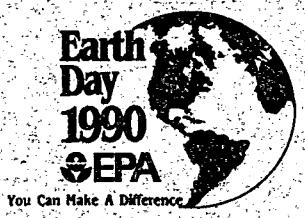
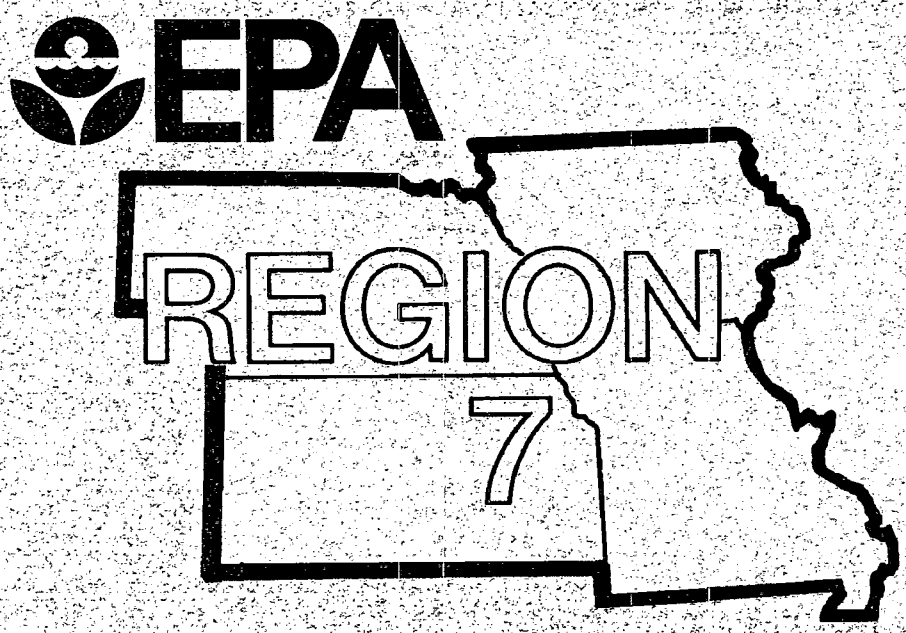


United States
Environmental
Protection Agency
Region 7

Air & Toxics
Division

April 1990

Nebraska Air Quality Progress Report



A Review of Air Quality Improvements in the State of Nebraska Under the Clean Air Act

Background

The first Clean Air Act promoting uniform laws and cooperative activities between the states and the federal government to control air pollution was approved in the Congress on December 17, 1963. This law authorized federal grant funds to support state, local, and multijurisdictional agencies in their effort to control air pollutant emissions. This Act was amended on November 21, 1967. The 1967 Act established the statutory concept of air quality standards, air quality control regions, and state implementation plans (SIP).

The 1967 Act required the Secretary of Health, Education, and Welfare to identify air basins, both interstate and intrastate. The Secretary was required to prepare air quality criteria documents for pollutants of concern and companion documents identifying control techniques. The states were to use those criteria documents as guides for selecting air quality standards which would protect against health and welfare effects of the criteria pollutants. Under the authority of the 1967 Act, the Department of Health, Education, and Welfare designated two interstate and two intrastate air quality control regions in the state of Nebraska during 1970. Figure 1 shows the boundaries of the Nebraska air quality control regions.

The Environmental Protection Agency (EPA) was created in 1970 and was given responsibility for the air pollution control program.

The Clean Air Act of 1970 required the Administrator of EPA to promulgate National Ambient Air Quality Standards (NAAQS) and prepare guidelines the states would use to prepare plans for attainment and maintenance of those standards. The NAAQS were promulgated by EPA on April 30, 1971.

Table I contains the air quality standards for criteria pollutants. The table includes total suspended particulate (TSP) matter even though EPA replaced the TSP standard with PM_{10} in 1987. The rationale for including TSP in this report is that all states have long-term data, and those data show the change or improvement in air quality over a long period of time. PM_{10} data have only been gathered for a short period and any trends are not yet apparent.

The Nebraska Legislature authorized air pollution control activities in the state Health Department in 1971. Subsequent to that original statute, the Nebraska Department of Environmental Control was created to protect and enhance the Nebraska environment.

Table I
National Ambient Air Quality Standards

	Primary[1]	Secondary[1]
Total suspended particulate matter (TSP) (standard was replaced by PM_{10} in 1987)	75 $\mu g/m^3$ annual geometric mean 260 $\mu g/m^3$ 24-hour value not to be exceeded more than once per year	150 $\mu g/m^3$ 24-hour value not to be exceeded more than once per year
PM_{10} (July 1, 1987)	50 $\mu g/m^3$ annual mean 150 $\mu g/m^3$ 24-hour average not to be exceeded more than once per year	Same as primary
Sulfur Dioxide	80 $\mu g/m^3$ annual arithmetic mean 365 $\mu g/m^3$ maximum 24-hour concentration not to be exceeded more than once per year	1300 $\mu g/m^3$ maximum 3-hour concentration not to be exceeded more than once per year
Ozone (as revised February 8, 1979)[2]	0.12 ppm (235 $\mu g/m^3$) 1-hour average concentration not to be exceeded more than once per year	Same as primary
Carbon Monoxide	9 ppm (10 mg/m^3) maximum 8-hour concentration not to be exceeded more than once per year 35 ppm (40 mg/m^3) maximum 1-hour concentration not to be exceeded more than once per year	Same as primary
Nitrogen dioxide	0.053 ppm (100 $\mu g/m^3$) annual arithmetic mean	Same as primary
Lead (October 5, 1978)	1.5 $\mu g/m^3$ maximum arithmetic mean averaged over a calendar quarter	Same as primary

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[1] Primary standards are set to protect public health and secondary standards to protect public welfare.

[2] The initial promulgation included photochemical oxidants and hydrocarbons. The photochemical oxidant standard was revised to ozone in 1979 because the preponderance of photochemical oxidants measured is ozone. The hydrocarbon standard was deleted in 1982. The hydrocarbon measurements included all organic compounds. Hydrocarbons were measured as a precursor to ozone, but only reactive organic compounds take part in the photochemical reaction producing ozone. The term "hydrocarbon" has been dropped and replaced with the term "volatile organic compounds" (VOC) because not all hydrocarbons are reactive.

The states were required by Section 110 of the 1970 Act to submit a plan showing attainment and maintenance of the NAAQS within nine months of promulgation of the NAAQS. The original Nebraska SIP was submitted January 28, 1972. The SIP submitted in 1972 provided for attainment of the TSP, SO_2, and NO_x standards and maintenance of the carbon monoxide (CO) and photochemical oxidant (ozone) standards. EPA acted on the state's submittal May 31, 1972. EPA's action approved the plan, but identified deficiencies needing corrective action by the state. The state adopted and submitted revisions to the SIP to correct deficiencies identified in the 1972 approval. These revisions were acted on by EPA through 1977. The Nebraska SIP also included an Emergency Episode Plan. That plan provided for curtailment of emissions at certain source operations in the event air quality levels increased to certain concentrations and meteorological conditions were expected to contribute to air stagnations for an extended period of time.

The Clean Air Act, as amended in 1977, added significantly to the state and EPA responsibilities. The states were to identify areas in their jurisdictions where air quality was worse than the NAAQS, equal to or better than the NAAQS, and areas where there were insufficient data to determine their attainment status. EPA published a listing of those areas as nonattainment, attainment, or unclassifiable. Table II identifies the Nebraska nonattainment areas designated in 1978. The states were required to adopt and submit plans for attainment and maintenance of standards in nonattainment areas. The Act also contained requirements for prevention of significant deterioration (PSD) of air quality in areas meeting the national standards. The 1977 Act provided for certain sanctions if states did not adopt or implement plans providing for attainment of the standards.

The Nebraska plan was submitted to EPA on September 25, 1980, and an amendment on August 9, 1982. Initial approval of the plan was published in the Federal Register March 28, 1983. Those revisions provided a strategy for attainment and maintenance of standards in the nonattainment areas of the state. Among other control measures, the plan required reasonably available control technology (RACT) on all existing major sources in the nonattainment areas and lowest achievable emission rates for new sources in these areas. The state later adopted requirements for best available control technology (BACT) in attainment areas to prevent significant deterioration of air quality.

EPA promulgated the national air quality standard for lead on October 5, 1978. Nebraska submitted its lead SIP January 9, 1981. EPA approved the basic plan November 29, 1983. Subsequent revisions to address lead standard violations in Omaha were approved in 1985 and 1987.

EPA promulgated a size specific particulate matter standard (PM_{10}) July 1, 1987, to replace the existing TSP standard. The state submitted its PM_{10} SIP revision on June 15, 1988. The

state's PM_{10} SIP was approved May 16, 1989. All remaining TSP nonattainment areas were designated "unclassified" with respect to the old standard.

Table II
Nebraska Nonattainment Area Designations (1978)[1]

County	Primary TSP	Secondary TSP	Ozone	CO	SO_2
Lancaster				P	
Douglas	W			P	
Cass	W				
Sarpy	W				

P—Partial
W—Whole county

[1] Because the lead standard was promulgated subsequent to the Clean Air Act Amendments of 1977, nonattainment designations for lead are not officially promulgated. However, the lead standard has been exceeded through the years in Douglas County and is still not being attained.

Nebraska's Air Quality Progress

The data discussion that follows is not to be construed to be an exhaustive or detailed data analysis. An effort was made to use data from 1974 through 1988 as an indication of air quality changes or improvements. Where monitor sites were discontinued and/or relocated, this was not possible. If a monitor was relocated in the same general area in order to provide a continuing overview, the new location was used to provide the continuity sought. This has introduced some data bias; however, the intent is to merely illustrate continuing air quality changes over the time period stated above. Where multiple monitor sites exist, a single site somewhat representative of the overall air quality of an area was selected. Some of the selected sites may not be either a best or worst case site in an area.

Table III shows a chronological record of the redesignation of areas in Nebraska since the original areas were identified in 1978. These redesignations occurred primarily as a result of changes in air quality. Most represent an improvement in the status of the area.

Particulate Matter (TSP and PM_{10})

Figure 2 shows the variation of the annual geometric mean concentration for TSP for five sites in the state (Omaha, Hastings, Kearney, Scottsbluff, and Waverly). These sites were selected because they are representative of statewide air quality, and monitoring has continued without interruption for a period of 14 to 15 years.

Table III
Redesignation of Nebraska Nonattainment Areas

Area (County)	Redesignation From	Redesignation To	Date
Part of Lincoln (Lancaster)	CO Nonattainment	Unclassified	1982
Part of Cass County (Cass)	PTSP Nonattainment	Unclassified	1982
Part of Sarpy County (Sarpy)	PTSP Nonattainment	Attainment	1982
Bellevue (Sarpy)	PTSP Nonattainment	STSP Nonattainment	1982
Part of Douglas County (Douglas)	PTSP Nonattainment	Attainment	1982
Weeping Water (Cass)	PTSP Nonattainment	STSP Nonattainment	1984
Omaha (Douglas)	PTSP Nonattainment	STSP Nonattainment	1985
Omaha (Douglas)	CO Nonattainment	Attainment	1986
Omaha (Douglas)		PM_{10} (Group II)[1]	1987
Weeping Water (Cass)		PM_{10} (Group II)[1]	1987
Lincoln (Lancaster)	CO Nonattainment	Attainment	1988
All remaining TSP areas	PTSP and STSP Nonattainment	Unclassified	1989

PTSP—Primary TSP
STSP—Secondary TSP

[1] After promulgating the PM_{10} standard in 1987, EPA divided all areas of the country into three categories: (1) areas with a strong likelihood of violating the standard (Group I); (2) areas where attainment of the standards is possible (Group II); and (3) areas with a strong likelihood of attaining the standard (Group III).

Figure 3 shows the second maximum 24-hour TSP concentration changes for Omaha, Hastings, Kearney, Scottsbluff, and Waverly. Waverly is in Lancaster County, Nebraska, and was selected because of an absence of long-term total suspended particulate (TSP) measurement sites in Lincoln. The second maximum is an illustration of 24-hour values which exceed the national standard for TSP. The standard allows one exceedance per year of the 24-hour standard; thus, second-high values exceeding the standard are a violation. Except for Scottsbluff in 1985, there have been no measured exceedances of the primary standard at these sites since 1980. The data presented indicate there were no violations of the 24-hour TSP standard in that period.

Figure 4 illustrates the second maximum 24-hour PM_{10} values for Omaha, Hastings, Weeping Water, and Louisville. The PM_{10} standard allows one exceedance per year; thus, the second maximum value is an indicator of standard violations. Omaha and Weeping Water are Group II areas for PM_{10}. The remainder of Nebraska is designated Group III. There have been no measured exceedances of the PM_{10} standard in Nebraska through 1988.

Sulfur Dioxide (SO_2)

There are no significant SO_2 problems in Nebraska. Except for violations of the 24-hour primary standard (365 $\mu g/m^3$) in Omaha in 1975, there have been no measured violations of the

primary or secondary SO_2 standard. SO_2 monitoring data collection began in 1975; however, only Omaha has SO_2 data which have been collected through 1988. These data were collected at different Omaha locations from 1974 through 1988; as a result, long-term data (10 years or more) are not available at any one location. Only Omaha continues to report ambient SO_2 data.

Carbon Monoxide (CO)

The metropolitan areas of Omaha and Lincoln are the only areas which have had recorded violations of the CO standard. Figure 5 illustrates the CO air quality improvements in Lincoln and Omaha. The second high maximum concentration is an indicator of violations.

The monitor in Omaha was relocated in 1980. The Lincoln monitor was relocated in 1985. The data in Figure 5 were collected at differing monitor locations. However, it is believed that the monitor results illustrate air quality changes in each community. There have been no CO exceedances reported in Omaha or Lincoln since 1983.

Ozone

Ozone measurements have been reported for Omaha since 1974. Lincoln ozone measurement reports date from 1979. Figure 6 contains second maximum 1-hour concentrations reported for Omaha and Lincoln. No violations have been reported for ozone.

Nitrogen Dioxide (NO_x)

Nitrogen dioxide measurements began reporting in 1974 in Omaha and Lincoln. The nitrogen dioxide concentrations found in Nebraska are so far below the national standard that EPA allowed the state to discontinue NO_x measurements. No NO_x measurements are reported for Nebraska since 1984. Nitrogen dioxide plays an important role in photochemical ozone formation. Since there are no ozone problems in the Omaha and Lincoln metropolitan areas, NO_x measurements are unnecessary.

Lead

EPA promulgated the NAAQS for lead on October 5, 1978. The lead standard is 1.5 micrograms (μg) per cubic meter (m^3) quarterly average and is both the primary and secondary standard. Lead levels measured in Omaha are primarily attributed to a lead refining operation; whereas, lead levels in other areas of the state are generally attributed to motor vehicle lead emissions. Figure 7 shows the measured quarterly averages from Omaha from 1985 through 1988. Omaha is the only area in Nebraska with significant lead concentrations.

Summary

The reduction of particulate matter concentrations in Nebraska is the single greatest air quality improvement statewide. Air pollution control activities began with the 1967 Clean Air Act which provided grant funds which had a significant impact on air program development in the state. The 1970 Clean Air Act initiated the NAAQS and required SIPs that would provide for attainment within three years of approval. A review of the state's air quality measurements from 1974 through 1988 suggests that the Clean Air Act, as amended in 1977, with its built-in sanctions and requirements for reasonably available control technology (RACT) in certain areas and best available control technology (BACT) in others and its emphasis on nonattainment areas had the greatest influence on improving air quality. Figure 2 shows for the first time in 1981 that annual average TSP concentrations, with one exception, are consistently at or below the standard. In that same period, the two metropolitan areas of Nebraska did not exceed the primary 24-hour TSP standard.

Figure 3 shows that most of the areas with high particulate (TSP) concentrations were within the primary TSP standard by 1982. Comparing the years 1986 through 1988 on Figure 3 with the same years of PM_{10} monitoring in Figure 4 suggests that much of the TSP collected were greater than the 10 micron size cutoff for PM_{10}. Figure 4 shows no exceedances of the 24-hour PM_{10} standard.

Figure 5 suggests that the Clean Air Act, as amended in 1977, had a significant impact on CO levels measured in Omaha and Lincoln. The federal motor vehicle pollution control program, in conjunction with traffic flow improvements and traffic reduction techniques, has improved CO air quality in the two metropolitan areas.

As shown in Figure 6, ozone is not a pollutant of concern either in Lincoln or Omaha. It seems reasonable, however, that the federal motor vehicle pollution control program has helped keep ozone concentrations well below the standard. Likewise, EPA's lead phase-down in gasoline and the use of unleaded fuels contributed to the atmospheric lead reductions in the state. Lead levels in Omaha are still impacted by a stationary lead source. EPA and the state are evaluating the lead emissions in Omaha to determine what further action is needed to bring the area into attainment.

The Clean Air Act of 1967 provided funding to start up or expand state air pollution control programs, but the 1970 and 1977 amendments provided the structure needed to develop strong and effective programs. The 1977 amendments contained requirements for areas not attaining the NAAQS to institute more stringent emissions controls to meet the standards, as well as

provisions intended to prevent violations in areas with air quality equal to or better than the NAAQS. The Clean Air Act has directly influenced activities which have benefited air quality in Nebraska.

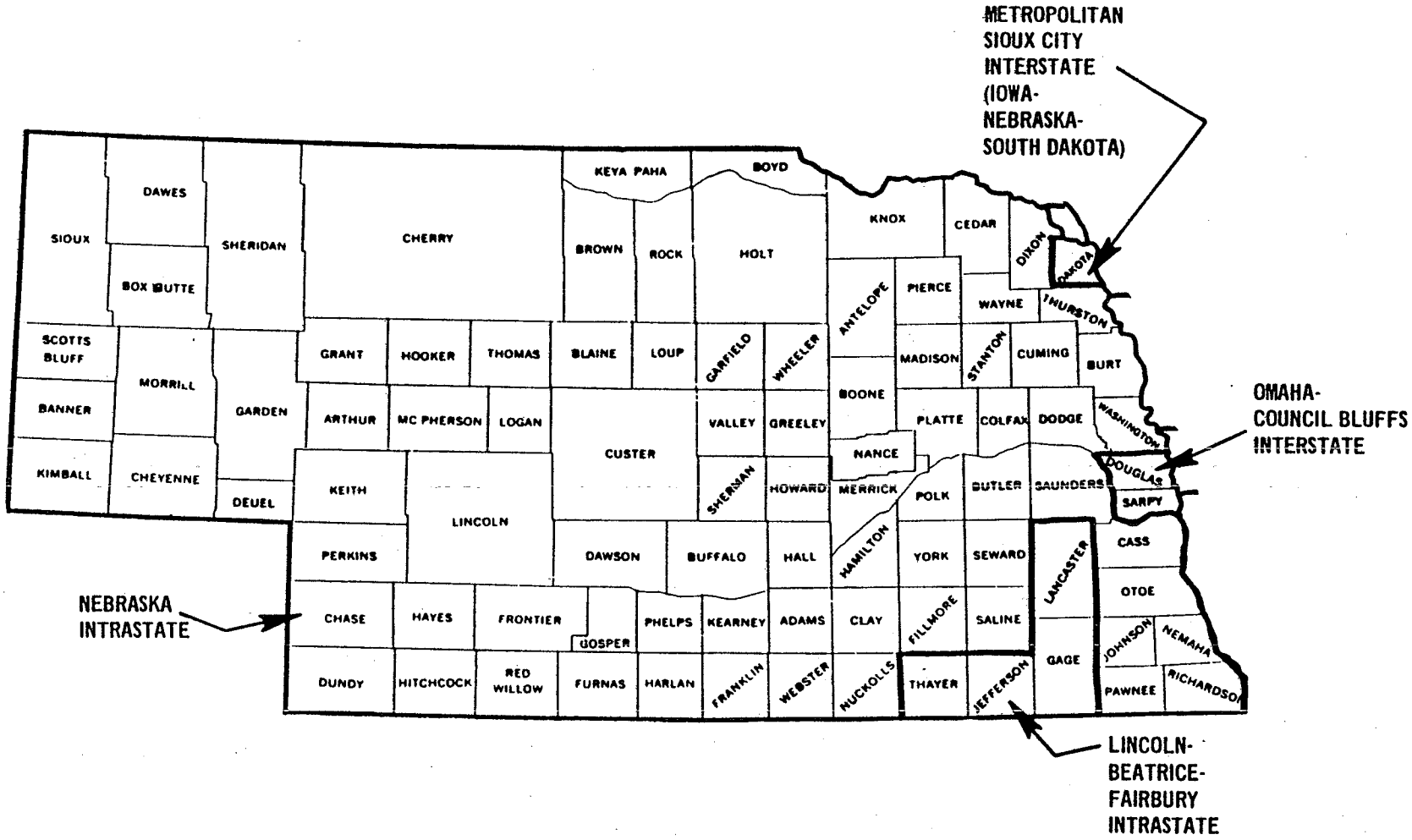


Figure 1. Air Quality Control Regions in Nebraska.

FIGURE 2

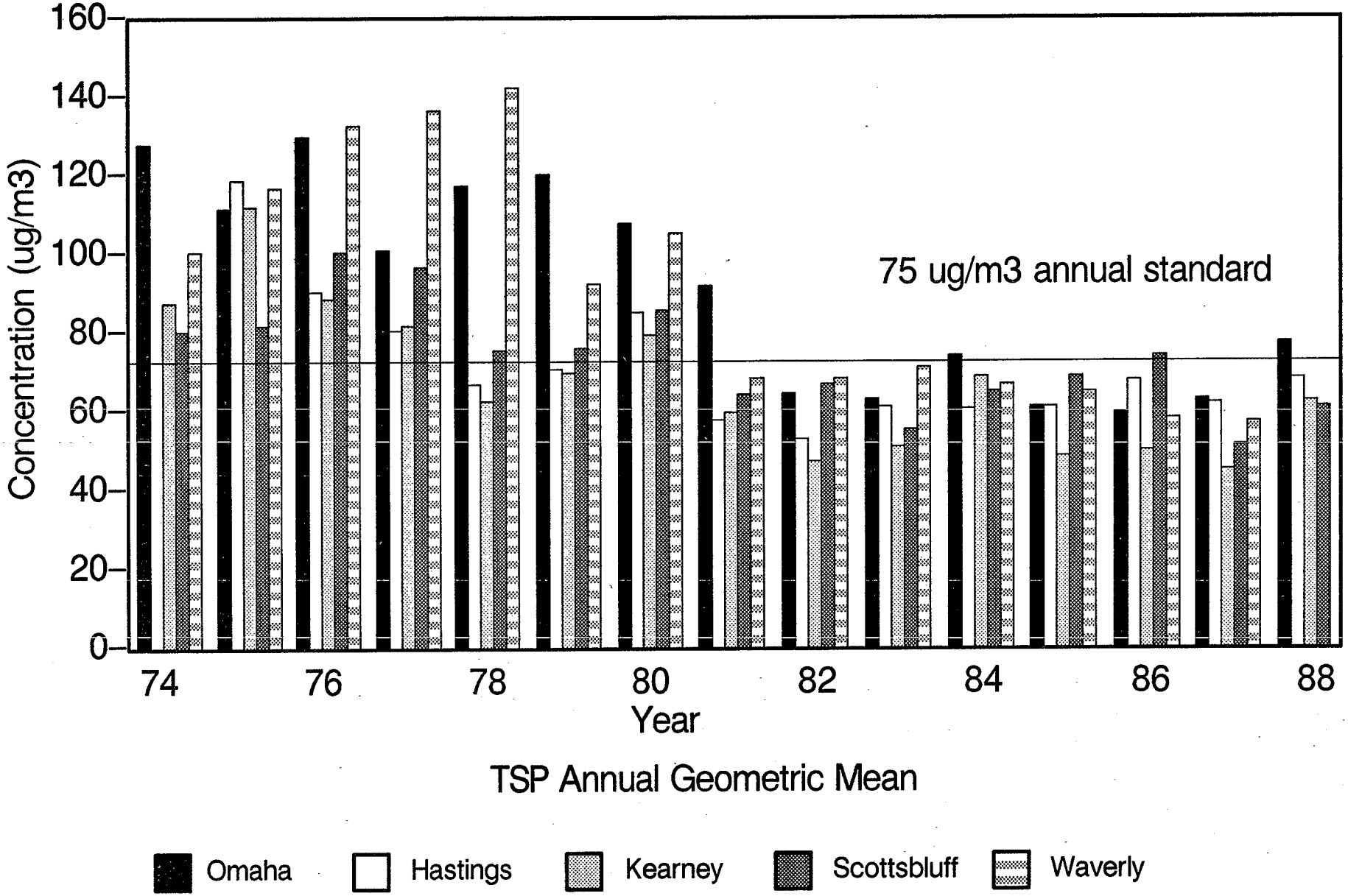

160
140
120
100
80
60
40
20
0
Concentration (ug/m3)
75 ug/m3 annual standard
74
76
78
80
82
84
86
88
Year
TSP Annual Geometric Mean
Omaha
Hastings
Kearney
Scottsbluff
Waverly

FIGURE 3

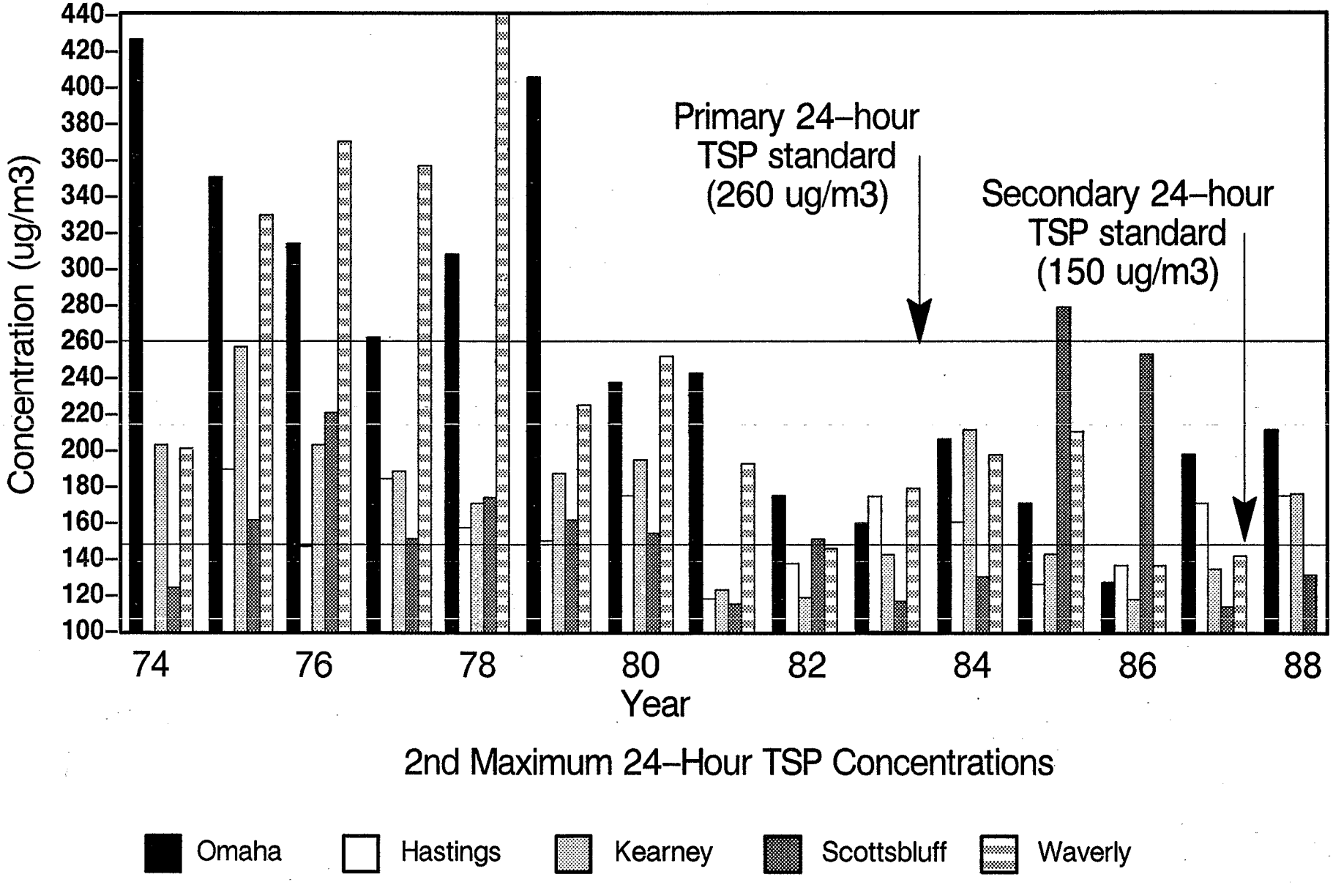

Concentration (ug/m3)
440
420
400
380
360
340
320
300
280
260
240
220
200
180
160
140
120
100
Primary 24–hour
TSP standard
(260 ug/m3)
Secondary 24–hour
TSP standard
(150 ug/m3)
74
76
78
80
82
84
86
88
Year
2nd Maximum 24–Hour TSP Concentrations
Omaha
Hastings
Kearney
Scottsbluff
Waverly

FIGURE 4

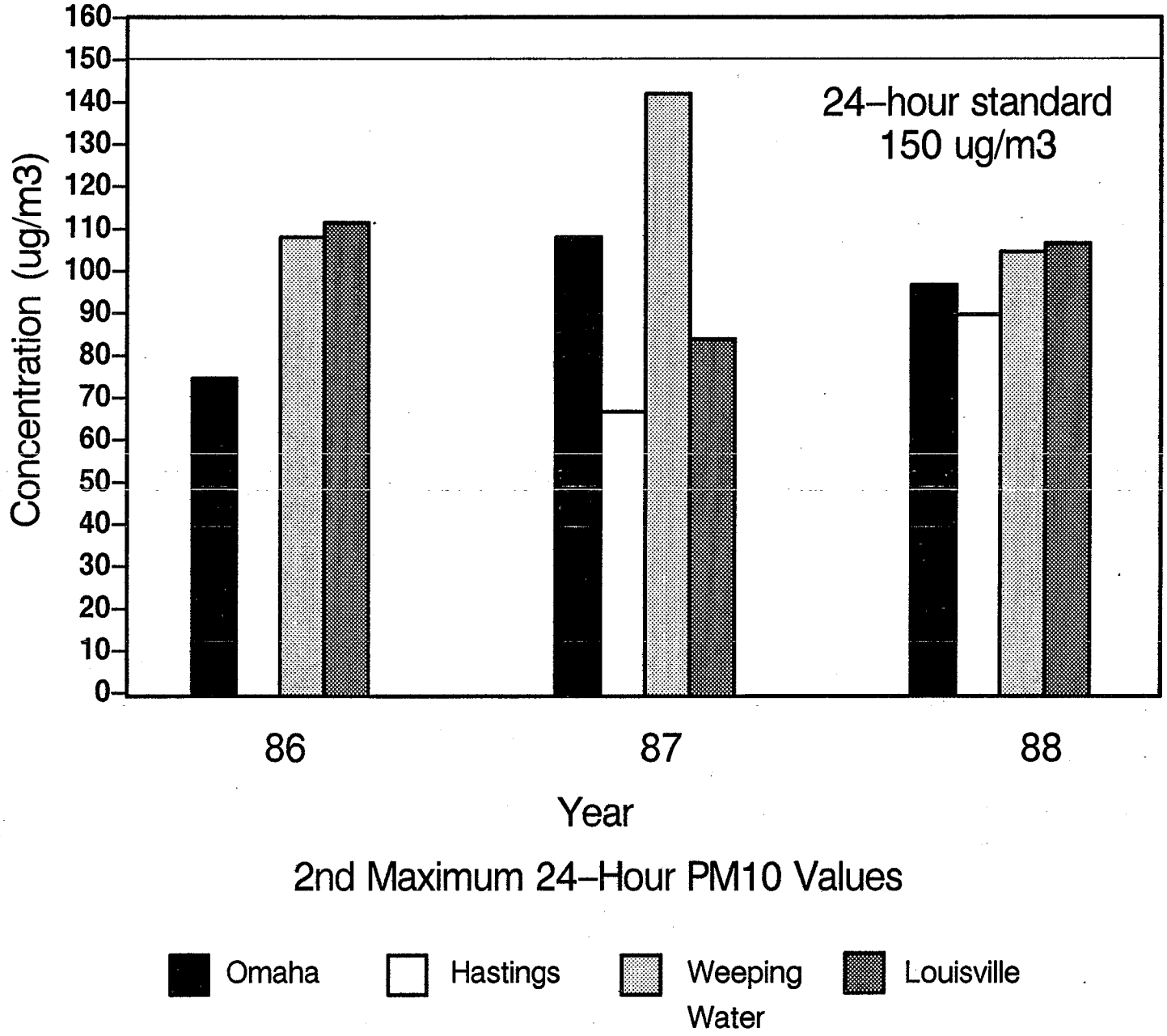

160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Concentration (ug/m3)
24–hour standard
150 ug/m3
86
87
88
Year
2nd Maximum 24–Hour PM10 Values
Omaha
Hastings
Weeping Water
Louisville

FIGURE 5

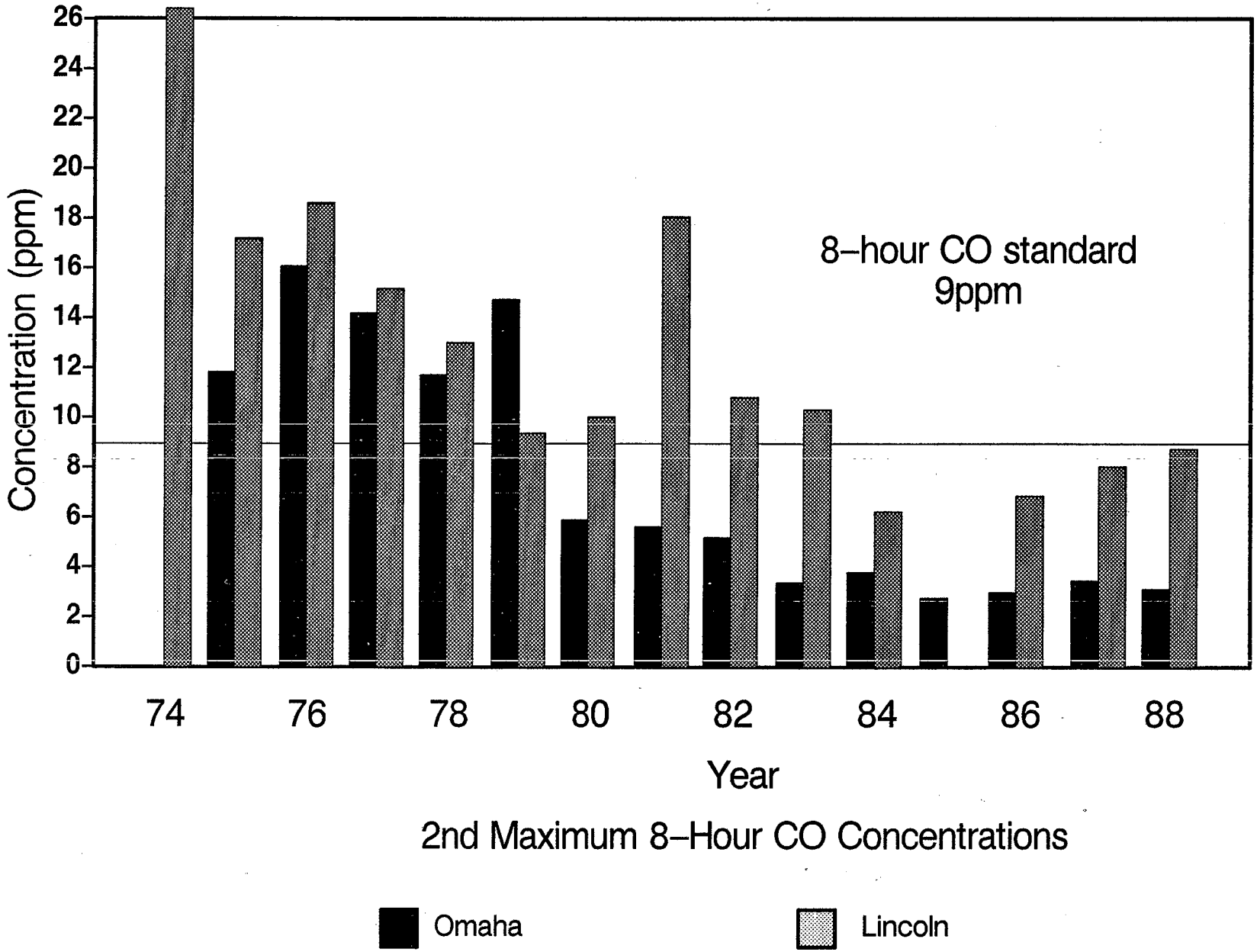
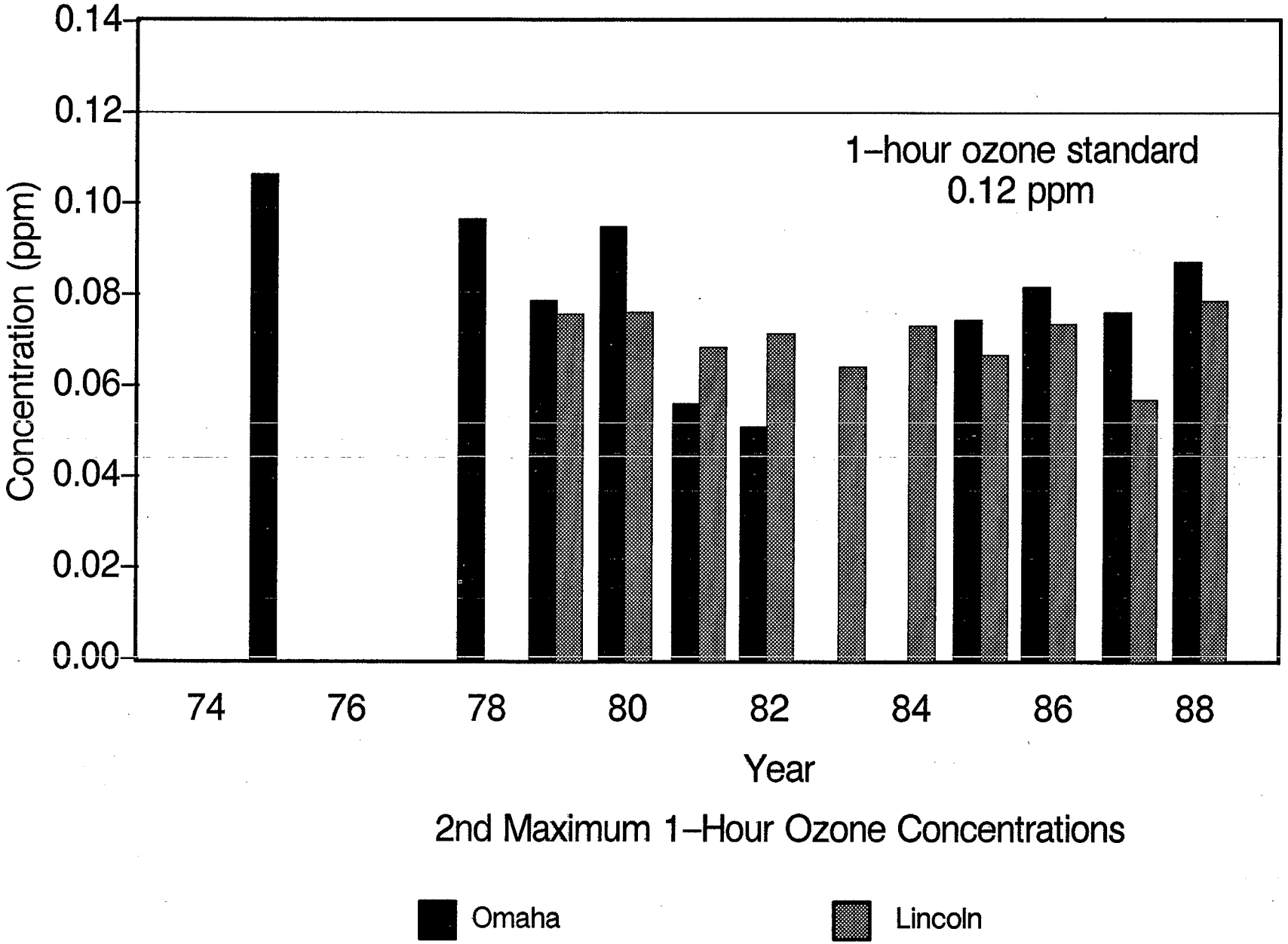
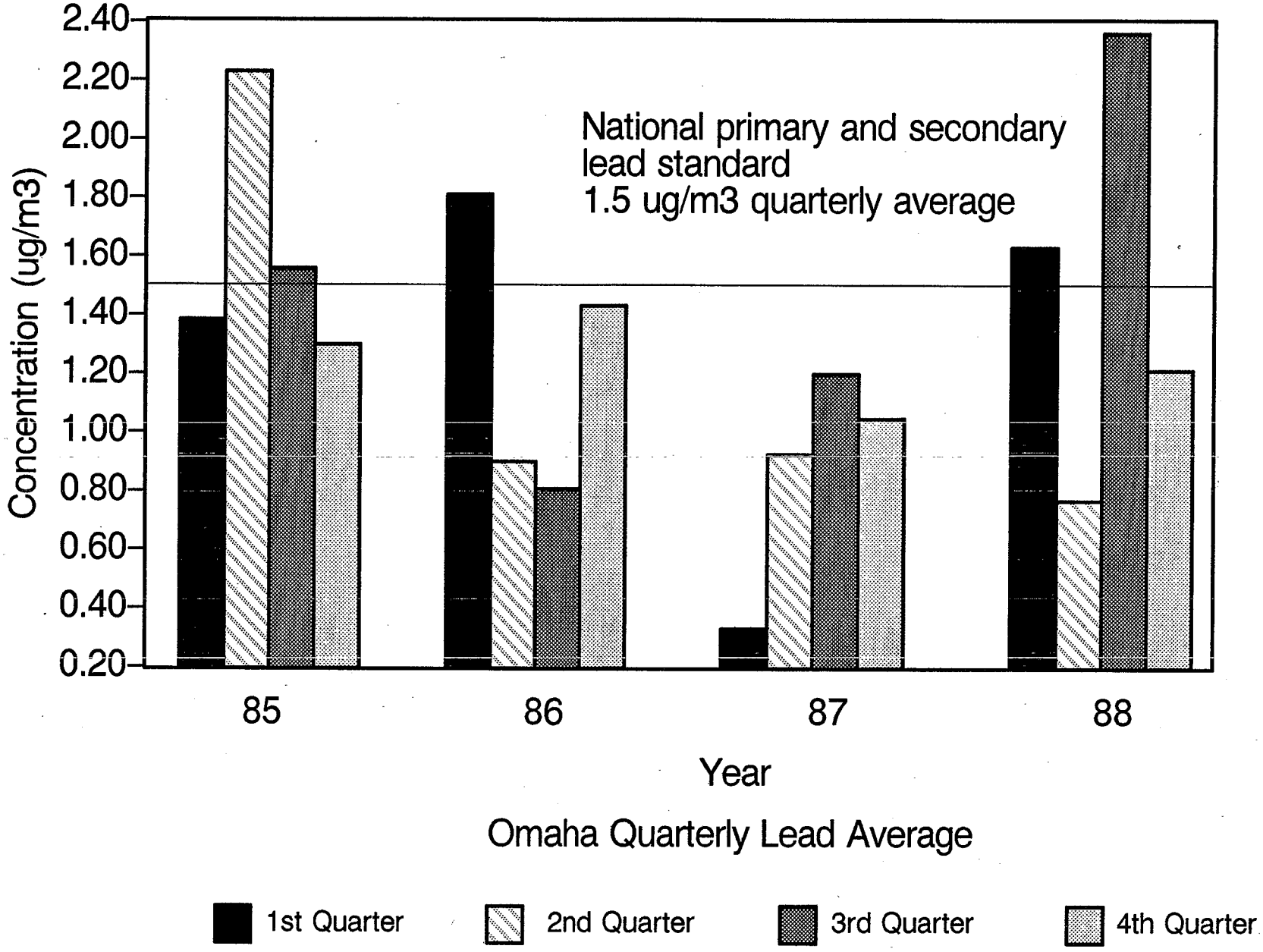

Concentration (ppm)
26
24
22
20
18
16
14
12
10
8
6
4
2
0
8–hour CO standard
9ppm
74
76
78
80
82
84
86
88
Year
2nd Maximum 8–Hour CO Concentrations
Omaha
Lincoln

FIGURE 6



2nd Maximum 1–Hour Ozone Concentrations

FIGURE 7


2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
Concentration (ug/m3)
National primary and secondary
lead standard
1.5 ug/m3 quarterly average
85
86
87
88
Year
Omaha Quarterly Lead Average
1st Quarter
2nd Quarter
3rd Quarter
4th Quarter