



2001 Sulfur Dioxide Summary

New Jersey Department of Environmental Protection

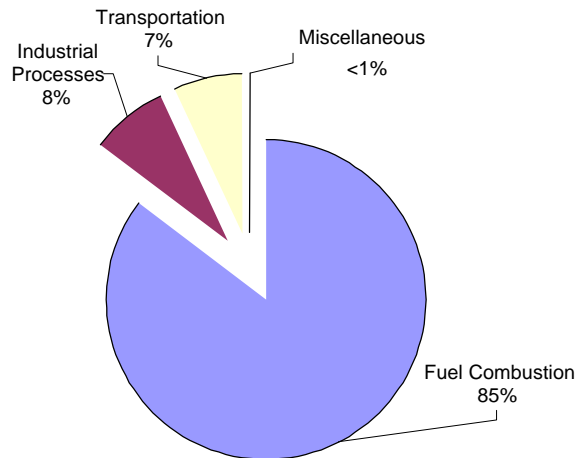
NATURE AND SOURCES

Sulfur Dioxide (SO₂) is a heavy, colorless, poisonous gas. Sulfur is found in raw materials such as crude oil, coal, and ore and SO₂ can be formed when fuel containing sulfur is burned, or when gasoline is extracted from oil.

Sulfur Dioxide easily dissolves in water and water vapor to form sulfuric acid. Most of the sulfur dioxide released into the air comes from electric utilities, especially those that burn coal with a high sulfur content. Industrial facilities that derive their products from raw materials such as metallic ore, coal, and crude oil, also release SO₂. Sulfur dioxide is also found in volcanic gases.

Figure 1

SO₂ Emissions by Source Category



Source: USEPA National Air Quality and Emissions Trends Report, 1999

HEALTH AND ENVIRONMENTAL EFFECTS

Sensitive groups for SO₂ include children, the elderly, and people with heart or lung disorders such as asthma. When there are peak levels of SO₂ in the air, people with asthma who are active outdoors may have trouble breathing.

Sulfur Dioxide reacts with other gases and particles in the air to form sulfates that can be harmful to people and the environment.

SO₂ is also a big contributor to acid rain, as SO₂ reacts with other substances in the air to form acids, which fall to the earth in rain and snow. Acid rain damages forests and crops, and can make lakes and streams too acidic for fish. Acid rain also speeds up the decay of buildings.

STANDARDS

There are several health and welfare based standards for sulfur dioxide. There are three National Ambient Air Quality Standards for SO₂. There is an annual average health standard of 0.030 parts per million (ppm). This is based on a calendar year average of continuously monitored levels. There is also a 24-hour average health based standard of 0.14 ppm which is not to be exceeded more than once a year, and a secondary (welfare based) standard of 0.50 ppm, 3-hour average concentration that is also not to be exceeded more than once per year.

New Jersey has also set state air quality standards for SO₂. They are similar to the federal standards but are expressed in micrograms per cubic meter (ug/m³) instead of ppm. They are also based on rolling averages rather than block averages. So, for example, the state's primary 12-month standard is based on any twelve-month average recorded during the year, while the federal standard is based solely on the calendar year average. The state also has secondary 12-month, 24-hour, and 3-hour average standards. Table 1 summarizes the National and New Jersey Ambient Air Quality Standards for SO₂.

Table 1
Ambient Air Quality Standards for
Sulfur Dioxide

| Averaging Period | Type | New Jersey | National^a |
|-------------------------|-------------|---------------------------------|-----------------------------|
| 12-month average | Primary | 80 ug/m ³ (.03 ppm) | .03 ppm |
| 12-month average | Secondary | 60 ug/m ³ (.02 ppm) | --- |
| 24-hour average | Primary | 365 ug/m ³ (.14 ppm) | .14 ppm |
| 24-hour average | Secondary | 260 ug/m ³ (.10 ppm) | --- |
| 3-hour average | Secondary | 1300 ug/m ³ (.5 ppm) | .5 ppm |

a – National standards are block averages rather than moving averages

MONITORING LOCATIONS

The state monitored SO₂ levels at 15 locations in 2001. These sites are shown in the map to the right. The Newark Lab site was relocated during 2001 and was not operational prior to August 6th.

SO₂ LEVELS IN 2001

None of the monitoring sites recorded exceedances of the primary or secondary SO₂ standards during 2001. The maximum annual average concentration recorded was 0.009 ppm at the Jersey City site. The maximum 24-hour average level recorded was 0.034 ppm which was recorded in Jersey City and Camden Lab. The highest 3-hour average recorded was 0.073 ppm at the site in Newark Lab. Summaries of the 2001 data are provided in Table 2, Table 3 and Figure 3.

Figure 2
2001 Sulfur Dioxide
Monitoring Network

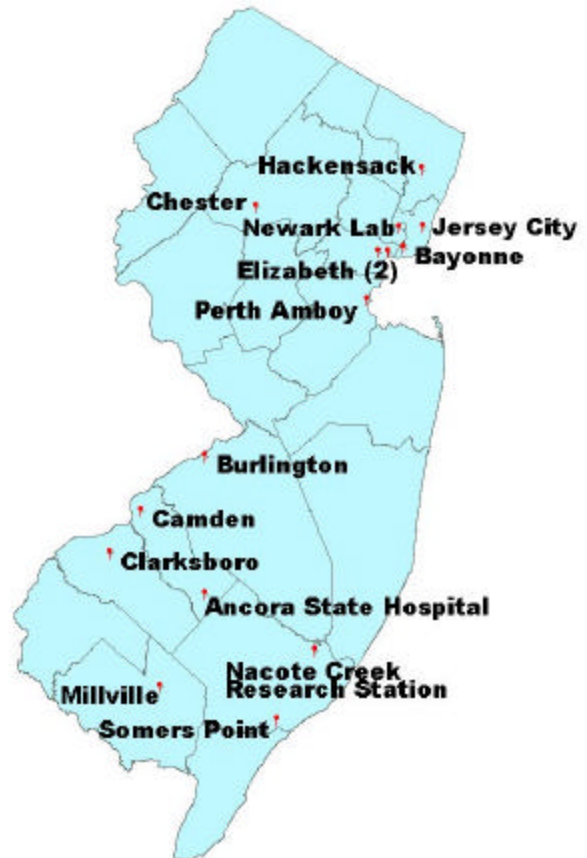


Table 2
Sulfur Dioxide Data – 2001
3-Hour and Annual Averages
Parts Per Million (ppm)

| Monitoring Sites | 3-Hour Average^a Maximum | 3-Hour Average^a 2nd Highest | 12-Month Average Maximum | 12-Month Average Year |
|-------------------------|-----------------------------------------------|--------------------------------------------------------------|-------------------------------------|----------------------------------|
| Ancora S.H. | .030 | .029 | .004 | .003 |
| Bayonne | .049 | .039 | .007 | .007 |
| Burlington | .035 | .034 | .005 | .005 |
| Camden Lab | .061 | .058 | .007 | .006 |
| Chester | .048 | .043 | .005 | .004 |
| Clarksboro | .041 | .041 | .006 | .005 |
| Elizabeth | .041 | .037 | .006 | .006 |
| Elizabeth Lab | .051 | .050 | .009 | .008 |
| Hackensack | .034 | .032 | .005 | .005 |
| Jersey City | .069 | .057 | .009 | .009 |
| Millville | .047 | .033 | .005 | .005 |
| Nacote Creek R.S. | .021 | .020 | .003 | .003 |
| Newark Lab ^b | .073 | .035 | ---- | ---- |
| Perth Amboy | .071 | .054 | .005 | .005 |
| Somers Point | .052 | .042 | .003 | .003 |

a – Based on non-overlapping 3-hour moving averages

b – Data not available prior to August 6th

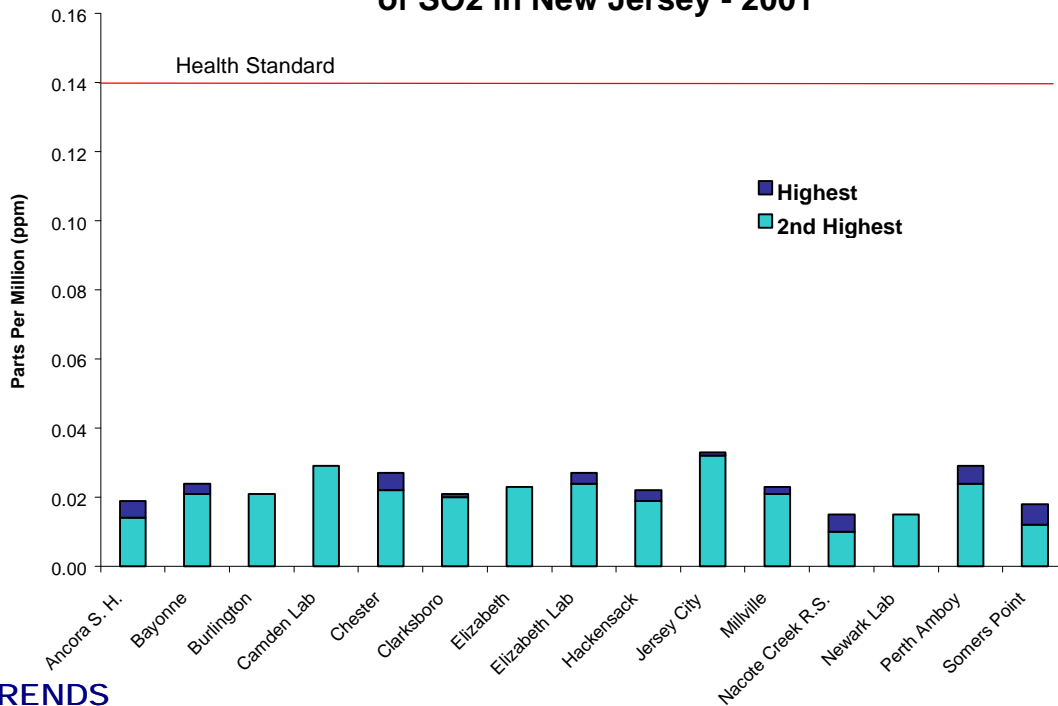
Table 3
Sulfur Dioxide Data – 2001
24-Hour and Daily Averages
Parts Per Million (ppm)

| Monitoring Sites | 24-Hour Average Maximum | 24-Hour Average^a 2nd Highest | Daily Average Maximum | Daily Average 2nd Highest |
|-------------------------|------------------------------------|---------------------------------------------------------------|----------------------------------|-------------------------------------------------|
| Ancora S.H. | .020 | .018 | .019 | .014 |
| Bayonne | .026 | .023 | .024 | .021 |
| Burlington | .025 | .022 | .021 | .021 |
| Camden Lab | .034 | .032 | .029 | .029 |
| Chester | .031 | .025 | .027 | .022 |
| Clarksboro | .027 | .022 | .021 | .020 |
| Elizabeth | .025 | .024 | .023 | .023 |
| Elizabeth Lab | .030 | .026 | .027 | .024 |
| Hackensack | .022 | .022 | .022 | .019 |
| Jersey City | .034 | .033 | .033 | .032 |
| Millville | .029 | .022 | .023 | .021 |
| Nacote Creek R.S. | .016 | .012 | .015 | .010 |
| Newark Lab ^b | .023 | .016 | .015 | .015 |
| Perth Amboy | .030 | .025 | .029 | .024 |
| Somers Point | .020 | .015 | .018 | .012 |

a – Based on non-overlapping 3-hour moving averages

b – Data not available prior to August 6th

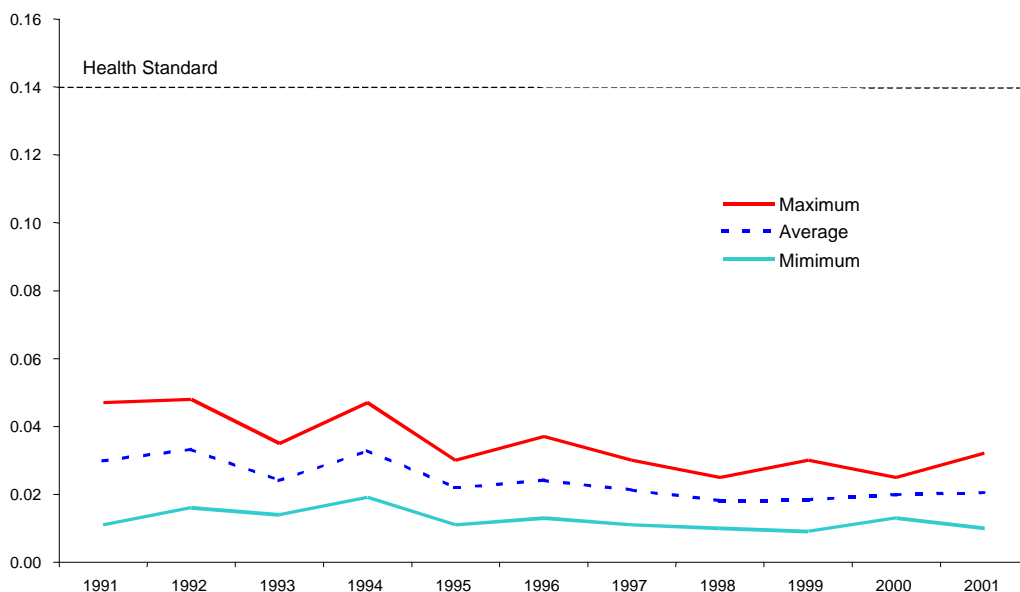
Figure 3
Highest and 2nd Highest Daily 24-Hour Averages
of SO2 in New Jersey - 2001



TRENDS

Since the implementation of regulations requiring the use of low sulfur fuels in New Jersey, SO₂ concentrations have improved significantly. The last time an exceedance of any of the National SO₂ standards was recorded in the state was in 1980. A trend graph of SO₂ levels showing the highest, lowest and average 24-hour average concentrations recorded over the past eleven years is shown below. The graph uses the second highest 24-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 4
Sulfur Dioxide Concentrations in New Jersey
1991 - 2001
Second Highest Daily Averages



References

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