United States
Environmental Protection
Agency

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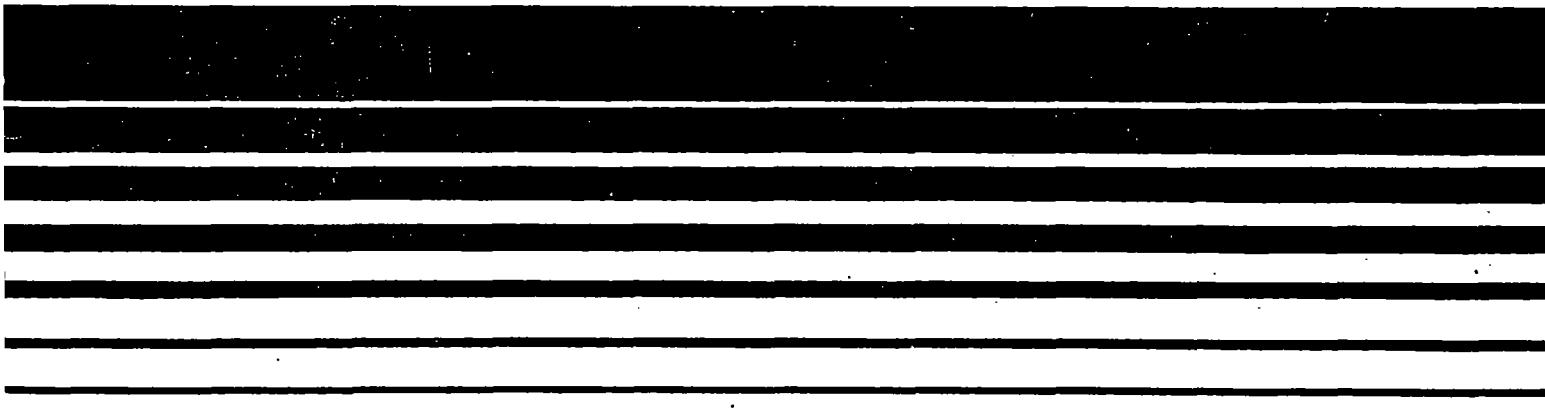
Air

EPA

NEW YORK CITY CARBON MONOXIDE TRAFFIC SITE SURVEY 1981-89

Environmental Protection Agency
Region II



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Regional Administrator

NEW YORK CITY CARBON MONOXIDE TRAFFIC SITE SURVEY 1981-89

This report was prepared by
Environmental Protection Agency
Region II Office
Air & Waste Management Division
Air Programs Branch

New York City Carbon Monoxide Traffic Site Survey 1981-89

Carbon monoxide (CO) data in New York City was reviewed to evaluate trends and compliance status at various monitoring locations. The data shows a strong and general trend toward fewer violations of the National Ambient Air Quality Standards (NAAQS). The reasons for this improvement may be due to a variety of conditions.

With traffic volume into Manhattan growing in the 1948-1988 time period, at an average rate of 2% per year (Figure 1 and Table 1), it can be assumed that the decline in CO levels is due to the continuing drop in CO emissions per vehicle. The older and higher emitting vehicles are being replaced by newer and better controlled vehicles. In addition, gasoline vapor pressure reductions beginning in 1989 reduced combustion chamber HC/O_2 ratios, particularly during start-up. This may also play a role in reducing the amounts of CO produced, particularly during the warmer months. Beginning in 1990, oxygen containing organic compounds were being added to the gasolines, and this may account for additional reductions in CO emissions per vehicle.

Review by Site

A) 45th Street Post Office - Eight hour exceedances were down to two (Figure 2 & 3 and Table 2), when the monitor was discontinued in July of 1989. This monitor was located in a commercial area and no exceedances occurred on Saturdays, Sundays and holidays. There is a limit to what this site is considered to represent, since it was primarily affected by a minor cross street and subject to exhausts primarily from parked postal vehicles.

B) Canal Street - It appears that the diminution of carbon monoxide violations has been partially offset by the continuing commercial growth of the Chinatown and SOHO areas, since violations still occur (Figure 4 & 5 and Table 3). The 45th Street monitor has fallen to two exceedances in the same time period.

C) Downtown Brooklyn - Relatively large numbers of (daily) multiple exceedances are observed (Figure 6 & 7 and Table 4), and the numbers of exceedances were greater than the number of exceedance days. When eight hour exceedances occurred during the 1984-1987 period there were, in many instances, two daily non-overlapping eight hour periods. This indicated that there was heavy traffic in the AM and PM rush hours. The most exceedances occurred on Fridays which may indicate that this is a heavy congestion period perhaps due to the start of the weekend. Violations on weekends have been rare in recent years.

D) Alexanders, 59th Street - The largest number of exceedances have been recorded at this site (Figure 8 & 9 and Table 5). There were many instances when two non-overlapping eight hour exceedances were recorded on the same day. This indicated that there was heavy traffic in the AM and PM rush hours. As the number of total eight hour exceedances has decreased, so has the number of days when there were two non-overlapping eight hour exceedances. There have also been a few days when the whole 24 hour period was in violation. This indicated that heavy traffic existed from early AM to well into the evening. Violations were predominant on business days; generally, Tuesday through Thursday.

In 1989 and the first quarter of 1990, exceedances occurred on days when non-summer temperatures were above normal, suggesting that gasoline vapor pressures may be a factor (See

Table 6). Gasoline vapor pressures are much higher during the winter to improve driving ability and are not limited by the recent limits. In addition, air stagnation tends to develop on the warmer winter days.

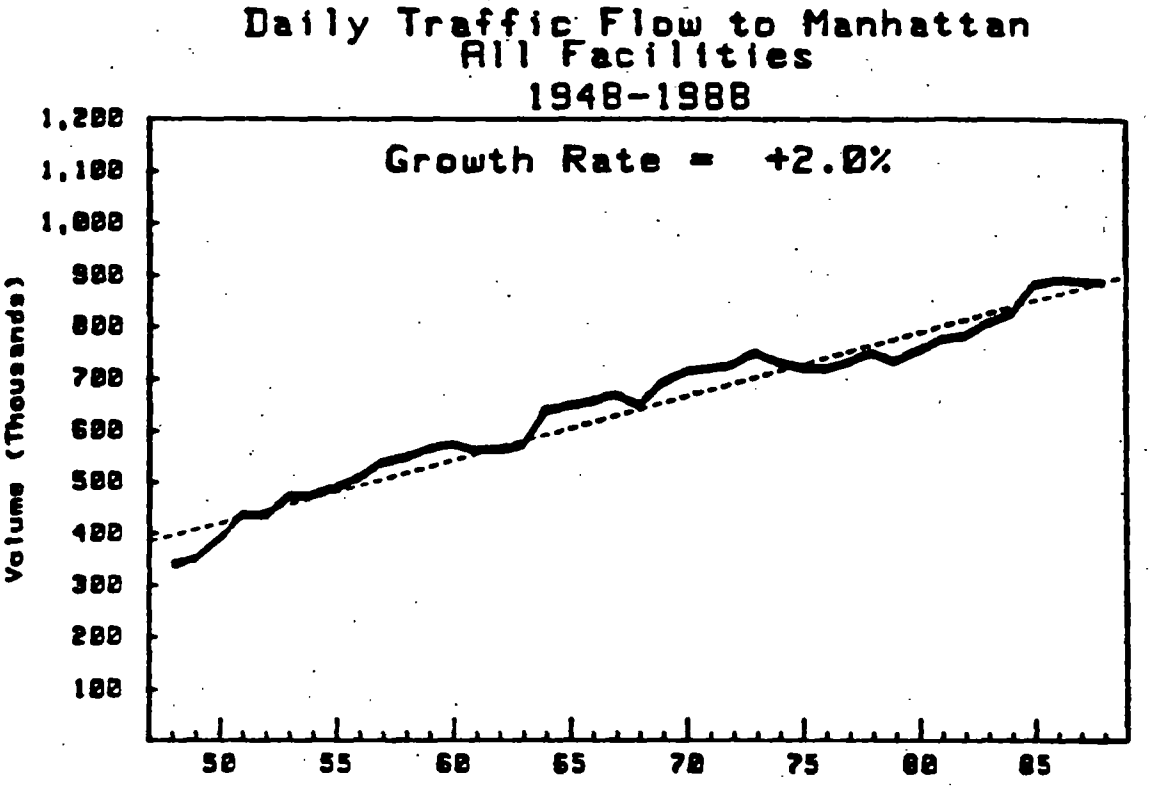
Another factor in the decline of violations is improved east-bound traffic flow on 59th Street due to more traffic agents on duty at 59th Street and Second Avenue.

General Discussion

From the attached graphs it appears that the reductions in carbon monoxide emissions per vehicle have been reflected in the improvement in air quality for the periods of record. In 1989, only the Alexanders site showed an appreciable number of exceedances (Figure 8 & 9 and Table 5).

The question that is of most interest is whether the continued improvement in vehicle emissions in combination with all other factors including increasing vehicle usage can result in attainment at all sites. Cursory review of 1990 data shows this to be a possibility.

FIGURE 1


Daily Traffic Flow to Manhattan
All Facilities
1948-1988
Growth Rate = +2.0%
Volume (Thousands)
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
50
55
60
65
70
75
80
85

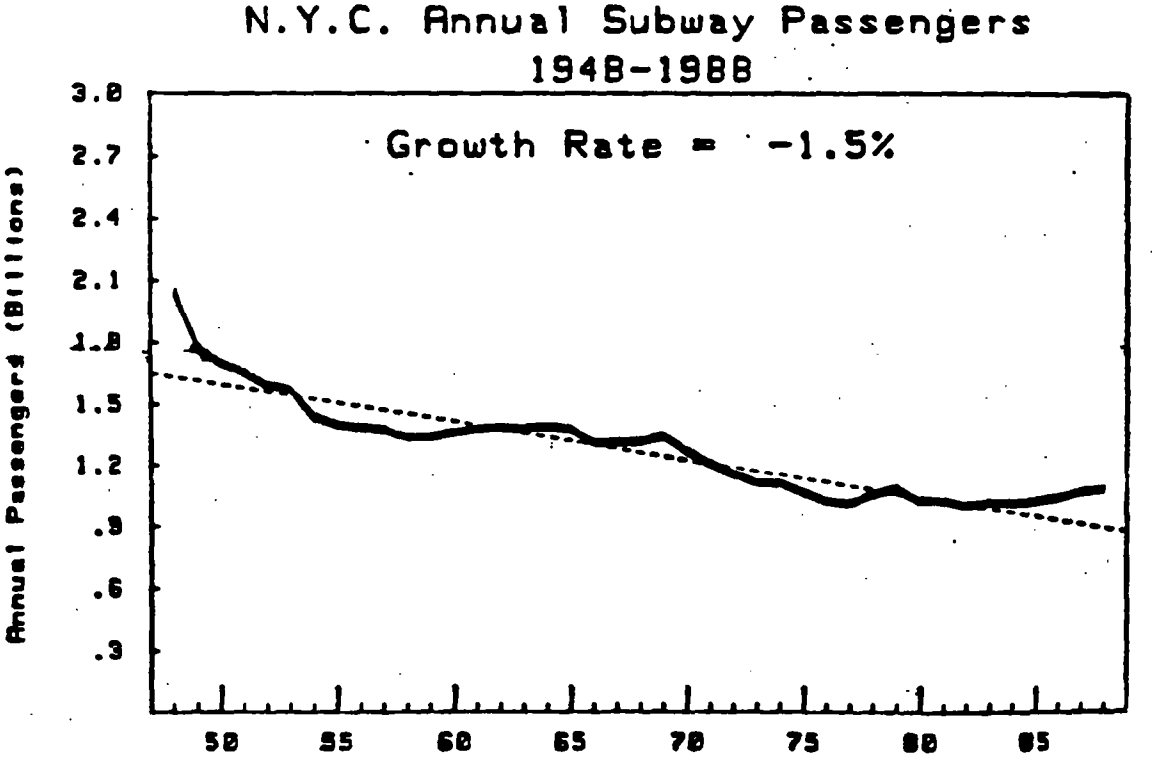

N.Y.C. Annual Subway Passengers
1948-1988
Growth Rate = -1.5%
Annual Passengers (Billions)
3.0
2.7
2.4
2.1
1.8
1.5
1.2
.9
.6
.3
50
55
60
65
70
75
80
85

TABLE 1

Manhattan Crossings
Traffic Growth Rate Trends
1948 - 1988

East River Bridges	1948-1958	1958-1968	1968-1978	1978-1988
Brooklyn Bridge	+6.2%	+4.7%	+1.6%	+2.9%
Manhattan Bridge	-1.2%	+0.4%	-0.8%	+0.6%
Queensboro Bridge	+1.4%	+2.6%	+1.3%	+1.9%
Williamsburg Bridge	+5.6%	-1.0%	+1.5%	+3.4%
Total	+2.2%	+1.7%	+1.1%	+2.2%
Harlem River Bridges				
Alexander Hamilton Bridge	N.A.	N.A.	+2.6%	+2.2%
Broadway Bridge	+2.6%	-0.2%	+1.3%	+2.0%
Macombs Dam Bridge	+5.7%	-3.7%	-1.1%	+3.0%
Madison Avenue Bridge	+5.6%	-0.3%	+1.6%	+1.4%
Third Avenue Bridge	+6.3%	-1.7%	+1.7%	+1.6%
University Heights Bridge	+5.2%	-4.6%	+2.0%	+1.6%
Washington Bridge	+4.3%	-5.6%	+2.9%	+3.5%
Willis Avenue Bridge	+4.1%	+1.4%	-1.2%	+3.5%
145th Street Bridge	+3.1%	-3.5%	-1.6%	+2.5%
Total	+4.6%	+2.3%	+1.3%	+2.4%
T.B.T.A. Facilities				
Brooklyn-Battery Tunnel	+4.0%	+2.0%	-1.9%	+0.6%
Queens-Midtown Tunnel	+7.5%	+1.6%	-0.3%	+0.4%
Triborough (Men) Bridge	+6.7%	+2.1%	-1.2%	+1.7%
Henry Hudson Bridge	+3.6%	-3.2%	-4.7%	+6.1%
Total	+7.9%	+0.6%	-1.7%	+1.7%
Port Authority Facilities				
Holland Tunnel	+2.5%	-0.5%	+1.9%	+2.4%
Lincoln Tunnel	+7.0%	+1.6%	+1.6%	+2.2%
George Washington Bridge	+6.6%	+7.5%	+1.9%	+2.5%
Total	+6.4%	+3.9%	+1.9%	+2.4%
Grand Total	+4.9%	+2.2%	+0.9%	+2.2%

FIGURE 2

EIGHT HOUR CO EXCEEDANCES

45TH STREET POST OFFICE

1981-1989

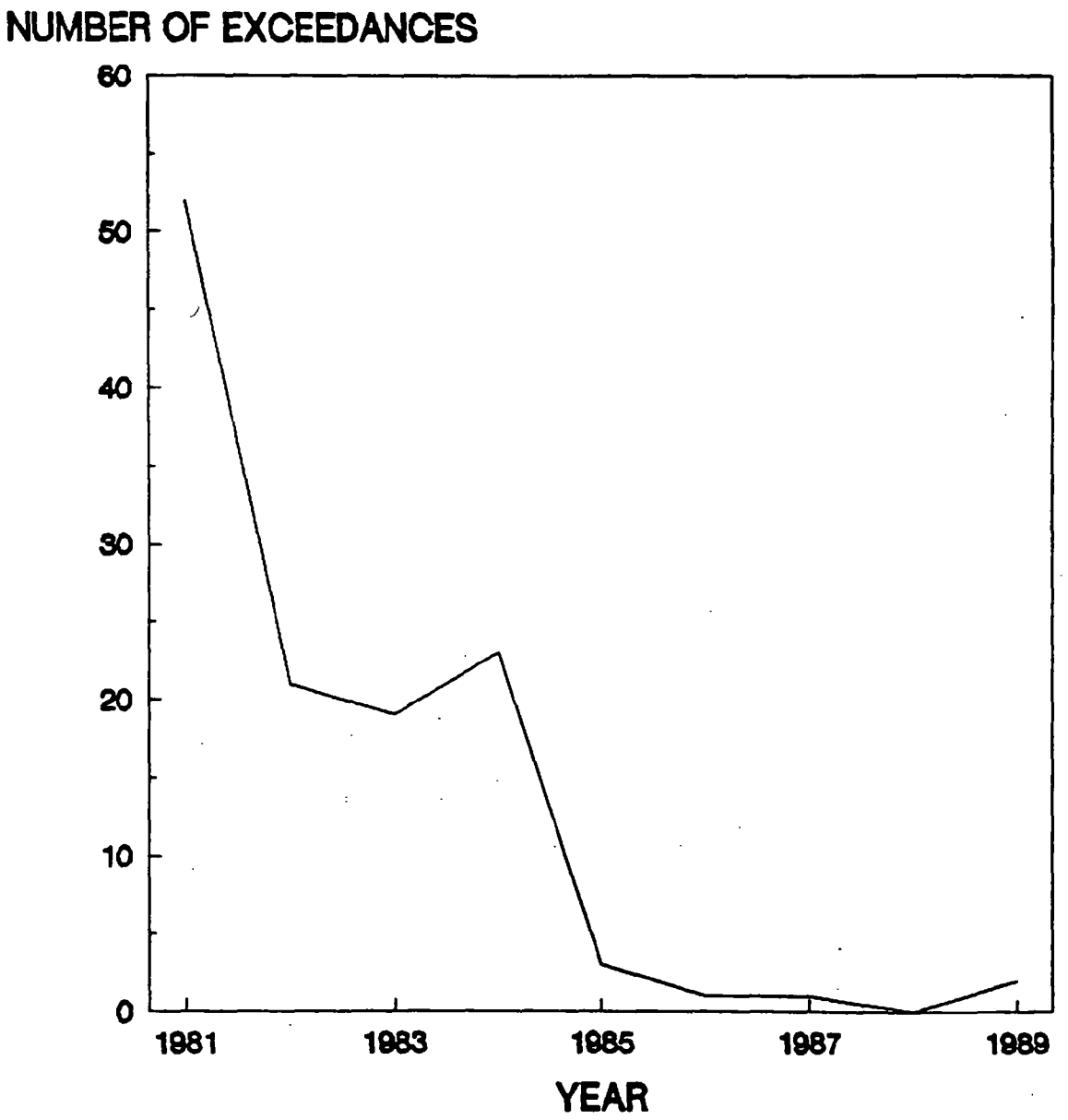


FIGURE 3

SECOND HIGHEST EIGHT HOUR MAXIMA

45TH STREET POST OFFICE

1981-1989

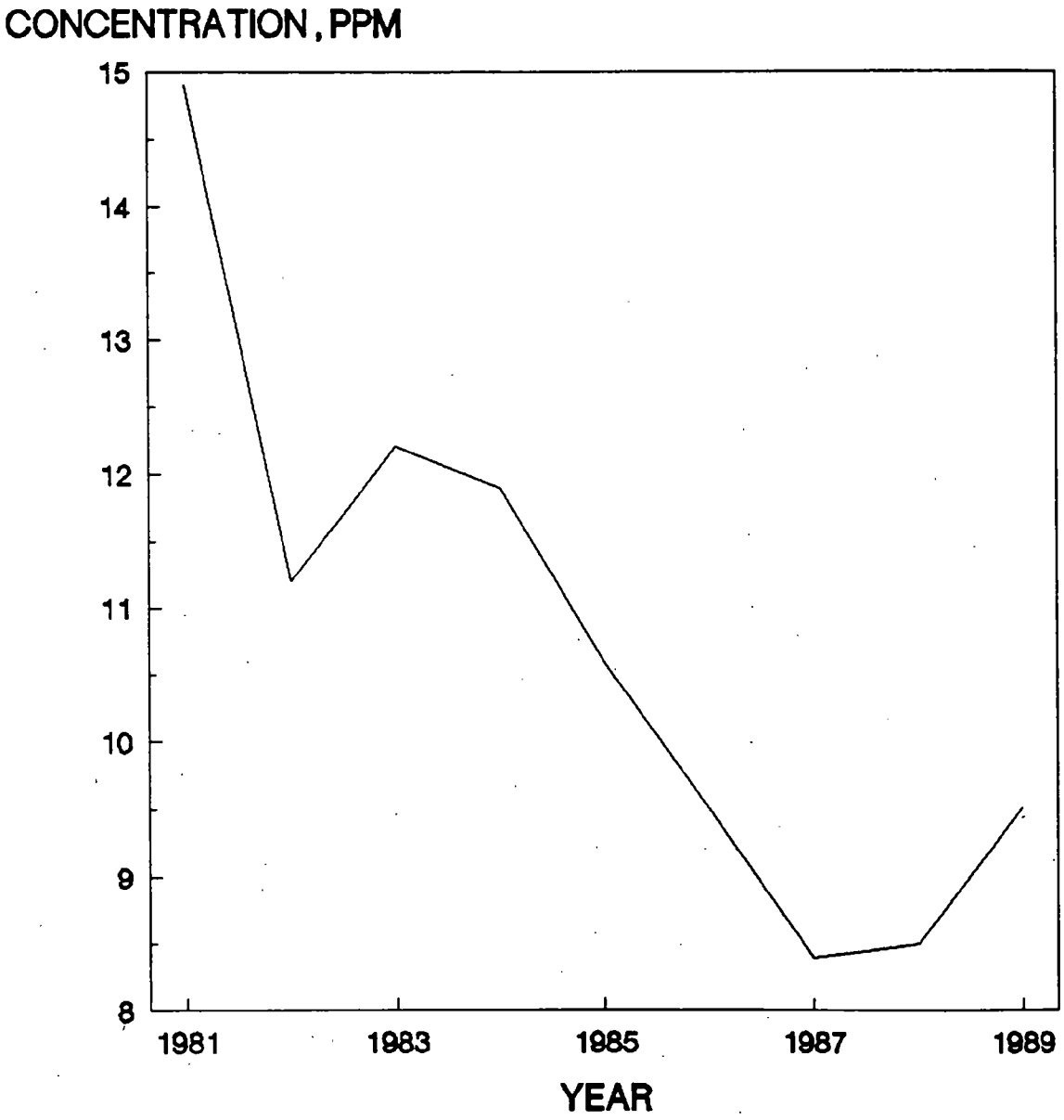


Table 2

Distribution, Eight Hour Carbon Monoxide NAAQS Violations, Microscale Traffic Sites

45th Street Post Office, Manhattan

	1981	1982	1983	1984	1985	1986	1987	1988	1989	TOTAL
Total Eight Hour Violations	52	21	19	23	3	1	1	0	2	122
Violation Days	42	21	18	23	3	1	1	0	2	111
Mondays	8	5	5	4	0	0	0	0	0	22
Tuesdays	10	2	5	6	0	0	0	0	1	24
Wednesdays	9	5	4	4	1	0	0	0	1	24
Thursdays	8	5	1	3	0	0	0	0	0	17
Fridays	7	4	3	6	2	1	1	0	0	24
Saturdays	0	0	0	0	0	0	0	0	0	0
Sundays	0	0	0	0	0	0	0	0	0	0

FIGURE 4

EIGHT HOUR CO EXCEEDANCES

CANAL STREET, DOWNTOWN MANHATTAN

1981-1989

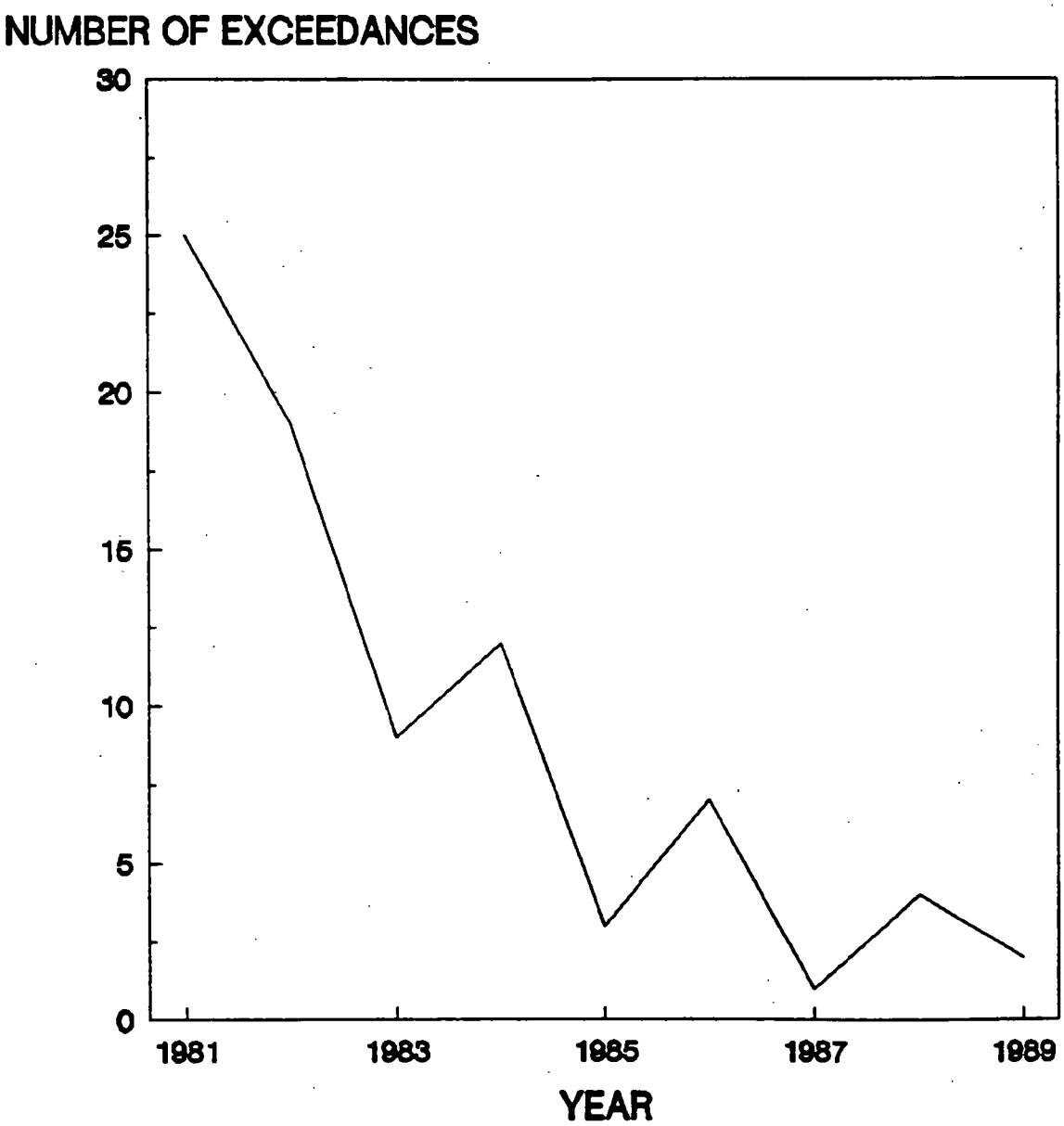


FIGURE 5

SECOND HIGHEST EIGHT HOUR MAXIMA

CANAL STREET, DOWNTOWN MANHATTAN

1981-1989

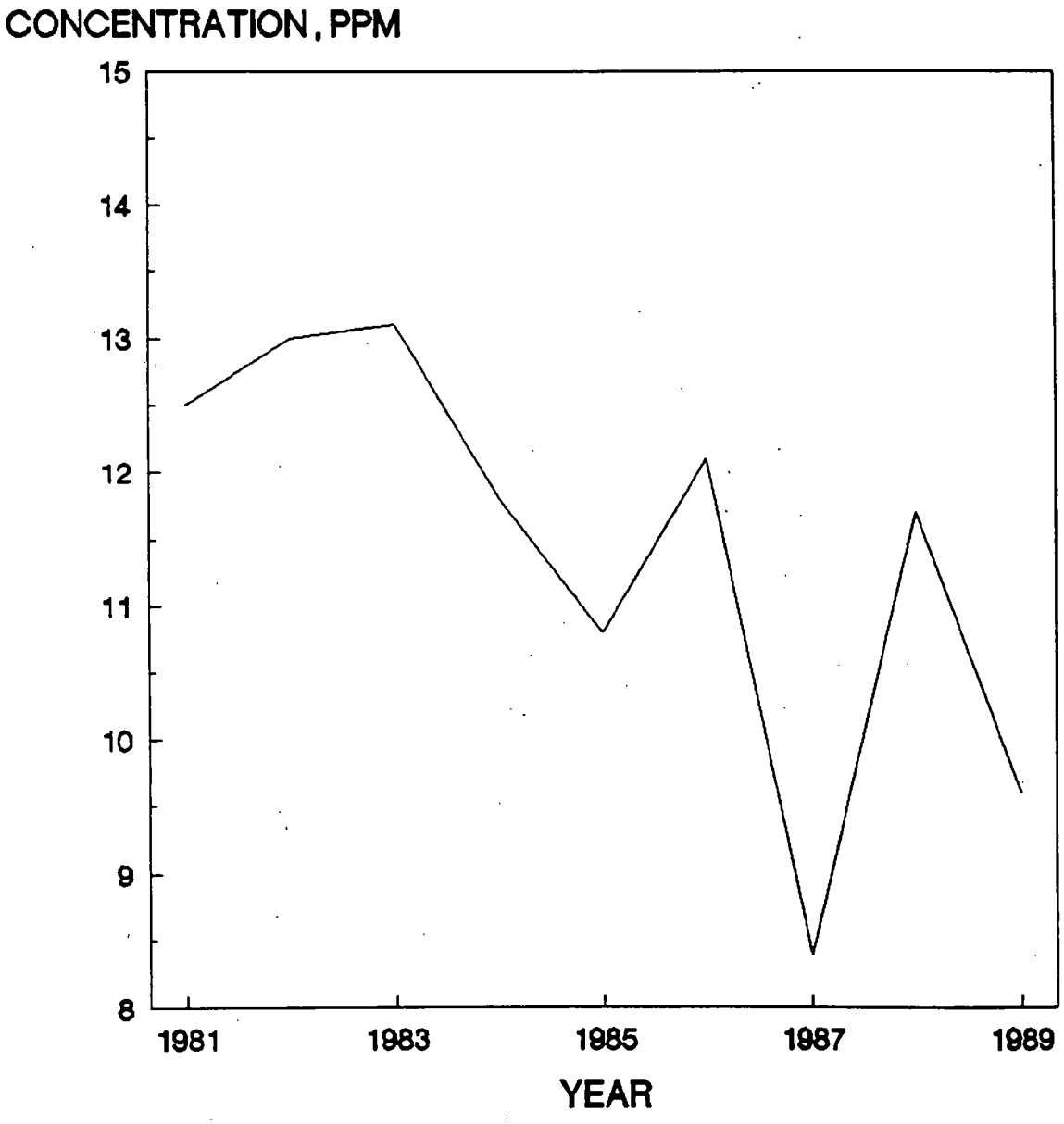


Table 3

Distribution, Eight Hour Carbon Monoxide NAAQS Violations, Microscale Traffic Sites

Canal Street, Manhattan

	1981	1982	1983	1984	1985	1986	1987	1988	1989	TOTAL
Total Eight Hour Violations	25	19	9	12	3	7	1	4	2	82
Violation Days	24	17	8	11	2	6	1	4	2	75
Mondays	3	1	2	0	1	1	0	1	1	10
Tuesdays	5	2	0	2	0	1	0	0	0	10
Wednesdays	2	2	0	0	0	0	0	1	1	6
Thursdays	5	2	0	2	0	0	0	0	0	9
Fridays	6	3	2	2	0	1	0	1	0	15
Saturdays	2	4	2	3	0	1	0	1	0	13
Sundays	1	3	2	2	1	2	1	0	0	12

FIGURE 6

EIGHT HOUR CO EXCEEDANCES

FLATBUSH AVENUE, DOWNTOWN BROOKLYN

1984-1989

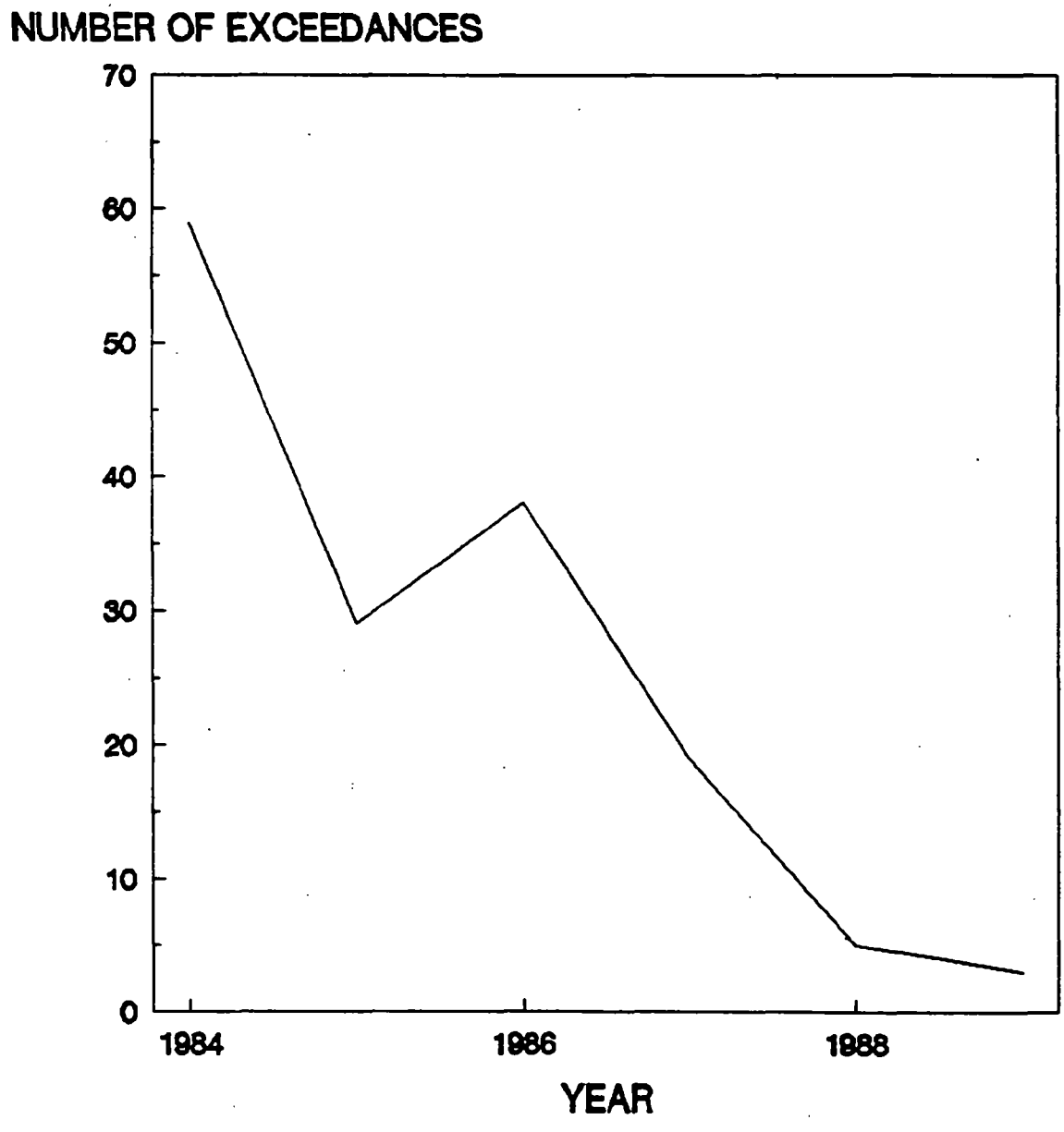


FIGURE 7

SECOND HIGHEST EIGHT HOUR MAXIMA

FLATBUSH AVENUE, DOWNTOWN BROOKLYN

1984–1989

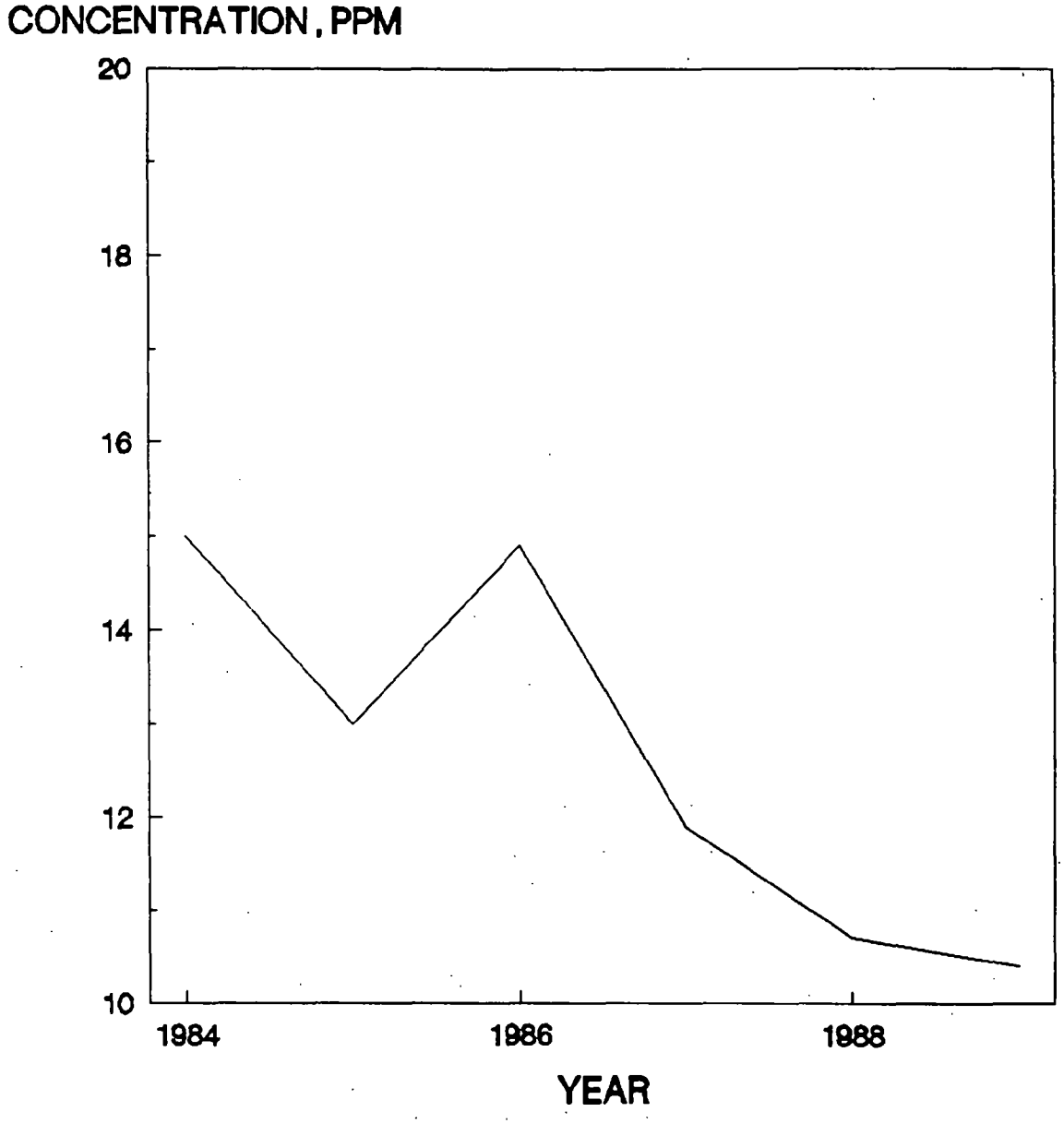


Table 4

Distribution, Eight Hour Carbon Monoxide NAAQS Violations, Microscale Traffic Sites

Downtown Brooklyn, Flatbush Avenue

	1981	1982	1983	1984	1985	1986	1987	1988	1989	TOTAL
Total Eight Hour Violations				59	29	38	19	5	3	153
Violation Days				46	20	27	17	5	3	118
Mondays				10	1	5	0	1	0	17
Tuesdays				4	4	1	3	0	0	12
Wednesdays				6	3	2	1	1	1	14
Thursdays				5	4	9	5	1	1	25
Fridays				12	8	8	7	2	1	38
Saturdays				5	0	1	1	0	0	7
Sundays				4	0	1	0	0	0	5

FIGURE 8

EIGHT HOUR CO EXCEEDANCES

59TH STREET-LEXINGTON AVENUE, MANHATTAN

1985-1989

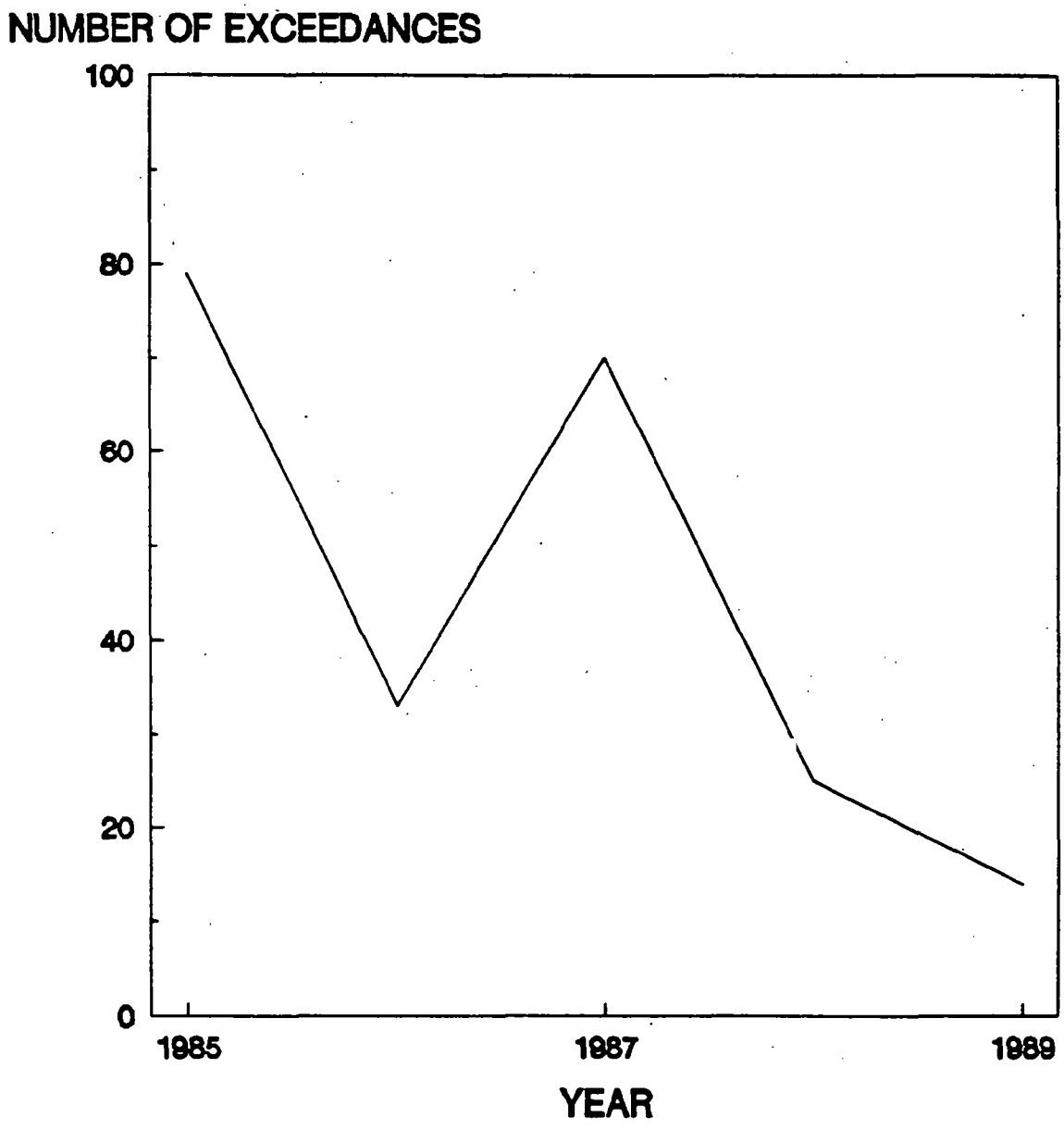


FIGURE 9

SECOND HIGHEST EIGHT HOUR MAXIMA

59TH STREET-LEXINGTON AVENUE MANHATTAN

1985-1989

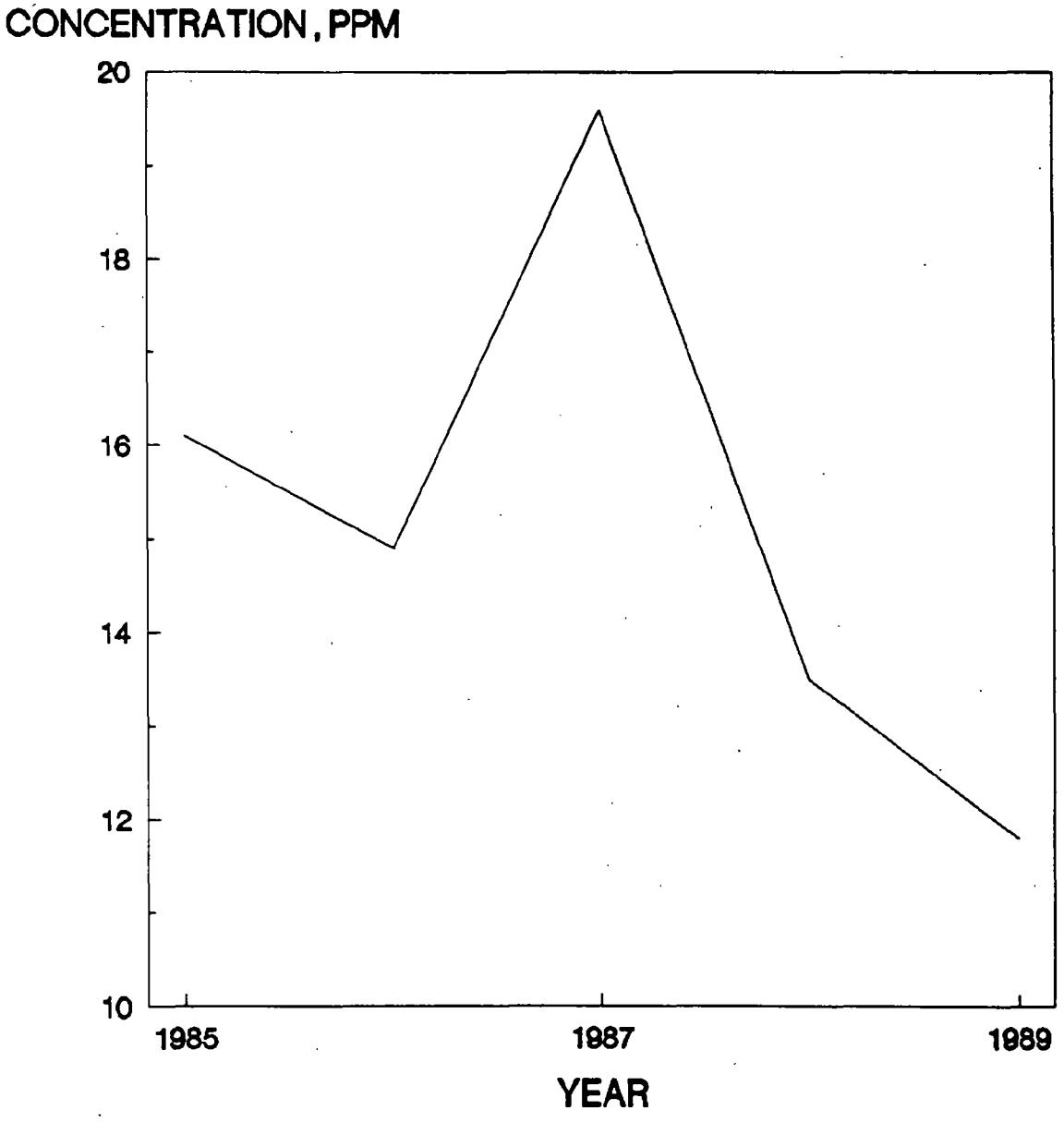


Table 5

Distribution, Eight Hour Carbon Monoxide NAAQS Violations, Microscale Traffic Sites

Alexanders, 59th Street, Lexington-Third Avenues, Manhattan

	1981	1982	1983	1984	1985	1986	1987	1988	1989	TOTAL
Total Eight Hour Violations					79	33	70	25	14	221
Violation Days					71	28	59	21	13	192
Mondays					9	3	12	5	2	31
Tuesdays					15	6	9	6	4	40
Wednesdays					13	7	10	3	3	36
Thursdays					13	3	10	2	2	30
Fridays					11	3	7	3	1	25
Saturdays					7	2	5	2	0	16
Sundays					3	4	6	0	1	14

Table 6

Temperatures, New York City (Central Park)

EXCEEDANCE Days-Alexanders*	MAX	MIN	MEAN	NORMAL MEAN	
1989					
1/23	51	32	42	31	1/23 inversion day
3/15	69	46	58	41	
3/28	82**	56	69**	46	
3/29	76	50	63	46	
4/3	58	44	51	48	
4/4	67	45	56	48	
7/20	74	68	71	77	
8/22	84	69	77	75	
8/24	83	64	74	74	
8/29	76	70	73	73	
8/30	89	71	80	73	
10/27	76	52	64	54	
10/29	76	57	67	53	
1990					
3/11	67	45	56	40	
3/15	77	42	60	41	

* Exceedances at Alexanders, CY-89 and First Quarter 1990
** Record high temperature