



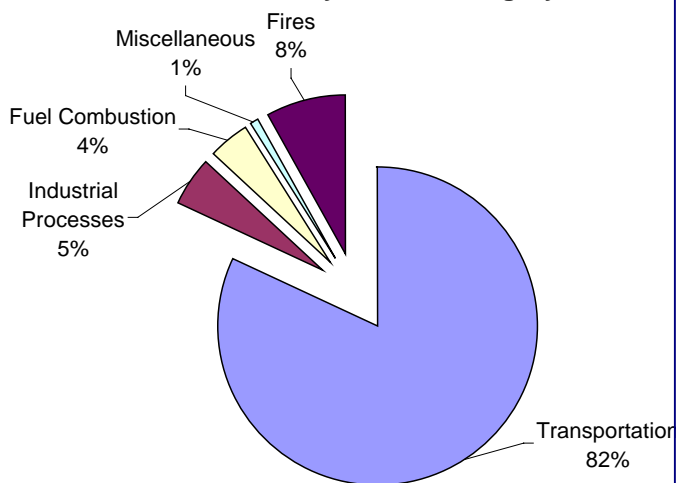
# 2002 Carbon Monoxide Summary

New Jersey Department of Environmental Protection

## NATURE AND SOURCES

Carbon monoxide (CO) is a colorless, odorless, poisonous gas formed when carbon in fuels is not burned completely. It is a by-product of motor vehicle exhaust, which contributes over 50 percent of all CO emissions nationwide. In cities, automobile exhaust can cause as much as 95 percent of all CO emissions, and high CO levels often coincide with morning and afternoon rush hours (Figure 3). Non-road engines and vehicles, such as construction equipment and boats, are also significant sources of CO and overall the transportation sector is responsible for about 82% of all CO emissions nationally. Other sources of CO include industrial processes, fuel combustion in sources such as boilers and incinerators, and natural sources such as forest fires. Figure 1 shows the national average contributions of these sources.

**Figure 1  
National Summary of 2002  
CO Emissions by Source Category**

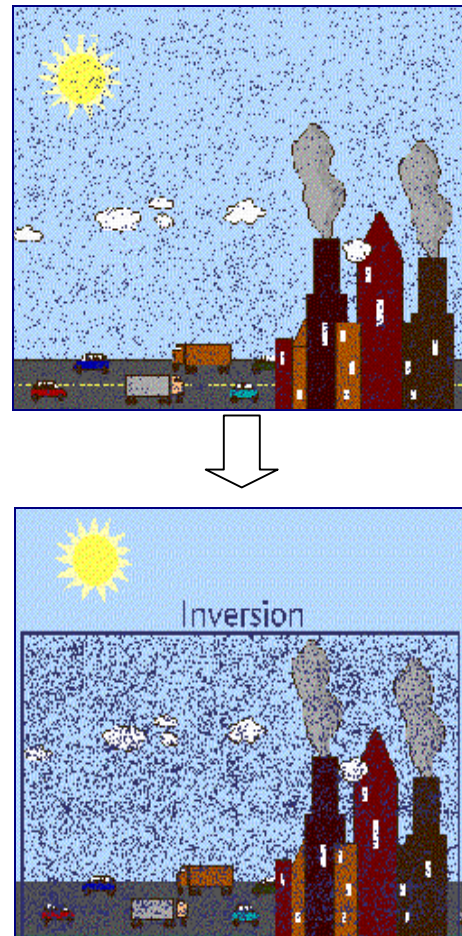


Source: USEPA National Air Quality Emissions Trends Report, 2003 Special Studies, September 2003

Figure 3 (page 2) also shows that CO levels are typically higher in the winter. This is because motor vehicles do not burn fuel as efficiently when they are cold. Atmospheric inversions are also more frequent during the winter months. Inversions usually occur overnight when cooler air is trapped beneath a layer of warmer air aloft. When this occurs, the

inversion acts like a lid, preventing pollution from mixing in the atmosphere and effectively trapping it close to ground level (see Figure 2).

**Figure 2: Effect of Atmospheric Inversion on Air Pollution**



## HEALTH AND ENVIRONMENTAL EFFECTS

Carbon monoxide enters the bloodstream and reduces the body's ability to distribute oxygen to organs and tissues. The most common symptoms associated with exposure to carbon monoxide are headaches and nausea. The health threat from exposure to CO is most serious for those who suffer from cardiovascular disease. For a person with

heart disease, a single exposure to CO at low levels may cause chest pain and reduce that individual's ability to exercise. Healthy people are also affected, but only at higher levels of exposure. Elevated CO levels are also associated with visual impairment, reduced work capacity, reduced manual dexterity, decreased learning ability, and difficulty in performing complex tasks.

New Jersey state standards for CO are based on different units (milligrams per cubic meter as opposed to parts per million), and our standards are not to be exceeded more than once in any 12-month period. The state has set secondary (welfare based) standards for CO at the same level as the primary standards. The standards are summarized in Table 1.

## STANDARDS

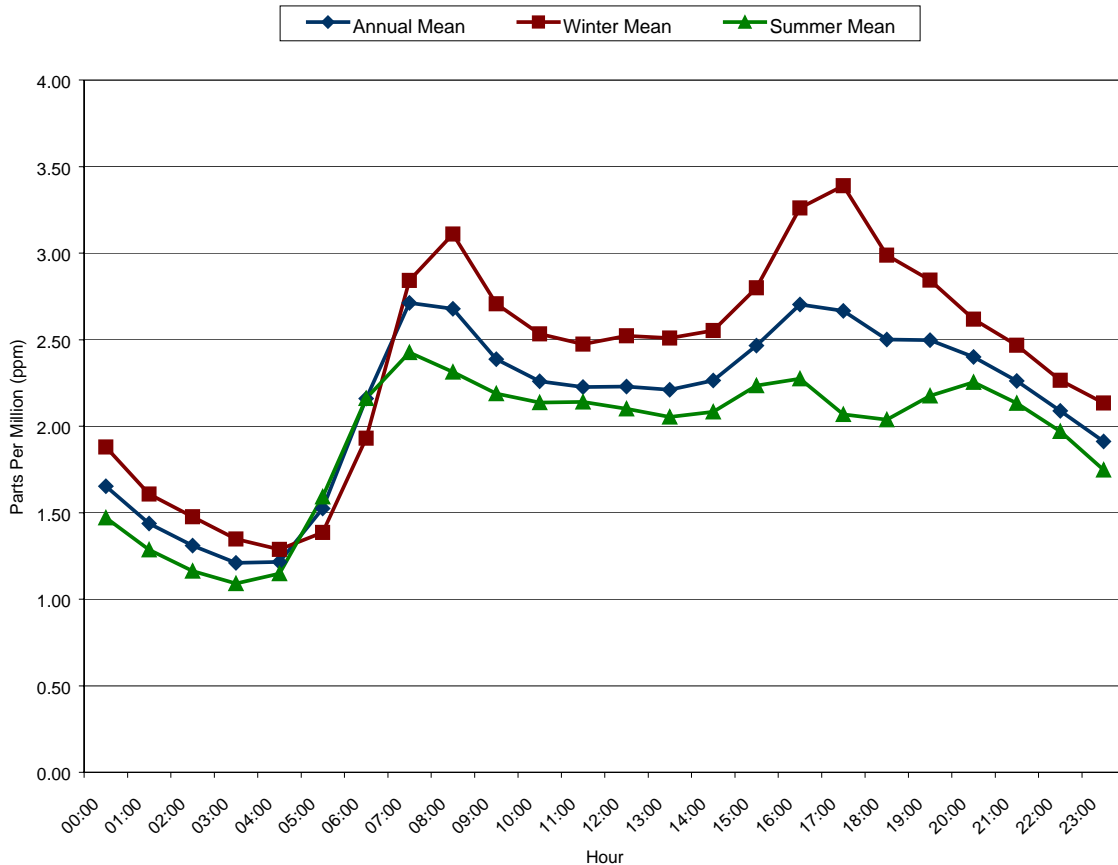
There are currently two national primary, or health based, standards for carbon monoxide. They are set at a one-hour concentration of 35 parts per million (ppm), and an 8-hour average concentration of 9 ppm. These levels are not to be exceeded more than once in any calendar year. There are no national secondary (welfare based) standards for CO at this time.

**Table 1**  
**National and New Jersey Ambient Air Quality Standards for Carbon Monoxide**

mg/m<sup>3</sup> = Milligrams Per Cubic Meter  
ppm = Parts per Million

Averaging Period	Type	New Jersey	National
1-Hour	Primary	40 mg/m <sup>3</sup> (35 ppm)	35 ppm
1-Hour	Secondary	40 mg/m <sup>3</sup> (35 ppm)	----
8-Hour	Primary	10 mg/m <sup>3</sup> (9 ppm)	9 ppm
8-Hour	Secondary	10 mg/m <sup>3</sup> (9 ppm)	----

**Figure 3**  
**Carbon Monoxide Concentrations – New Jersey**  
**1967-1999**  
**Seasonal and Hourly Variations**



## MONITORING LOCATIONS

The state monitored CO levels at 15 locations in 2002. These sites are shown in the map in Figure 4. The site in Fort Lee did not operate between June 22<sup>nd</sup> and September 8<sup>th</sup> due to site relocation. The Middlesex site was shutdown on January 31<sup>st</sup> and the North Bergen site was shut down on July 2<sup>nd</sup>.

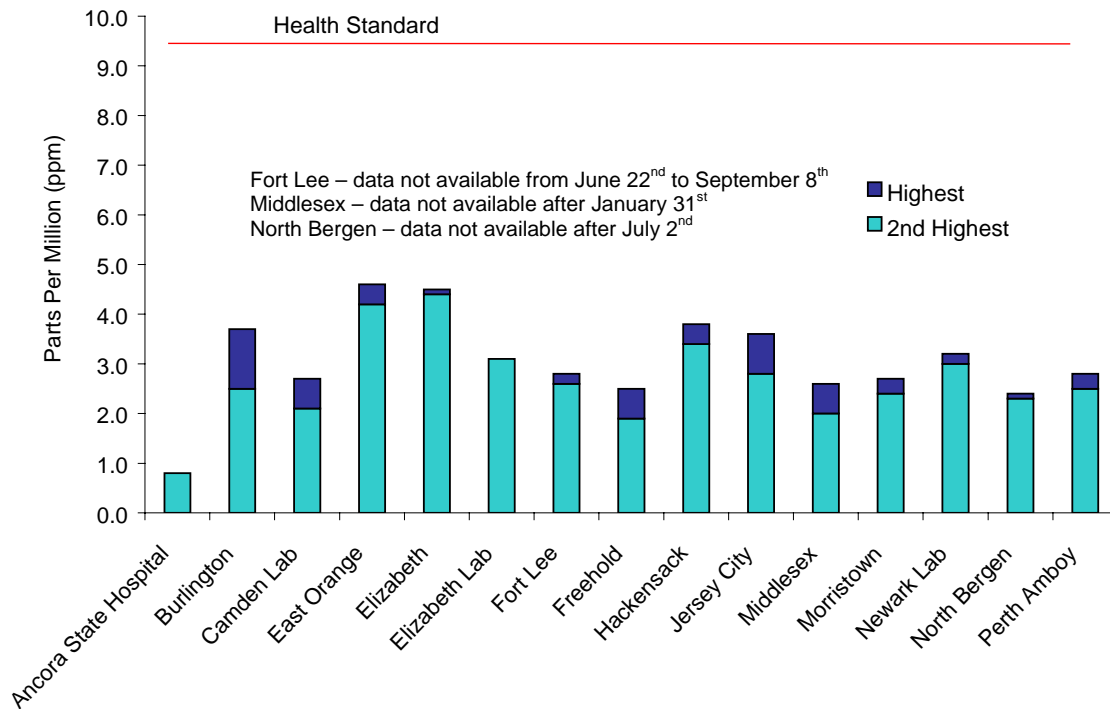
## CO LEVELS IN 2002

None of the monitoring sites recorded exceedances of any CO standard during 2002. The maximum one-hour average concentration recorded was 7.6 ppm at the site in Burlington. The highest 8-hour average level recorded was 4.6 ppm, at the East Orange site. Summaries of the 2002 data are provided in Figure 5 and Table 2 (page 4).

**Figure 4**  
2002 Carbon Monoxide  
Monitoring Network



**Figure 5**  
Highest and 2<sup>nd</sup> Highest 8-Hour Averages  
of Carbon Monoxide in New Jersey - 2002



**Table 2  
Carbon Monoxide Data – 2002  
1-Hour and 8-Hour Averages**

1-hour standard = 35 ppm  
8-hour standard = 9 ppm

Parts Per Million (ppm)

<b>Monitoring Sites</b>	<b>Maximum 1-Hour Average</b>	<b>2<sup>nd</sup> Highest 1-Hour Average</b>	<b>Maximum 8-Hour Average</b>	<b>2<sup>nd</sup> Highest 8-Hour Average</b>
Ancora State Hospital	1.3	1.2	0.8	0.8
Burlington	7.6	7.6	3.7	2.5
Camden Lab	4.5	3.8	2.7	2.1
East Orange	6.0	5.6	4.6	4.2
Elizabeth	6.5	6.4	4.5	4.4
Elizabeth Lab	5.0	4.9	3.1	3.1
Fort Lee <sup>1</sup>	3.5	3.4	2.8	2.6
Freehold	4.5	4.2	2.5	1.9
Hackensack	4.6	4.2	3.8	3.4
Jersey City	4.5	4.4	3.6	2.8
Middlesex <sup>2</sup>	3.5	3.3	2.6	2.0
Morristown	5.2	4.9	2.7	2.4
Newark Lab	4.2	4.1	3.2	3.0
North Bergen <sup>3</sup>	3.5	3.1	2.4	2.3
Perth Amboy	4.3	3.7	2.8	2.5

<sup>1</sup> Data not available from June 22<sup>nd</sup> to September 8<sup>th</sup>

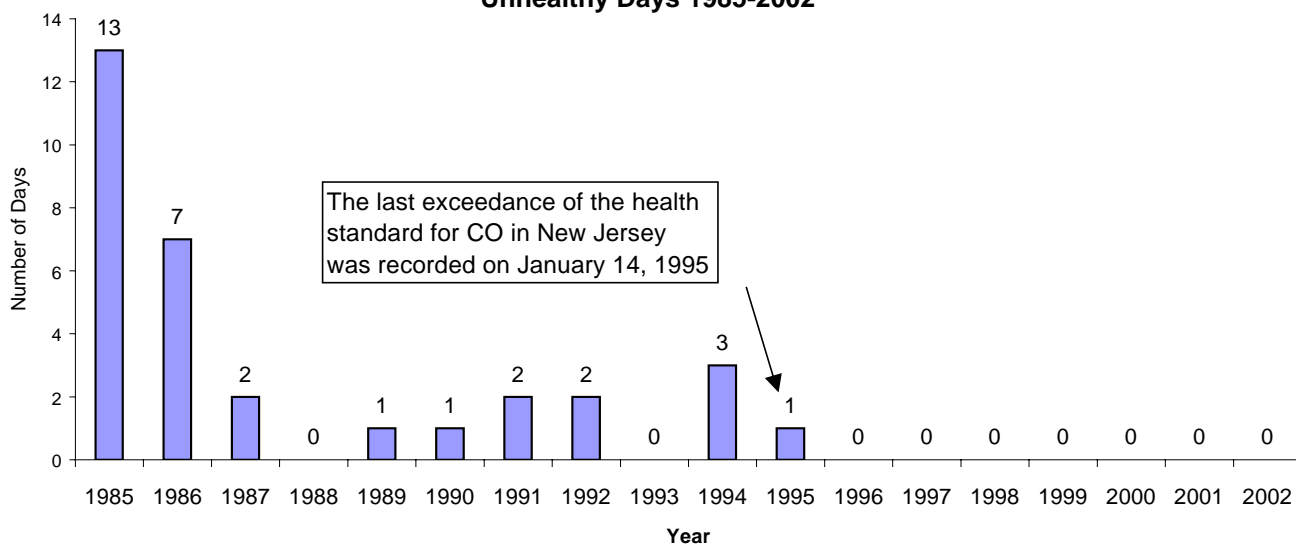
<sup>2</sup> Data not available after January 31<sup>st</sup>

<sup>3</sup> Data not available after July 2<sup>nd</sup>

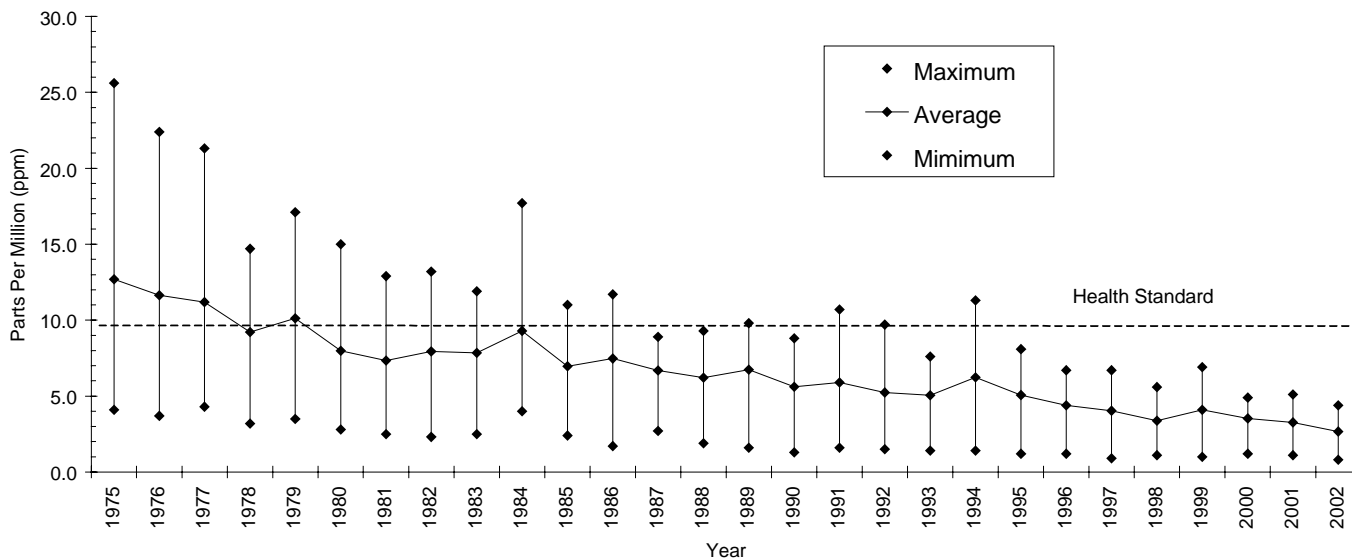
## Trends

Carbon monoxide levels have improved dramatically over the past 20 years. The last time the CO standard was exceeded in New Jersey was in January of 1995 (see Figure 6, page 5), and the entire state was officially declared as having attained the CO standard on August 23, 2002. At one time unhealthy levels of CO were recorded on a regular basis – as much as a hundred days a year at some sites. The reduction in CO levels is due primarily to cleaner running cars which are by far the largest source of this pollutant. A trend graph of CO levels showing the maximum, minimum and average 8-hour concentrations recorded since 1975 is provided in Figure 7 (page 5). The graph depicts the second highest 8-hour value recorded, as this is the value that determines if the health standard is being met (one exceedance per site is allowed each year).

**Figure 6**  
**Carbon Monoxide**  
**Unhealthy Days 1985-2002**



**Figure 7**  
**Carbon Monoxide Air Quality, 1975-2002**  
**2<sup>nd</sup> Highest 8-Hour Average**



## REFERENCES

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