLUTANT PARAMETERS	METEOROLOGICAL PARAMETERS
CUB RUN AIRS: 51-059-0005	Upper Cub Run Dr. Chantilly, VA 20151	38° 53' 38.3" N	77° 27' 56.3" W	289.177 km E, 4307.697 km N	33-4	CO; O3; NO/NO2; SO2; PM10	None
FRANCONIA AIRS: 51-059-0030	Robert E. Lee Rec Center 6601 Telegraph Rd. Franconia, VA 22310	38° 46' 22" N	77° 06' 20" W	317.090 km, 4293.450 km N	92-1	O3; PM2.5	None
LEWINSVILLE AIRS: 51-059-5001	McLean Governmental Center 1437 Balls Hill Rd. Mclean, VA 22101	38° 55' 56.6" N	77° 11' 54.6" W	309.443 km E, 4311.600 km N	30-1	CO; O3; NO/NO2; SO2; PM2.5	Wind Speed and Direction; Temperature, Precipitation
MOUNT VERNON AIRS: 51-059-0018	Mount Vernon Fire Station 2675 Sherwood Hall Ln. Mount Vernon, VA 22306	38° 44' 32" N	77° 04' 37" W	319.488 km E, 4290.214 km N	102-1	O3; PM10	Wind Speed and Direction; Temperature; Precipitation
BUSH HILL*	Bush Hill Elementary School 5927 Westchester St. Alexandria, VA 22310	38° 47' 24" N	77° 07' 25" W	315.46 km E 4295.400 km N	81-4	TSP; Lead	None
CLERMONT*	Clermont Elementary School 5720 Clermont Dr. Alexandria, VA 22310	38° 47' 42" N	77° 06' 42" W	316.505 km E, 4295.963 km N	82-1	TSP; Lead	None
GUNSTON* AIRS: 51-059-0021	Gunston Elementary School 1100 Gunston Rd. Lorton, VA 22079	38° 41' 03" N	77° 12' 35" W	307.369 km E, 4283.938 km N	113-2	TSP; Lead	None
I-95* AIRS: 51-059-0029	I-95 Resource/Recovery 9850 Furnace Rd. Lorton, VA 22079	38° 41' 30.5" N	77° 14' 41.5" W	305.280 km E, 4284.740 km N	113-1	TSP; Lead	None
LUCK MET* AIRS: 51-059-0123	Luck Stone P.O. Box 1817 Centreville, VA 20122	38° 49' 34.4" N	77° 29' 43" W	4300.427 km E, 283.427 km N	42-4	Wind Speed and Direction;Temperature; Precipitation; Relative Humidity	Wind Speed and Direction; Temperature; Precipitation
LUCK* AIRS: 51-059-0123	Luck Stone 6911 Bull Run Post Office Rd Centreville, VA 20120	38° 49' 34.4" N	77° 29' 43" W	4300.427 km E, 283.427 km N	42-4	PM10	None
OCCOQUAN HILL* AIRS: 51-059-0023	Water Authority 9800 Ox Rd. Lorton, VA 22079	38° 41' 23.8" N	77° 15' 34.7 W	303.475 km E, 4284.648 km N	112-2	TSP; PM10; Lead	Wind Speed and Direction; Temperature; Precipitation
SPRINGFIELD AIRS: 51-059-3002	6120 Brandon Ave. Springfield, VA 22150	38° 47' 03" N	77° 10' 57.0" W	310.420 km E, 4294.805 km N	80-4	TSP; PM10; Lead	None
THOMAS EDISON*	Edison High School 5801 Franconia Rd. Alexandria, VA 22310	38° 46' 55" N	77° 08' 00" W	314.500 km E, 4294.56 km N	81-4	TSP; Lead	None

*Special study monitoring site; may not have assigned AIRS number.

Air Quality & Meteorological Sites



Base data provided by Fairfax County Department of Information Technology,
Geographic Information Services Division