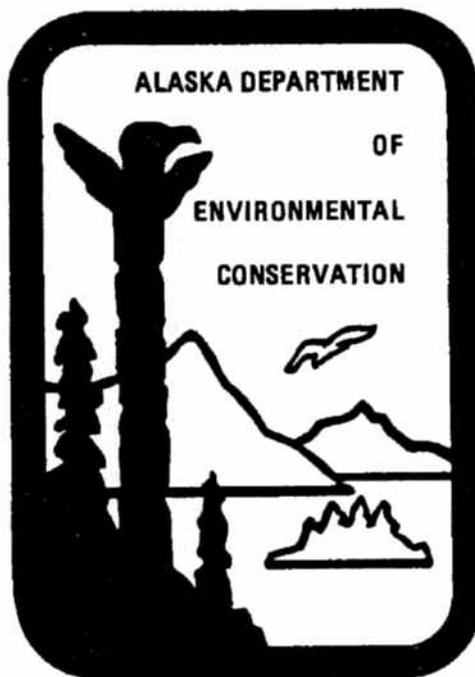


Juneau Air Quality Monitoring Project

Lemon Creek Valley

**Data Summary
January 1984 - April 1994**



Issued: August 31, 1994

PROJECT BACKGROUND AND OBJECTIVE

The State of Alaska Department of Environmental Conservation (ADEC), in an effort to protect the public health and the environment, has been mandated by the legislature to evaluate, assess, and mediate environmental issues that may affect the health and welfare of residents within the state. To further these objectives, a statewide air monitoring network has been established by the Air Quality Section of the Division of Environmental Quality. The network currently consists of sites in Juneau, Anchorage, Fairbanks, Kenai, and Ketchikan.

In response to a variety of public concerns over degradation of air quality in Juneau during the early 1980s, the Department established several monitoring sites in the Lemon Creek and Mendenhall River valleys. These sites were established to determine whether the concentration of airborne pollutants in the valley could be impairing the health of local residents. Periodic winter inversions, coupled with pollution-emitting activities, have resulted in noticeable ground-based pollution. Citizen complaints have primarily centered on woodstove emissions and road dust. Pollutants are often trapped within a specific locale of origin or transported to neighboring areas depending upon the localized meteorology. In the Lemon Creek Valley, the concerns centered upon days when smoke and other particulates were trapped near the ground.

The main air pollutant of concern in the Lemon Creek area is particulate matter. Originally particulate matter was measured as total suspended particulate (TSP) and later as inhalable particulate (PM_{10}). Both measurements rely on the use of a high-volume particulate sampler. The TSP sampler measured for total suspended particulate, while the sampler for inhalable particulate collects particles that are 10 micrometers, or less, in diameter. These small diameter particles, less than 10 μm , can be inhaled and trapped in the lungs. The resulting respiratory impairment may aggravate existing respiratory problems or lead to respiratory ailments in the future.

In consideration of the financial resources required to operate a single air monitoring station, a great deal of effort is invested initially to select a monitoring location for which the collected data will represent a larger geographic area of pollutant exposure. This would mean that data collected at the monitoring sites in Lemon Creek are generally considered to represent air quality conditions at other locations throughout the Valley. This does not necessarily mean that these concentrations are homogeneous throughout the Valley, but that similar concentrations are expected to occur at other locations at differing time periods when compared with levels measured at the site.

Usually, pollutant exposures of short duration are one of the greatest concerns to the Department. This is because short-term meteorological conditions can result in air pollutants being trapped in a specific area or transported to an area in a relatively concentrated form. Consequently, the probability of observing pollutant concentrations that exceed the health standards is more likely for short-term averaging periods such as 1, 3, or 24 hours, than for standards established for annual average exposures. Since the worst-case, short-term conditions are irregular events, if a project is to be successful in observing the maximum pollution levels, the duration of a project must be several months, or perhaps a year or two.

APPLICABLE AIR QUALITY STANDARDS

Particulate matter is frequently classified by size and is described by using a reference diameter measured in micrometers (μm). Human hair has a diameter of about 100 to 200 μm . Airborne particles having a diameter between 2.5 μm and 10 μm are considered coarse and tend to come from crustal sources such as unpaved roadways, agricultural activities, and surface mines. Particles smaller than 2.5 μm are considered fine and generally come from smoke stacks, motor vehicles, and chemical processes that emit gases, such as sulfur dioxide and volatile organic compounds which transform to liquid or solid particles in the atmosphere. Natural sources of suspended particulate include windblown dust, volcanoes, and forest and grass fires. These natural sources can contribute both fine and coarse particles to ambient air.

Health reviews have shown that particles greater than 10 μm primarily lodge in the oral and nasal passages. The particles are largely eliminated by natural body processes and do not penetrate further into the respiratory tract. Particles smaller than 10 μm , often called PM_{10} , can travel deep into the respiratory tract and may lodge in the lungs.

The Environmental Protection Agency (EPA) has established national ambient air quality standards (NAAQS) for select pollutants. National primary standards are set to protect human health, with an adequate margin of safety to protect even the most sensitive portion of the population. Particulates are one of the pollutants that have standards set by the EPA. The national and Alaska ambient air quality standard for PM_{10} sized particulate is $150 \text{ ug}/\text{m}^3$ for a 24-hour average. Prior to establishing a standard for PM_{10} , the standard for particulate matter was based on TSP. When the TSP standard was in effect, it was also set at $150 \text{ ug}/\text{m}^3$ for a 24-hour average.

SUMMARY AND DISCUSSION OF DATA

This report summarizes data collected in the Lemon Creek area from January 1984 through April 1994. The discussion that follows provides statistics and a brief outline of the data. A detailed listing of all data collected during this period is provided in the appendices.

During the past ten years, particulate monitoring has been undertaken at three different monitoring sites. From 1984-86 a TSP monitoring site was located at 5937 Mountain Avenue. In January 1987 a TSP monitoring site was established at Lot #6 on Pine Street. This site operated as a TSP site through September 1987. In October 1987 the Pine Street site began monitoring for PM_{10} . This site remained in operation through October 1993. In November 1993 a PM_{10} monitoring site was established in the parking lot of the new Dzantik'i Heeni Middle School near the Switzer Village trailer park. This site operated through the winter of 1993-94, terminating May 1, 1994.

5937 Mountain Avenue

The Mountain Avenue site was established to determine if the concentrations of particulate from wood stove emissions in the valley during periodic winter inversions could be impairing the health of local residents. Because the focus was on wood smoke, the site only operated during the winter months (October through March). TSP measurement exhibited relatively low concentrations during the time the site was in operation. The highest 24-hour average observed was 112 ug/m³, reported on February 27, 1984. The second highest value observed was 93 ug/m³, reported on February 19, 1986. The mean concentration for all the data collected at this site was 27 ug/m³, with a standard deviation of 20. A complete exhibit of the TSP concentrations for each day a sample was taken is included in Appendix A.

Lot #6 Pine Street

The Pine Street site was also originally established to monitor wood smoke emissions in the Lemon Creek area, however, the Pine Street site was operated year round. The site monitored for TSP from January through September 1987. During the winter months (January through March), TSP measurements showed relatively low concentrations. However, during the summer months, there were six days when the observed TSP concentrations approached or exceeded the standard for TSP. The highest 24-hour average observed was 193 ug/m³, reported on July 2, 1987. The second highest value observed was 187 ug/m³, reported on July 20, 1987. The mean TSP concentration for the period January through September 1987 was 48 ug/m³, with a standard deviation of 44.

In October 1987, the Pine Street site began monitoring for particulate matter as PM₁₀. From October 1987 through October 1993, on only one day did the observed PM₁₀ concentration exceed the PM₁₀ standard. On November 25, 1988 the observed concentration at the monitoring site was 162 ug/m³. Further analysis of this sample showed that the particulate matter was from a road-dust source and not wood smoke. The second highest PM₁₀ concentration observed at the Pine Street site was 120 ug/m³ reported on March 3, 1991. In general, the highest concentrations observed at the Pine Street site have been due to road dust. During the summer of 1991, a road paving project was undertaken in the Lemon Creek area. Since that time, there have been no concentrations observed in excess of the PM₁₀ health standard. The following table shows the highest PM₁₀ concentration, second highest PM₁₀ concentration, and average PM₁₀ concentration observed at the site for each monitoring year.

Table 1
PM₁₀ Statistics
Pine Street Monitoring Site

Year	Max. PM ₁₀ Conc. ug/m ³	Date	2nd Max. PM ₁₀ Conc. ug/m ³	Date	Avg. Conc. ug/m ³	Std. Dev.
1987	52	12/29/87	38	10/30/87	14	10
1988	162	11/25/88	64	1/4/88	17	17
1989	112	7/11/89	105	7/7/89	24	19
1990	119	7/4/90	108	7/20/90	23	20
1991	120	3/3/91	76	3/1/91	21	16
1992	72	2/12/92	72	4/6/92	17	13
1993	78	5/15/93	72	3/16/93	21	13

A complete exhibit of the TSP and PM₁₀ concentrations observed at the Pine Street site is included in Appendix B.

Dzantik'i Heeni Middle School, Switzer Creek

In November 1993, the air monitoring site in Lemon Creek was relocated to the parking lot of Dzantik'i Heeni Middle School. Because recent concentrations observed at the Pine Street site had been generally low, the monitoring site was moved up the hillside to check for potential wood smoke impacts near the new school. The new middle school was not yet in session and construction work continued at the school during the monitoring period. In addition to the Hi-Vol PM₁₀ sampler, the Department operated a nephelometer and a beta attenuation monitor. All three of these samplers are used to measure PM₁₀ in ambient air. The Department wanted to conduct a comparison of results obtained by the beta attenuation monitor and nephelometer to the Hi-Vol sampler. Only the Hi-Vol results are discussed in this report, since the Hi-Vol method is routinely used to collect particulate data throughout the state. The other methods for monitoring PM₁₀ and the intermethod comparison will be discussed in a separate report.

The Switzer Creek site was operated from November 1993 through April 1994. PM₁₀ measurement exhibited low particulate concentrations throughout the monitoring period. The reported values did not approach the NAAQS 24-hour primary standard for PM₁₀ of 150 ug/m³. The highest 24-hour average observed was 51 ug/m³, reported on January 20, 1994. The second highest value observed was 21 ug/m³, reported on March 29, 1994. The mean concentration observed at the monitoring site was 7 ug/m³ with a standard deviation of 5. A complete exhibit of all the particulate concentrations observed at the Switzer Creek site is included in Appendix C.

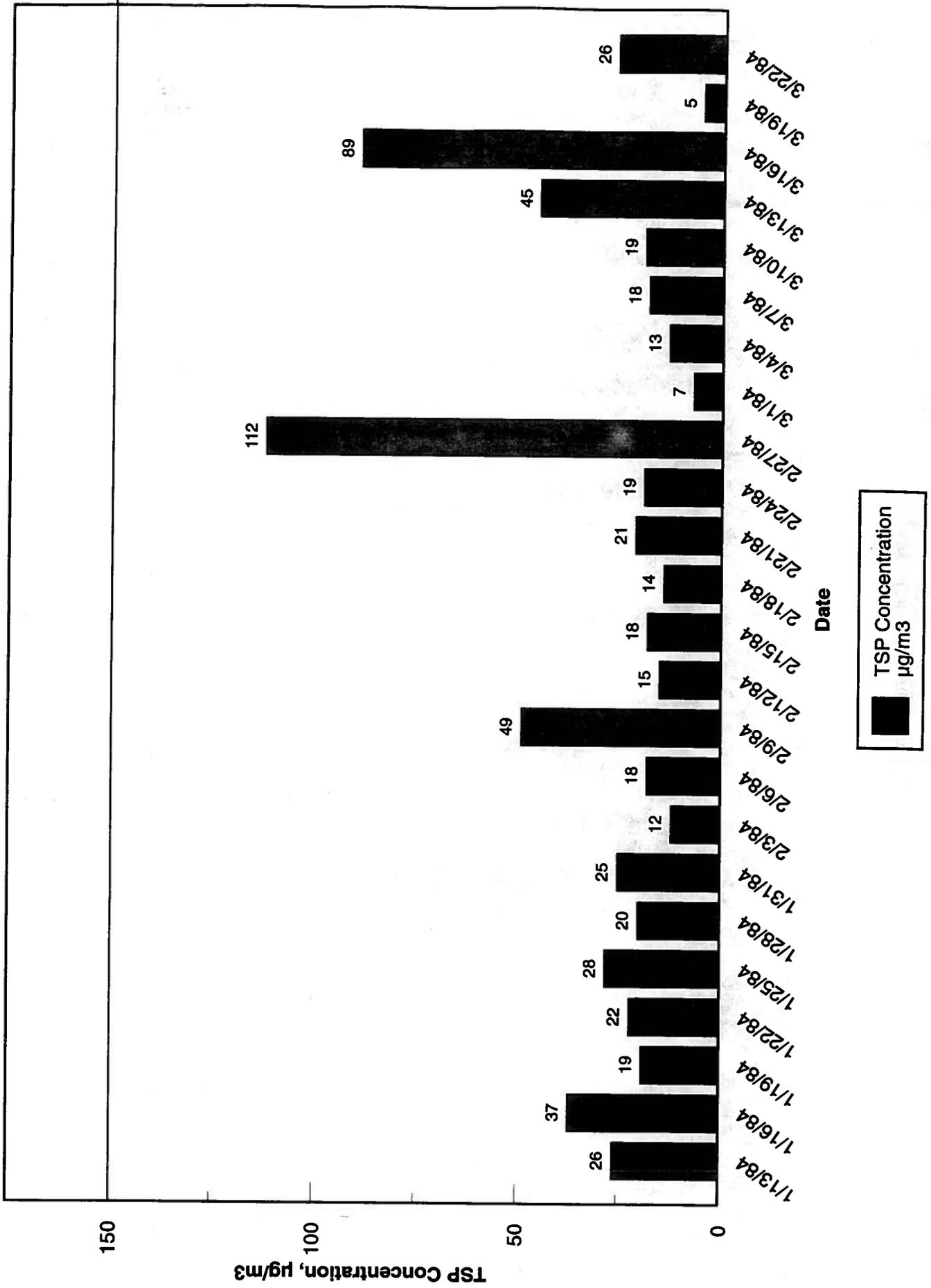
SUMMARY AND CONCLUSIONS

The Department's monitoring efforts in the Lemon Creek Valley to date indicate that the NAAQS, 24-hour primary standard for PM₁₀ was seldom exceeded. There have been no concentrations in excess of the standard observed since November of 1988. Wintertime wood stove emissions do not currently appear to be creating a health hazard for the local citizens. The main concern in recent years has been with exposure to high levels of particulate due to road dust and other fugitive dust sources. Since the City and Borough of Juneau paved many of the streets in the Lemon Creek Valley in 1991, particulate concentrations due to dust have significantly decreased.

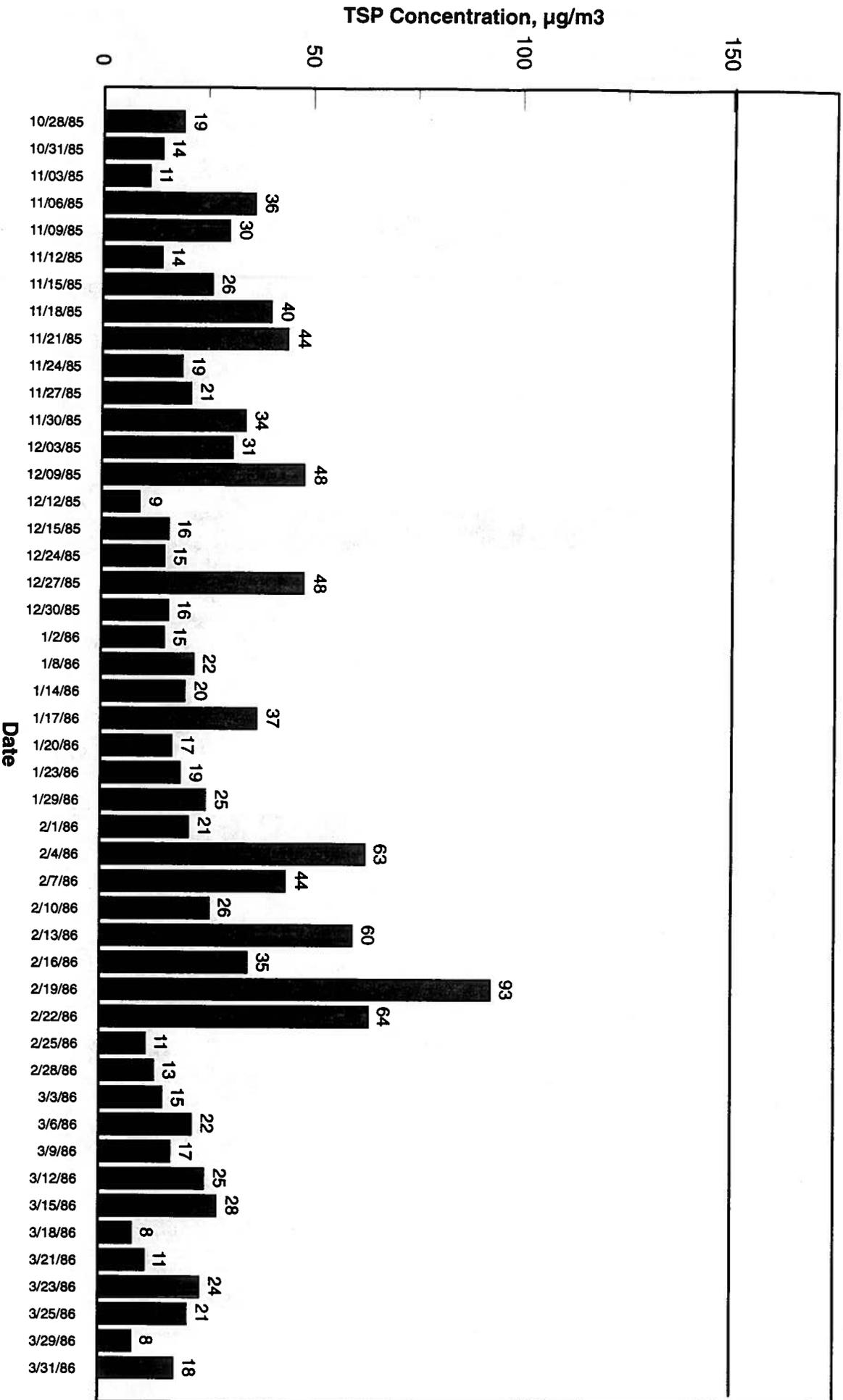
Recently, concerns have been raised over dust from industrial activities in the area near the new Costco warehouse store. To address these concerns, the Department has established a temporary PM₁₀ monitoring site located in the Costco parking lot. This site began operation in August 1994 and monitoring will continue through September 1994. The focus of this monitoring site is to determine if fugitive dust emissions from the local gravel quarry and other industrial activities are causing violations of the health-based standard. When data from this project is available, an addendum will be made to this report.

Appendix A
Mountain Avenue Site

TSP Monitoring Site - 5937 Mountain Avenue 1984



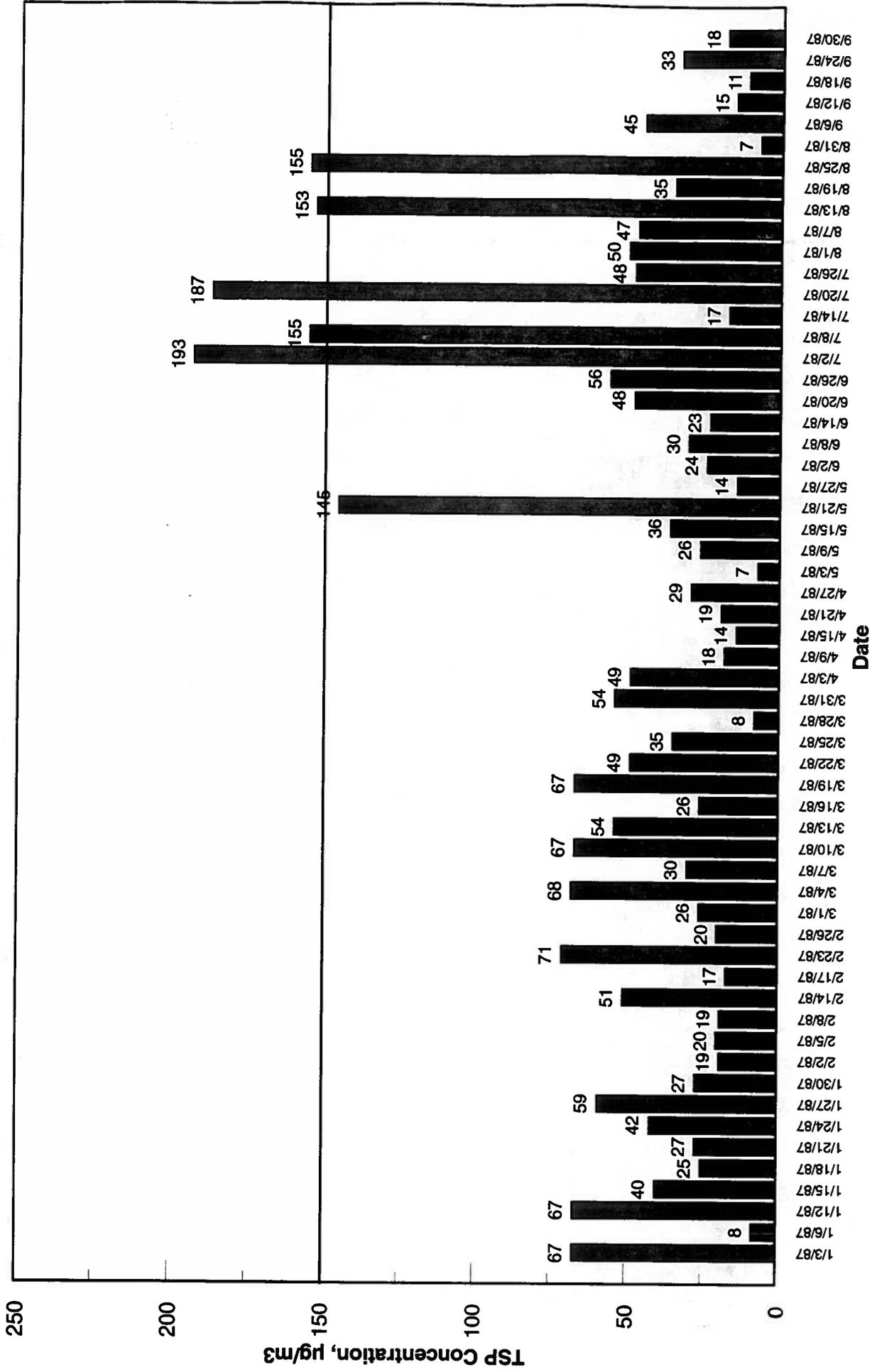
TSP Monitoring Site - 5937 Mountain Avenue
 Winter Season
 1985-1986



**Appendix B
Pine Street Site**

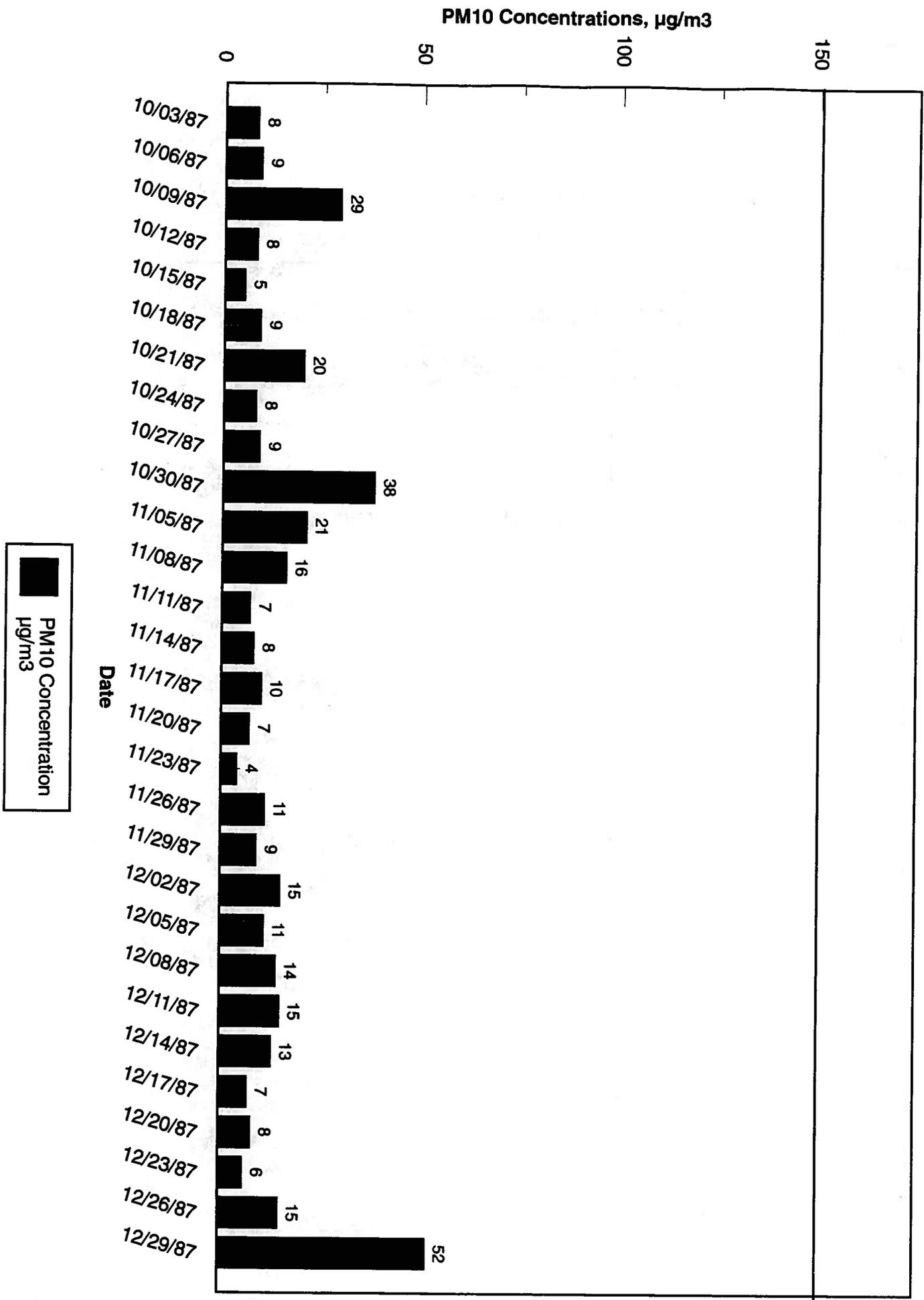
TSP Monitoring Site - Lot #6 Pine Street

January - September 1987

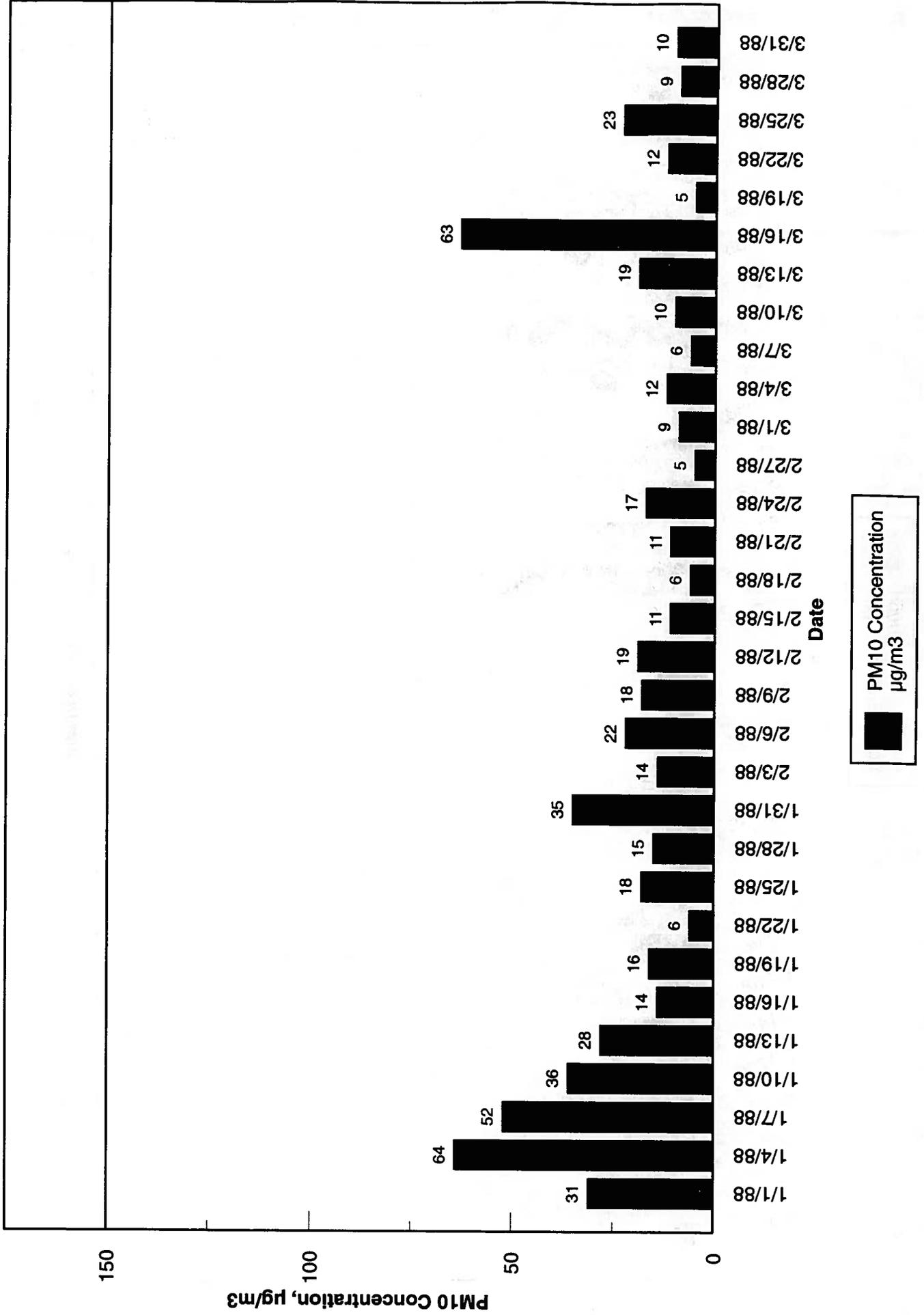


TSP Concentration
µg/m³

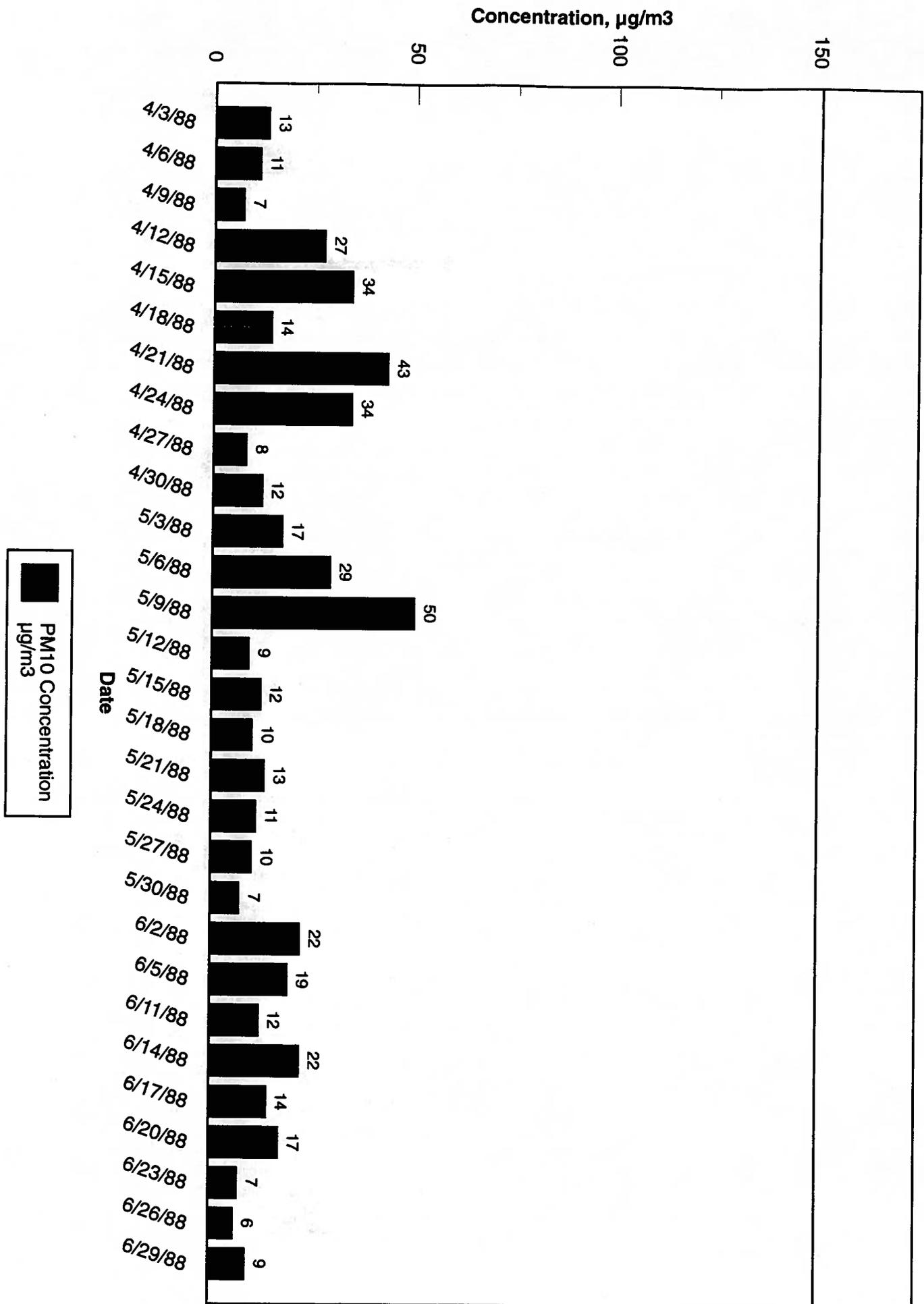
PM10 Monitoring Site - Lot #6 Pine Street
Fourth Calendar Quarter 1987



PM10 Monitoring Site - Lot #6 Pine Street
First Calendar Quarter 1988

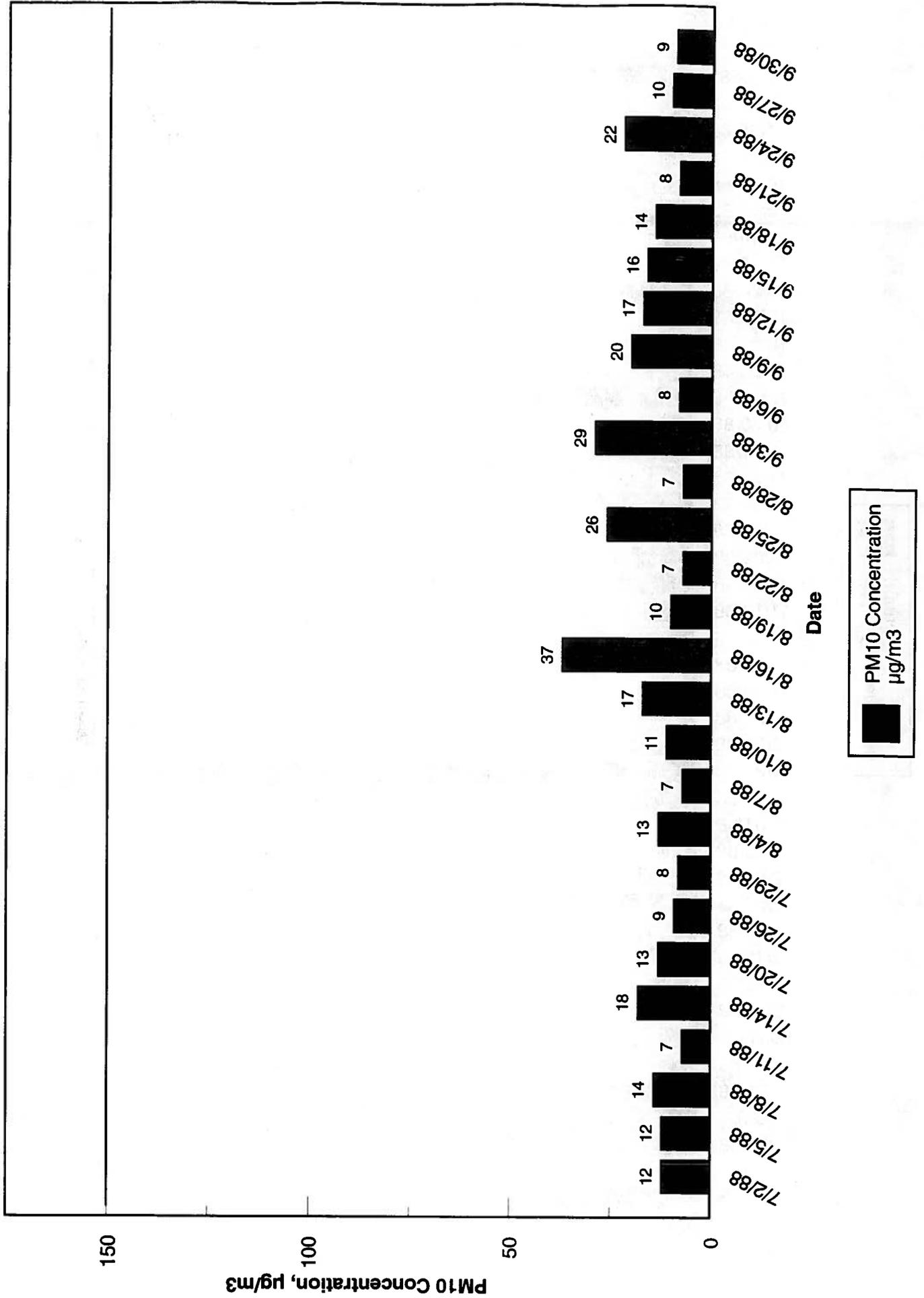


PM10 Monitoring Site - Lot #6 Pine Street
Second Calendar Quarter 1988

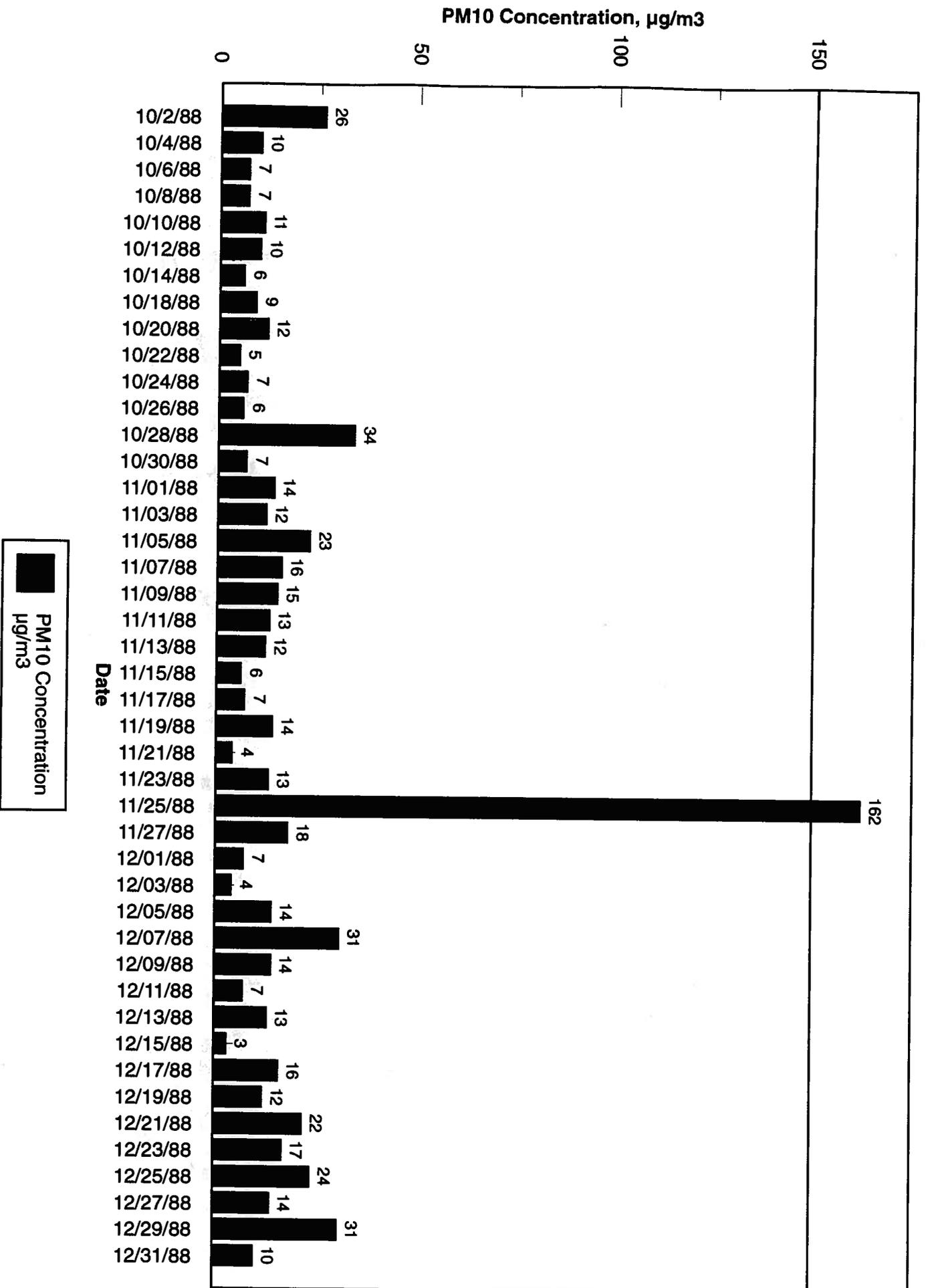


PM10 Monitoring Site - Lot #6 Pine Street

Third Calendar Quarter 1988

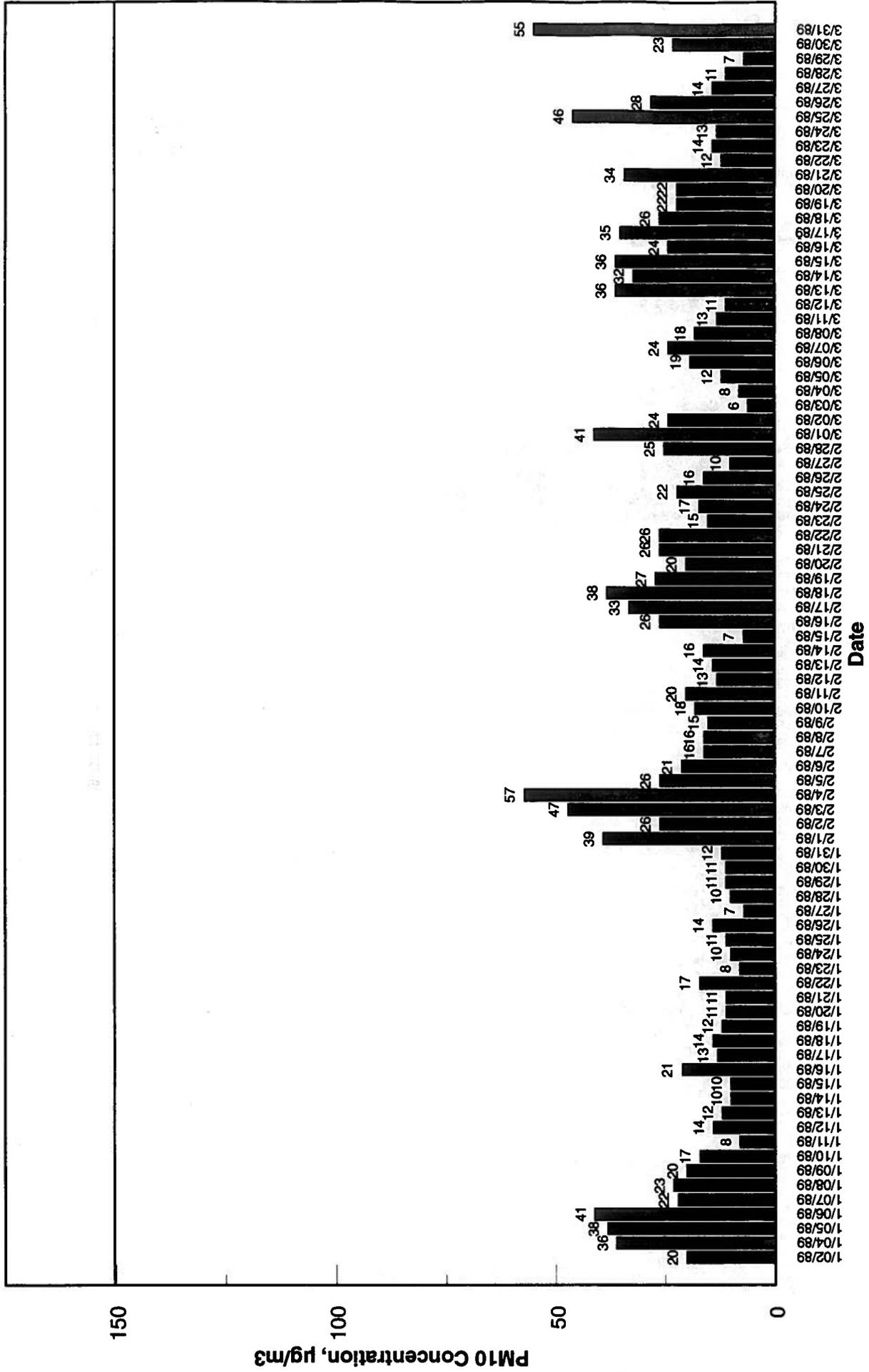


PM10 Monitoring Site - Lot #6 Pine Street
Fourth Calendar Quarter 1988



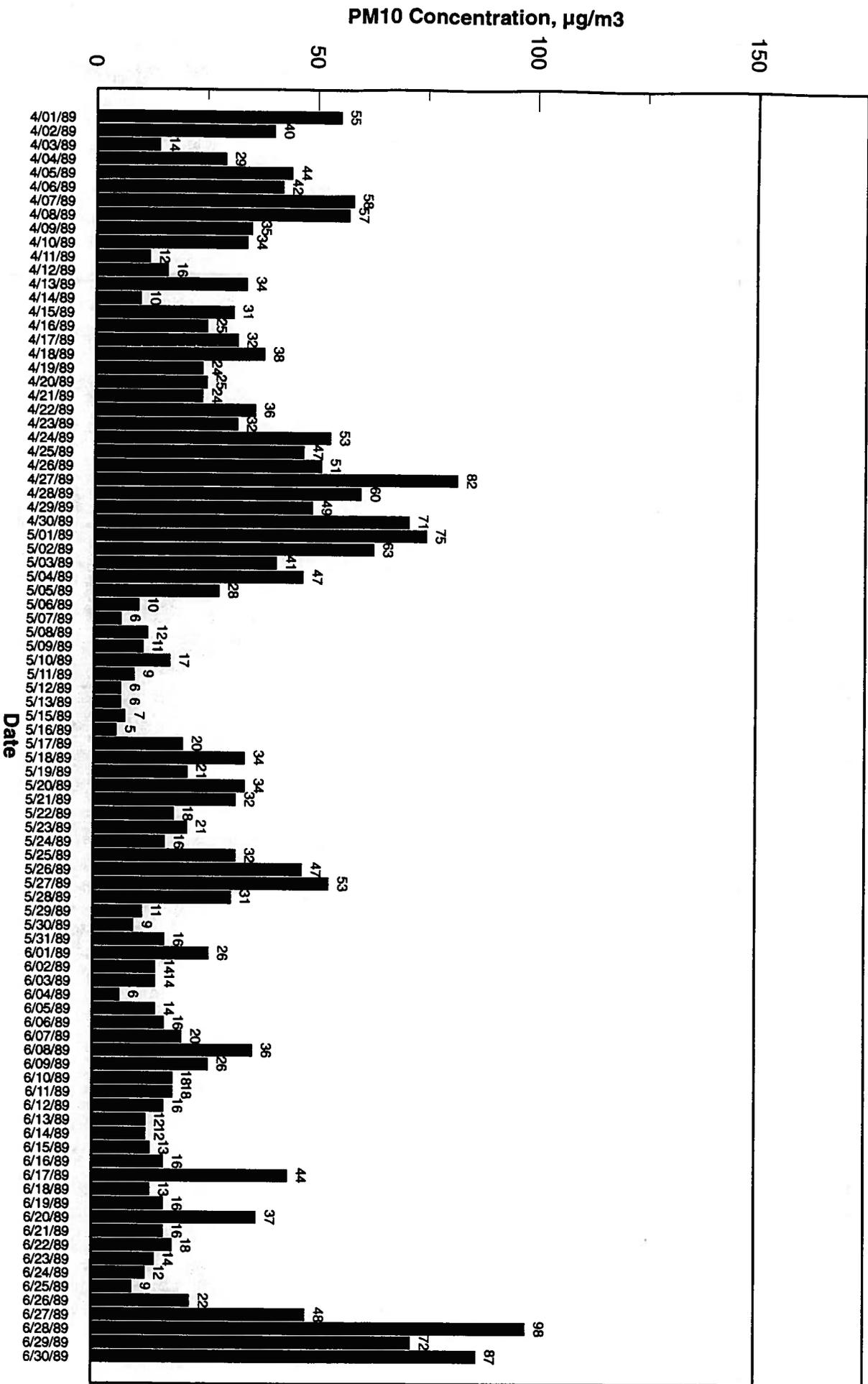
PM10 Monitoring Site - Lot #6 Pine Street

First Calendar Quarter 1989



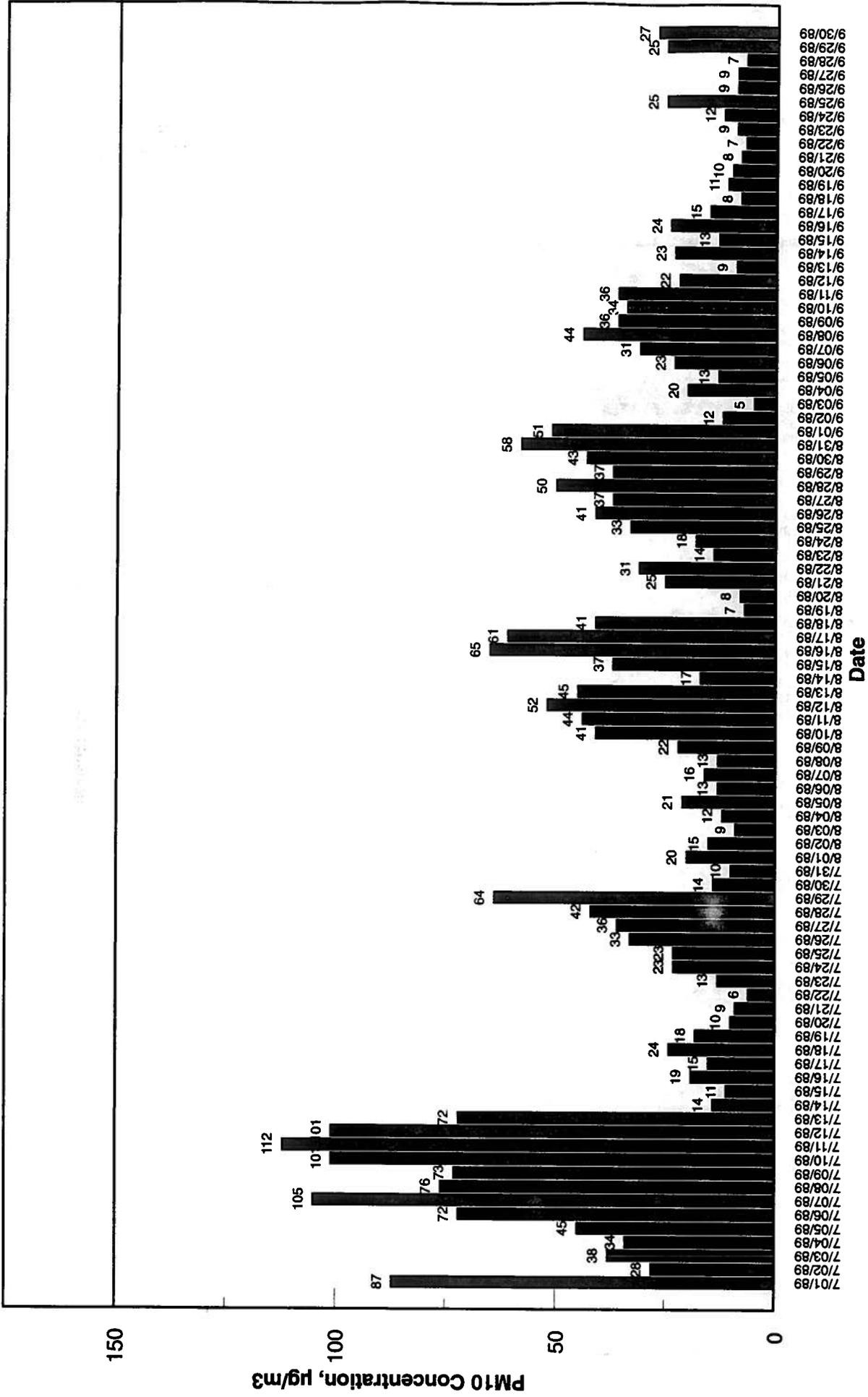
PM10 Concentration
 µg/m³

PM10 Monitoring Site - Lot #6 Pine Street
 Second Calendar Quarter 1989



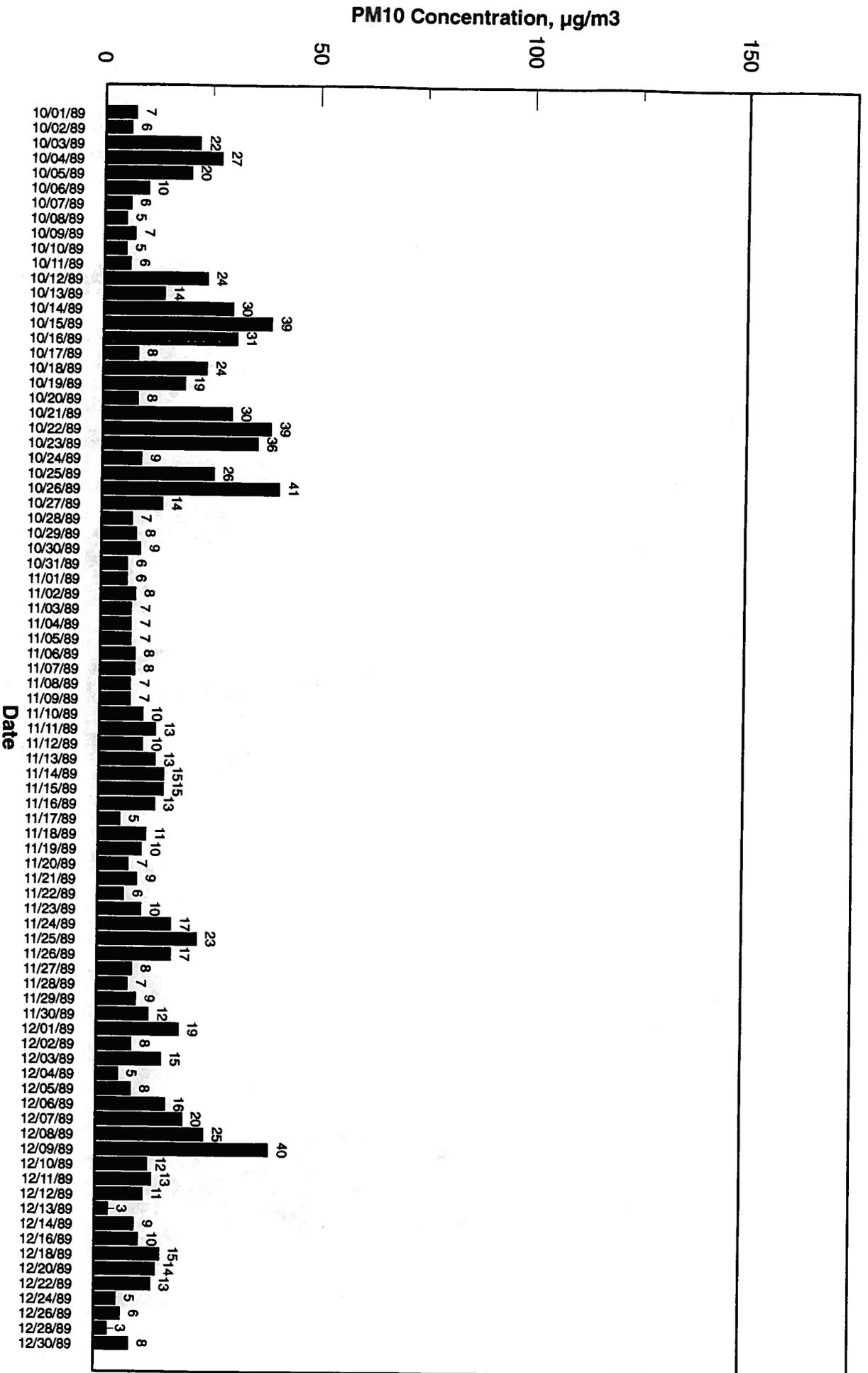
PM10 Monitoring Site - Lot #6 Pine Street

Third Calendar Quarter 1989

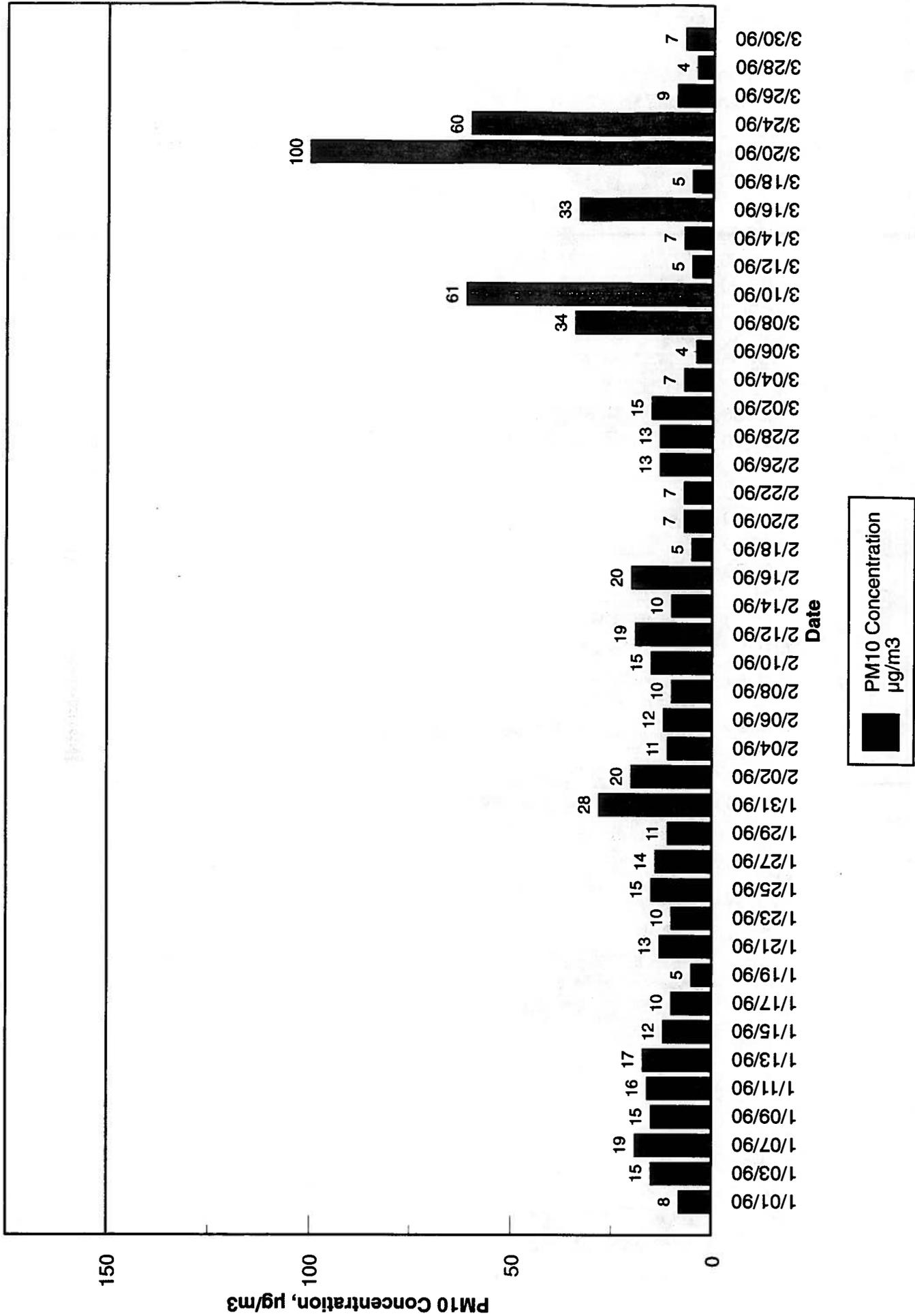


PM10 Concentration
µg/m3

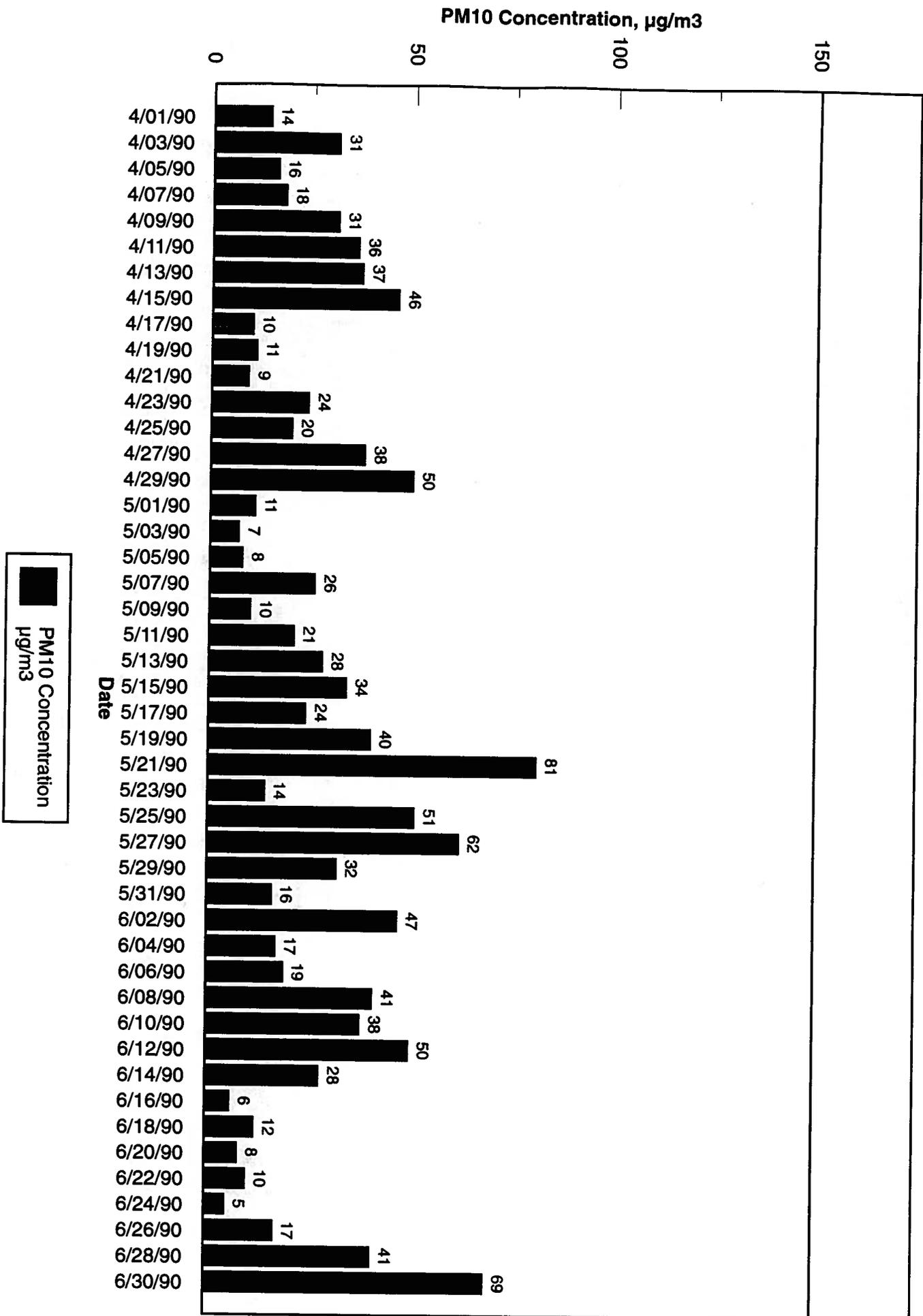
PM10 Monitoring Site - Lot #6 Pine Street
Fourth Calendar Quarter 1989



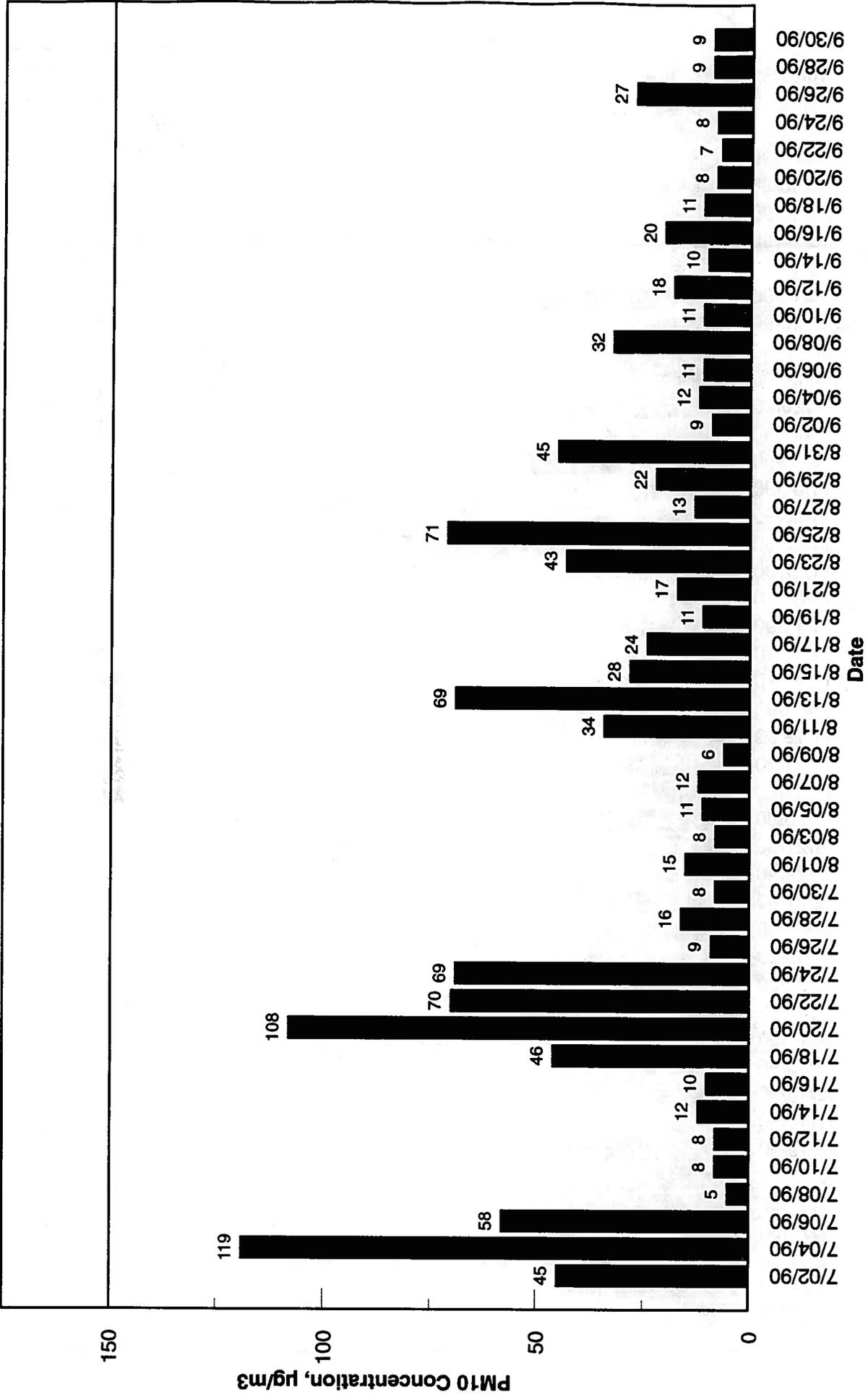
PM10 Monitoring Site - Lot #6 Pine Street
 First Calendar Quarter 1990



PM10 Monitoring Site - Lot #6 Pine Street
Second Calendar Quarter 1990

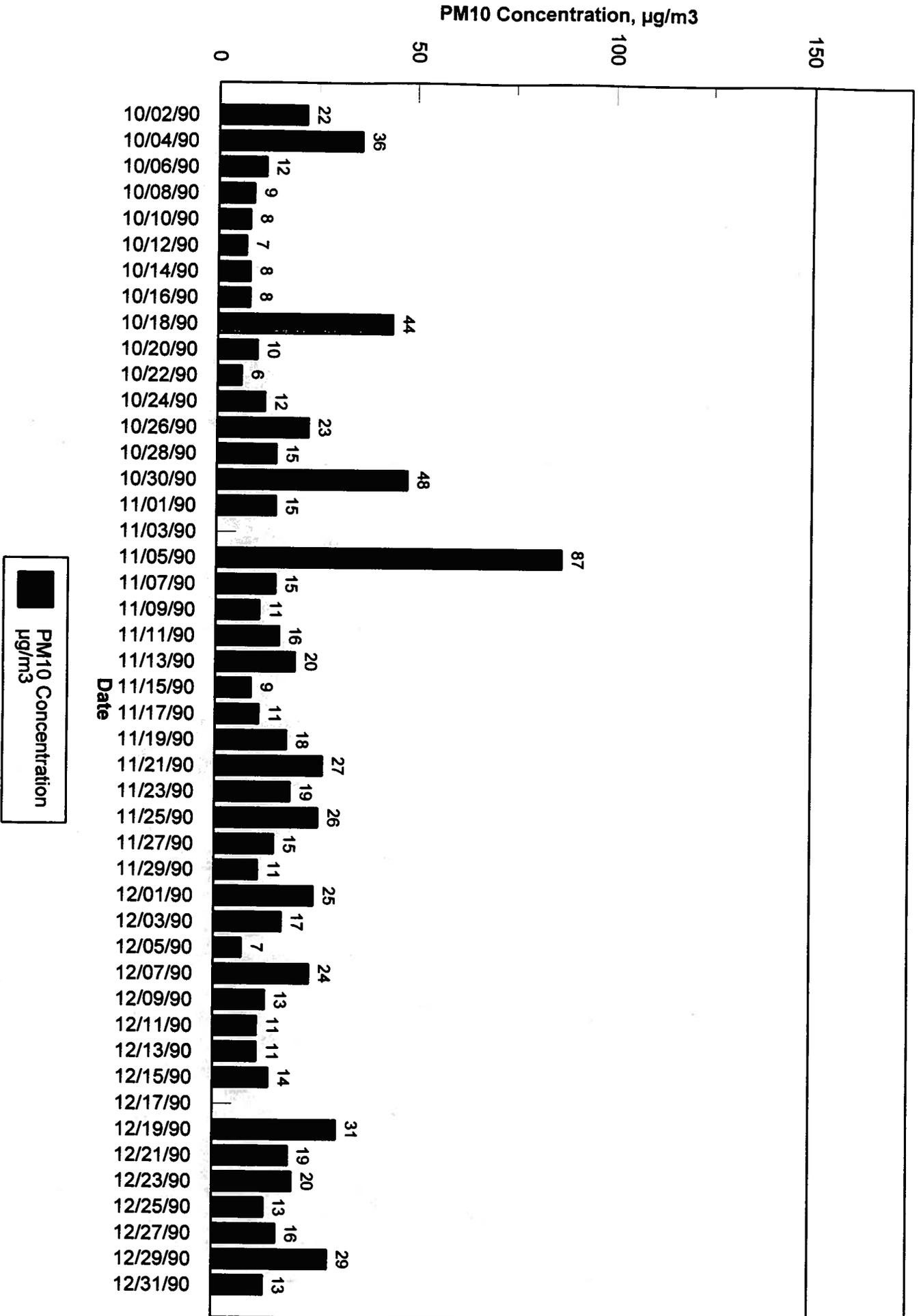


PM10 Monitoring Site - Lot #6 Pine Street
 Third Calendar Quarter 1990

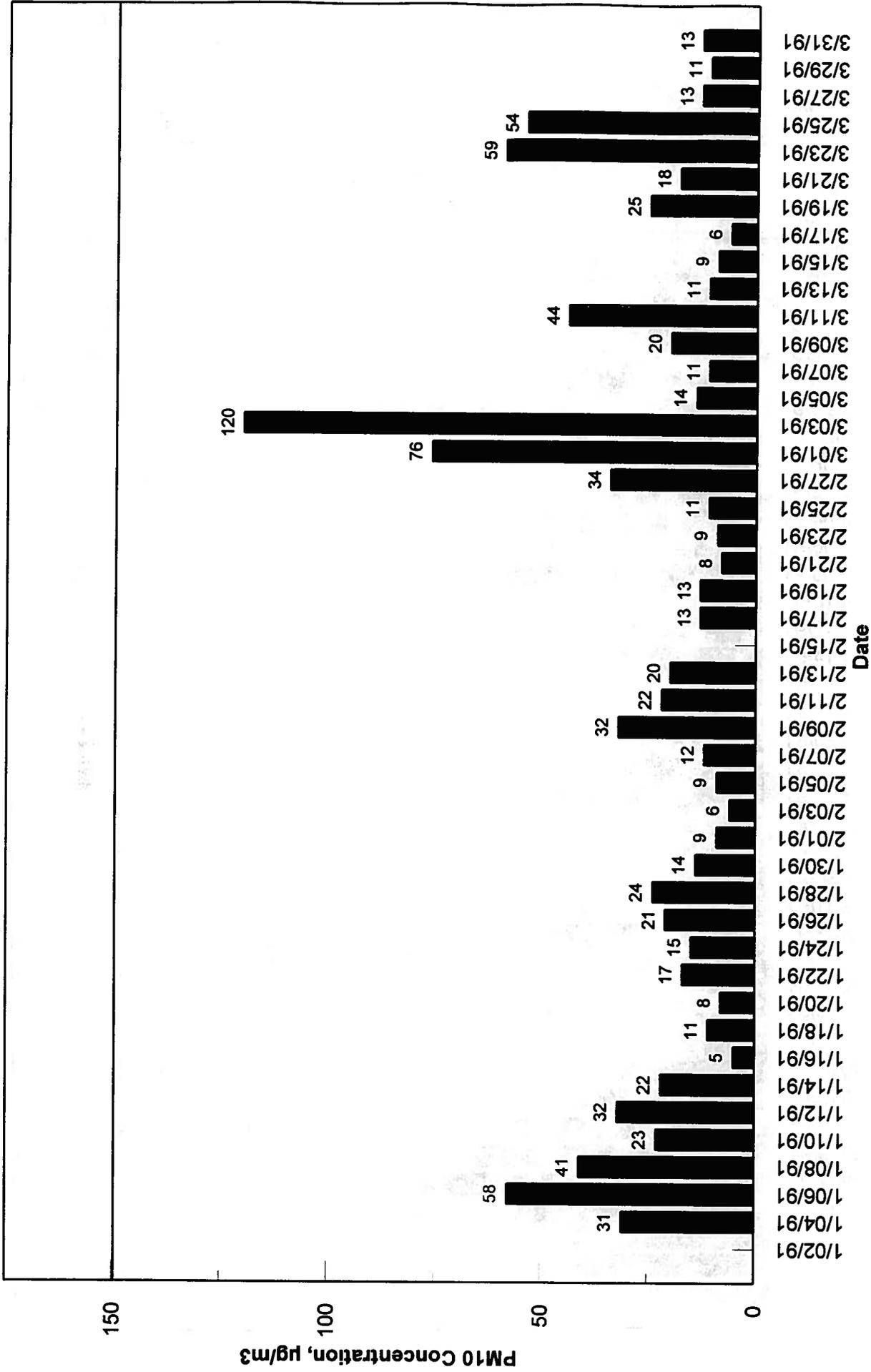


PM10 Concentration
 µg/m3

PM10 Monitoring Site - Lot #6 Pine Street
Fourth Calendar Quarter 1990

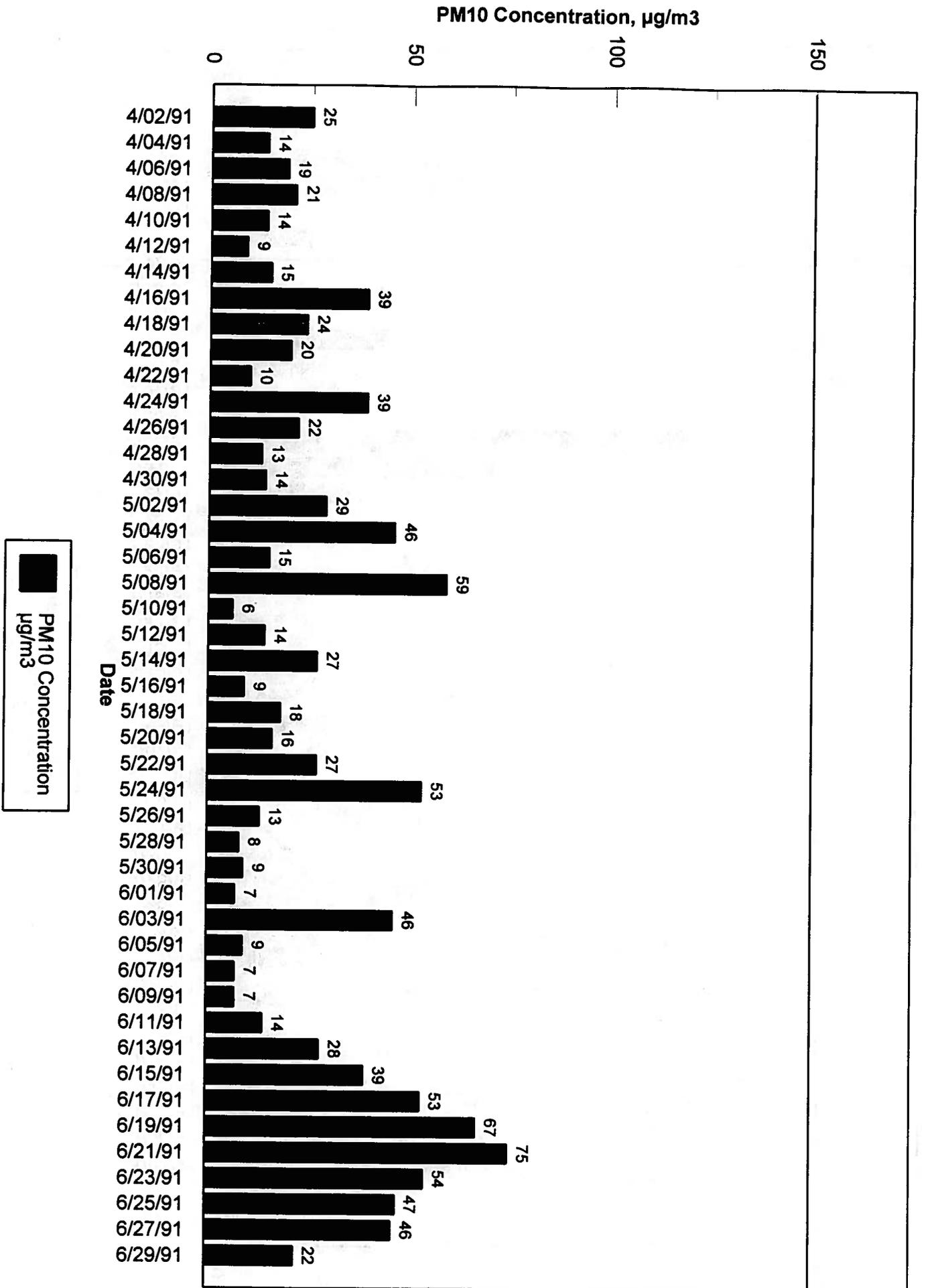


PM10 Monitoring Site - Lot #6 Pine Street
First Calendar Quarter 1991

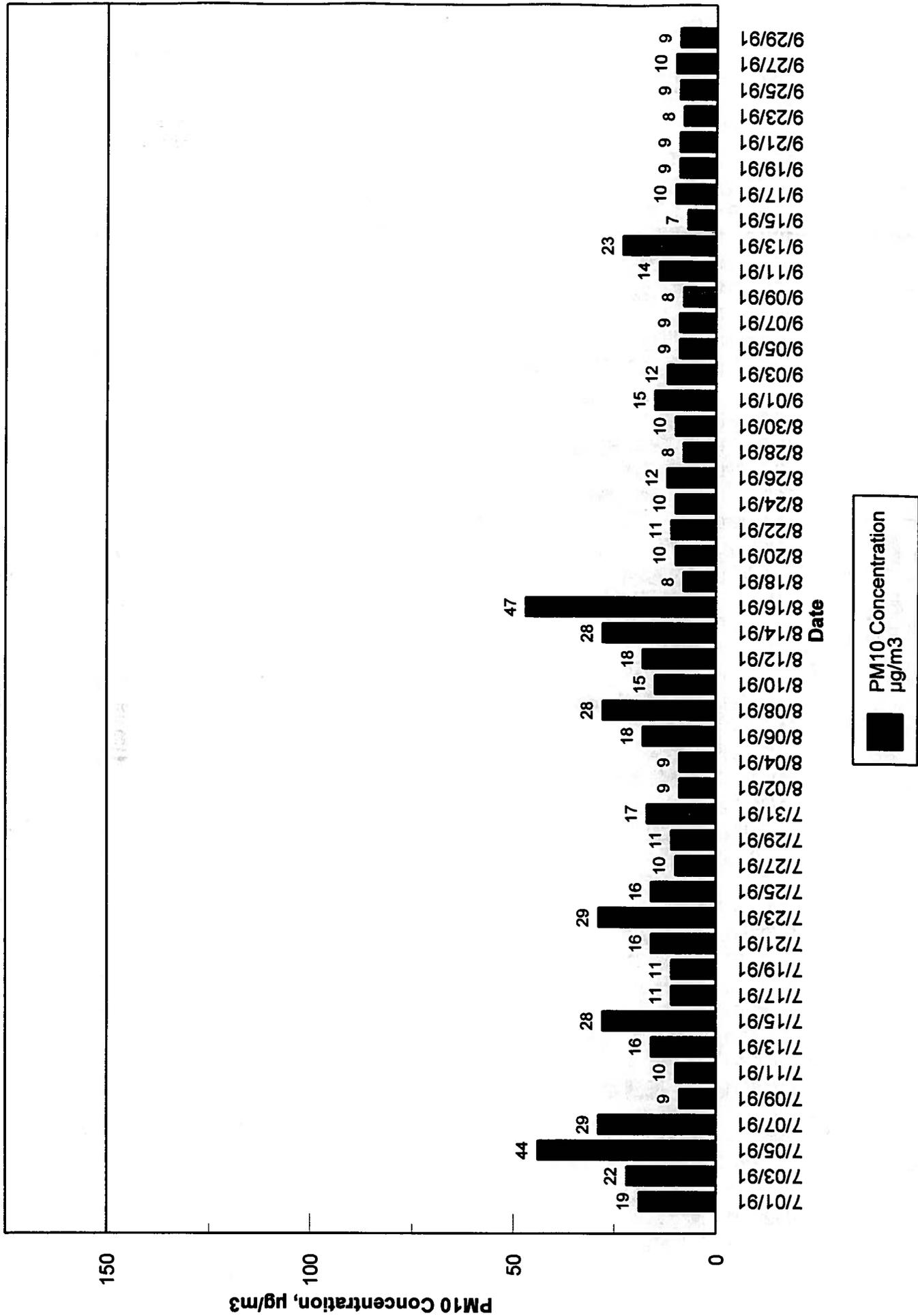


PM10 Concentration
µg/m³

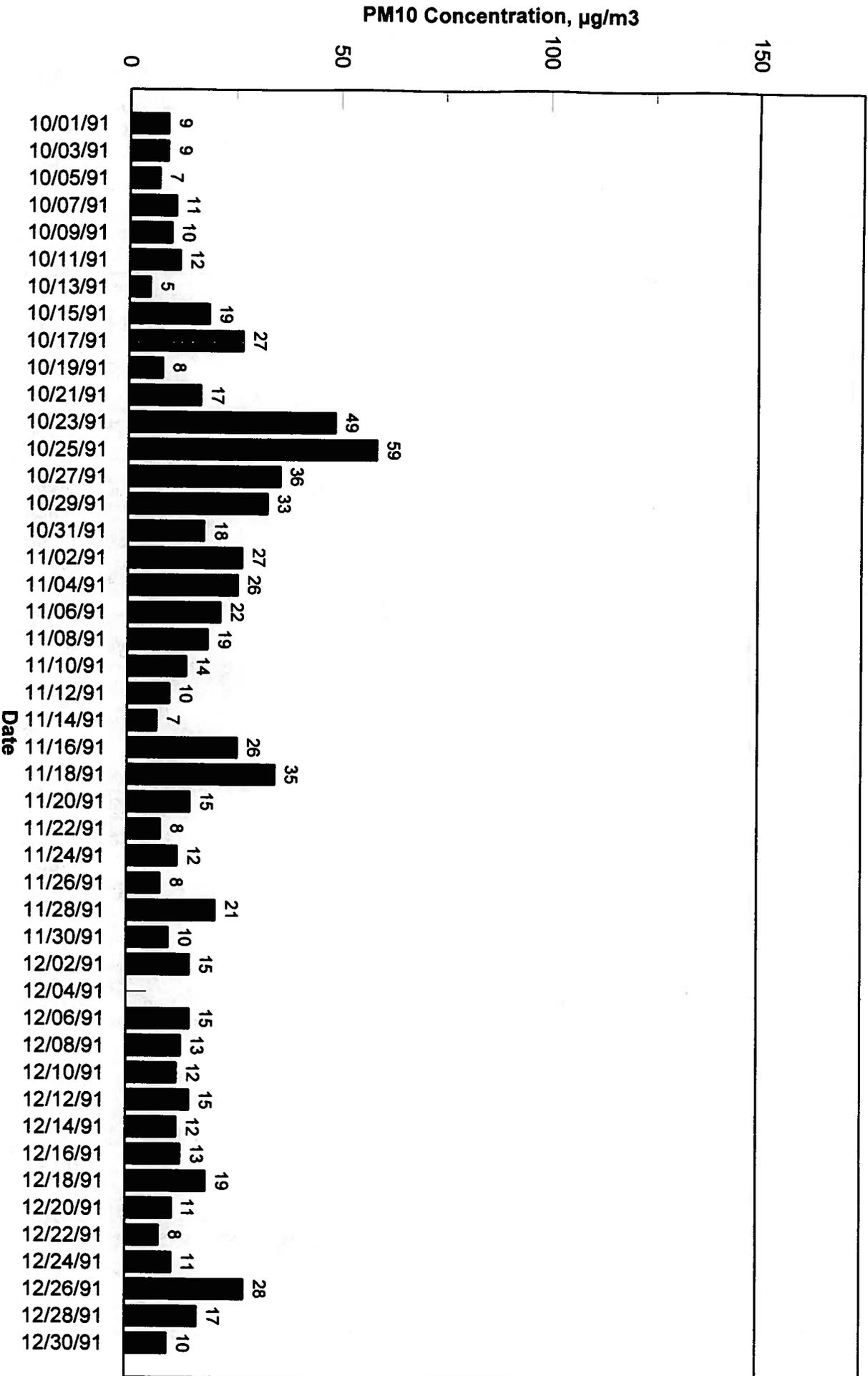
PM10 Monitoring Site - Lot #6 Pine Street
 Second Calendar Quarter 1991



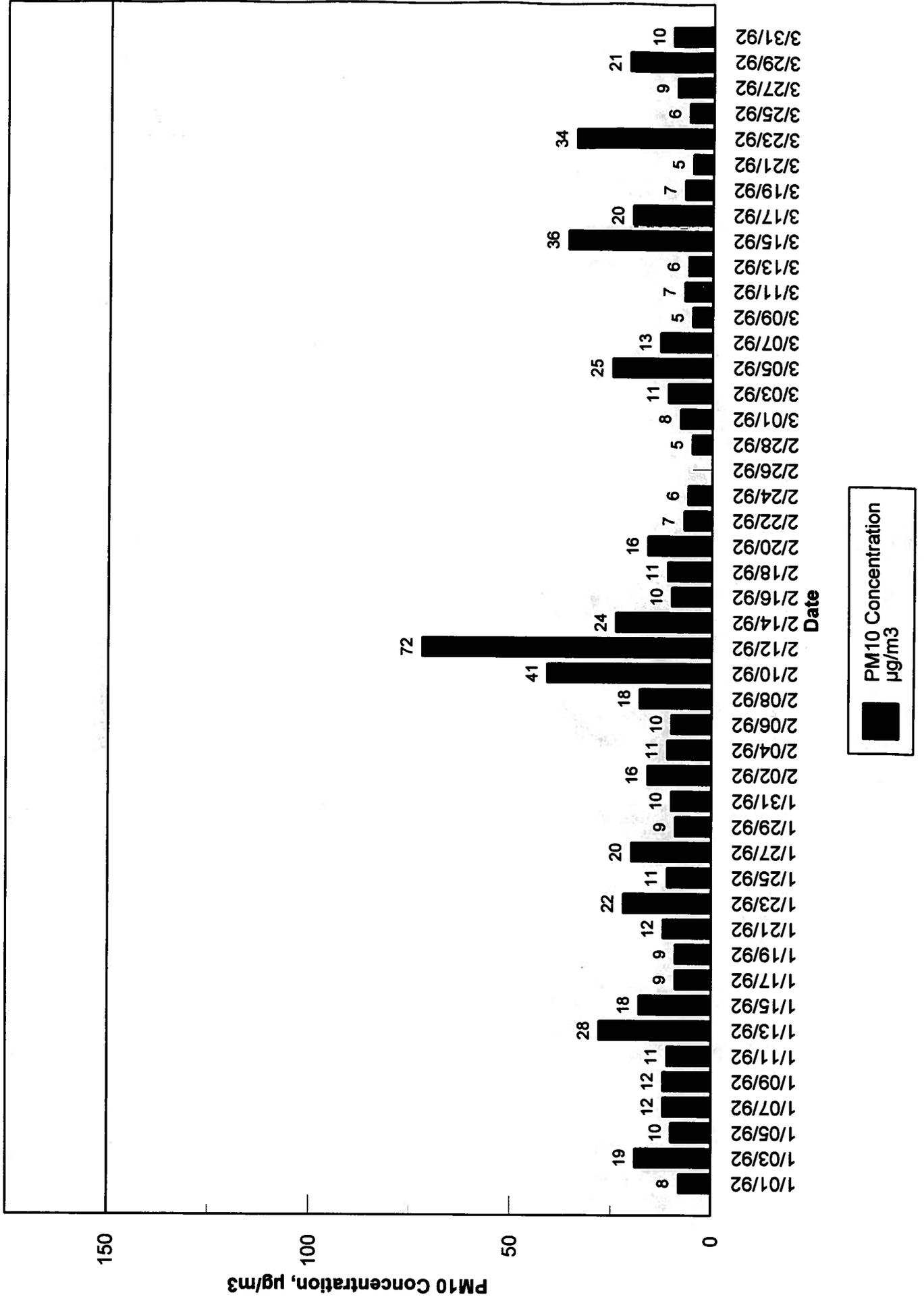
PM10 Monitoring Site - Lot #6 Pine Street
 Third Calendar Quarter 1991



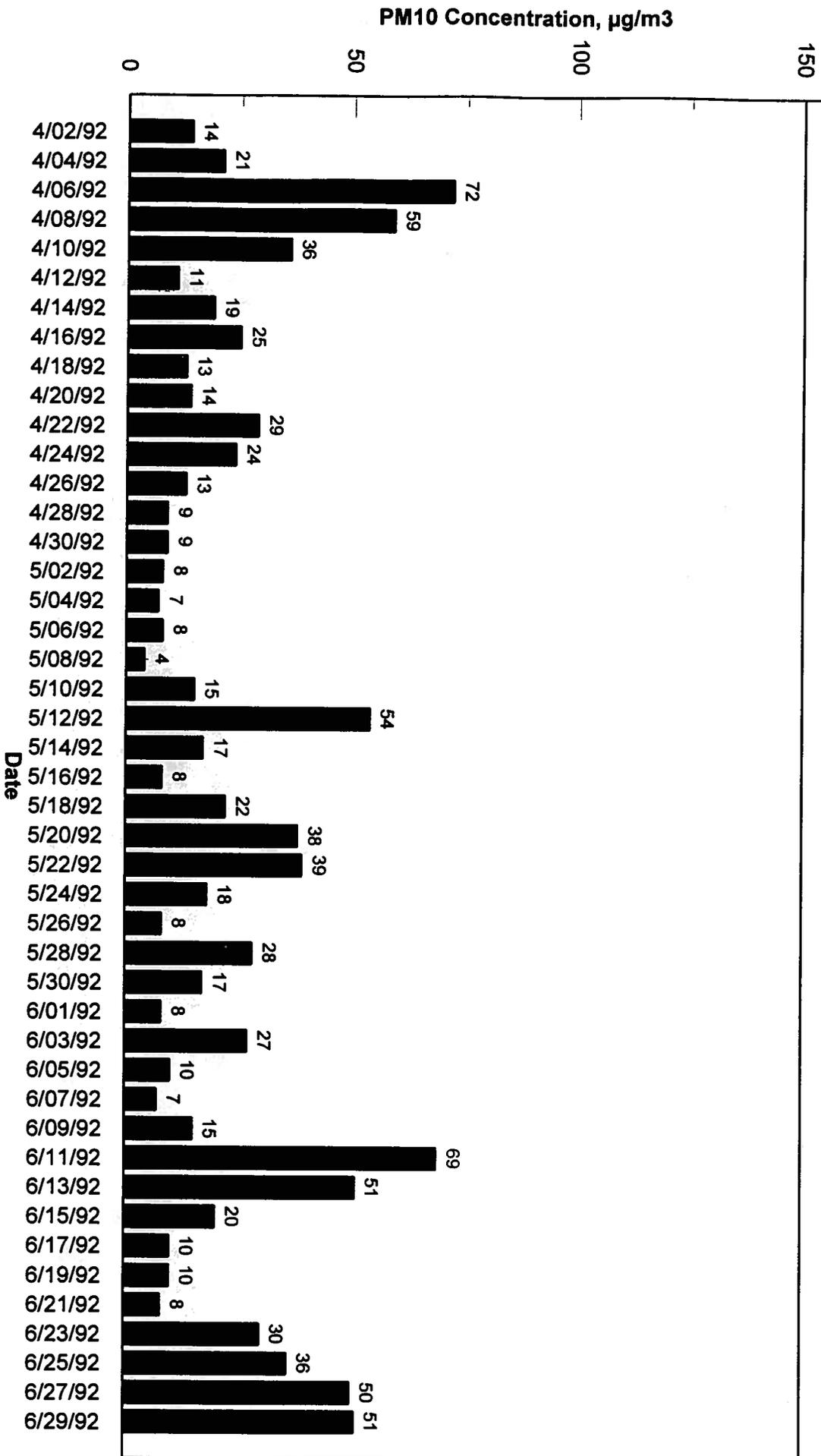
PM10 Monitoring Site - Lot #6 Pine Street
Fourth Calendar Quarter 1991



PM10 Monitoring Site - Lot #6 Pine Street
First Calendar Quarter 1992



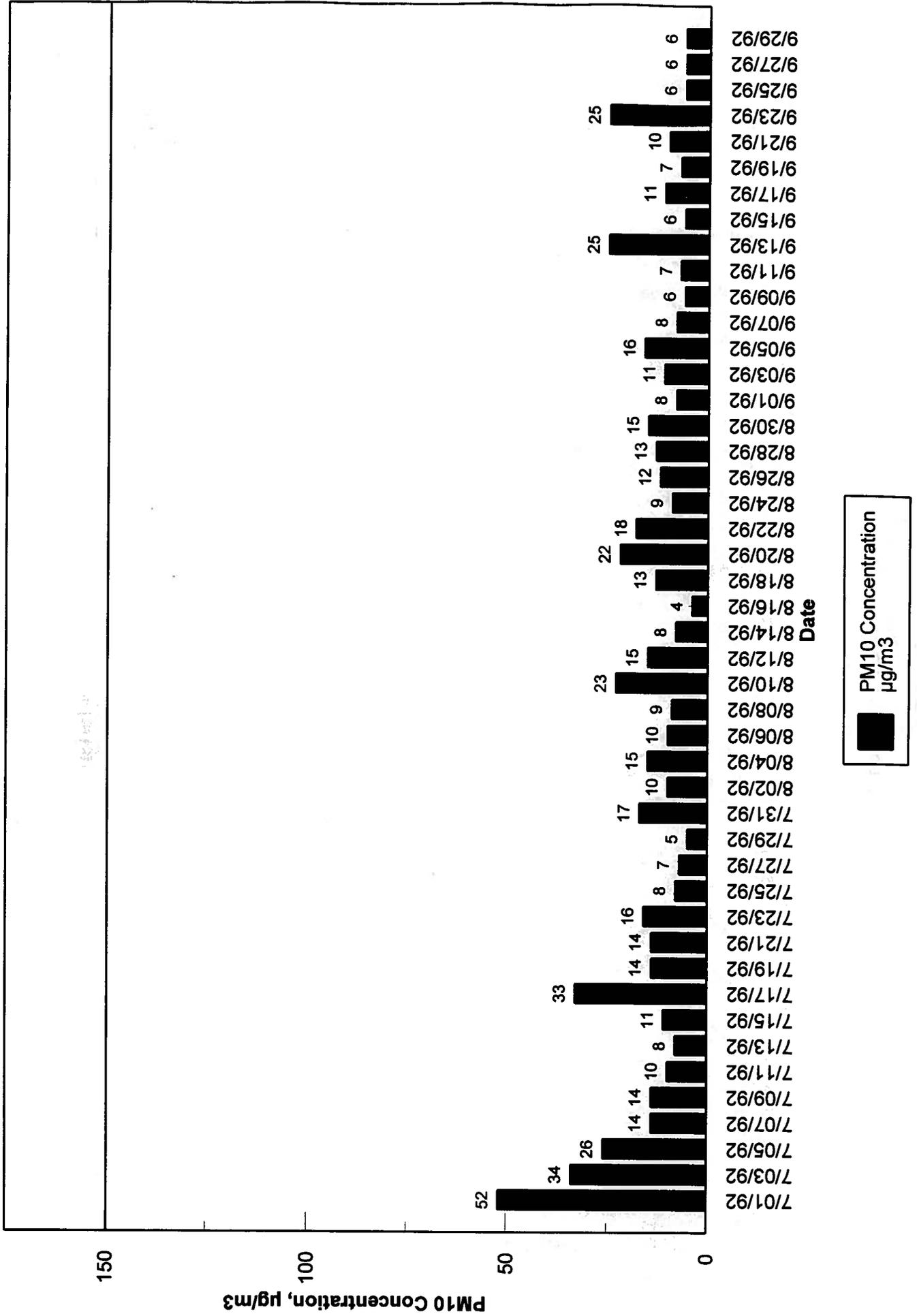
PM10 Monitoring Site - Lot #6 Pine Street
 Second Calendar Quarter 1992



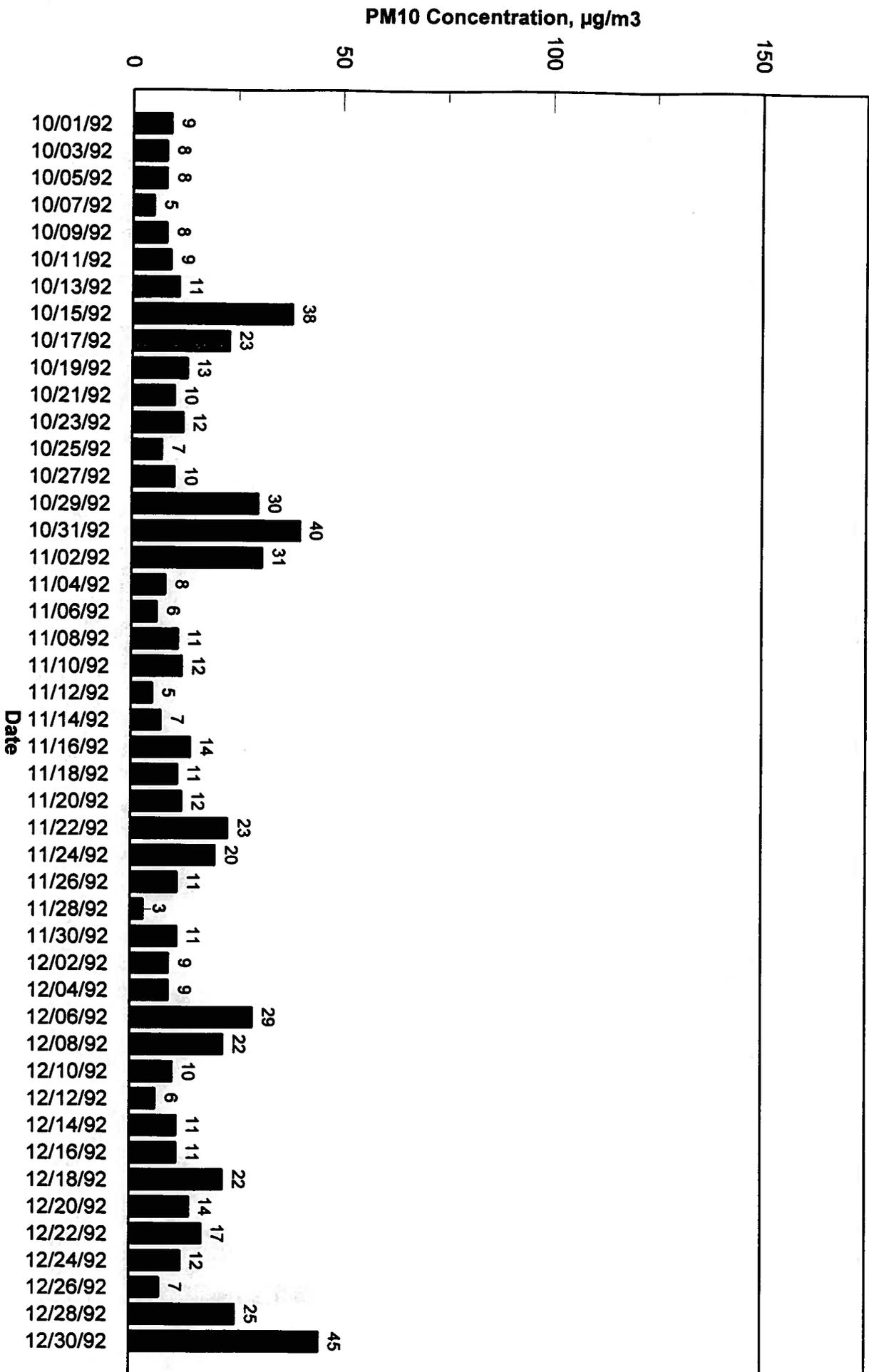
PM10 Concentration
 $\mu\text{g}/\text{m}^3$

PM10 Monitoring Site - Lot #6 Pine Street

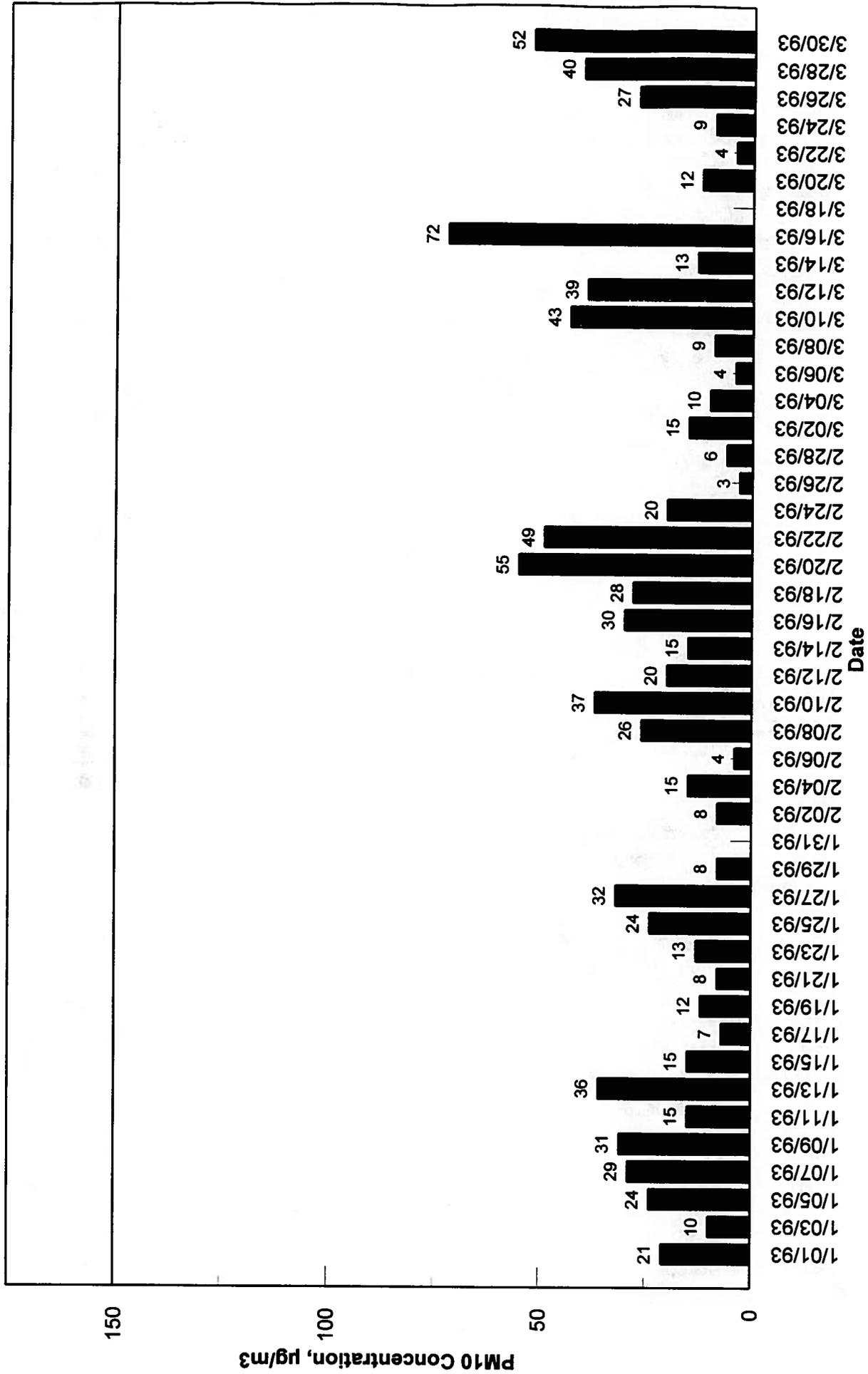
Third Calendar Quarter 1992



PM10 Monitoring Site - Lot #6 Pine Street
Fourth Calendar Quarter 1992

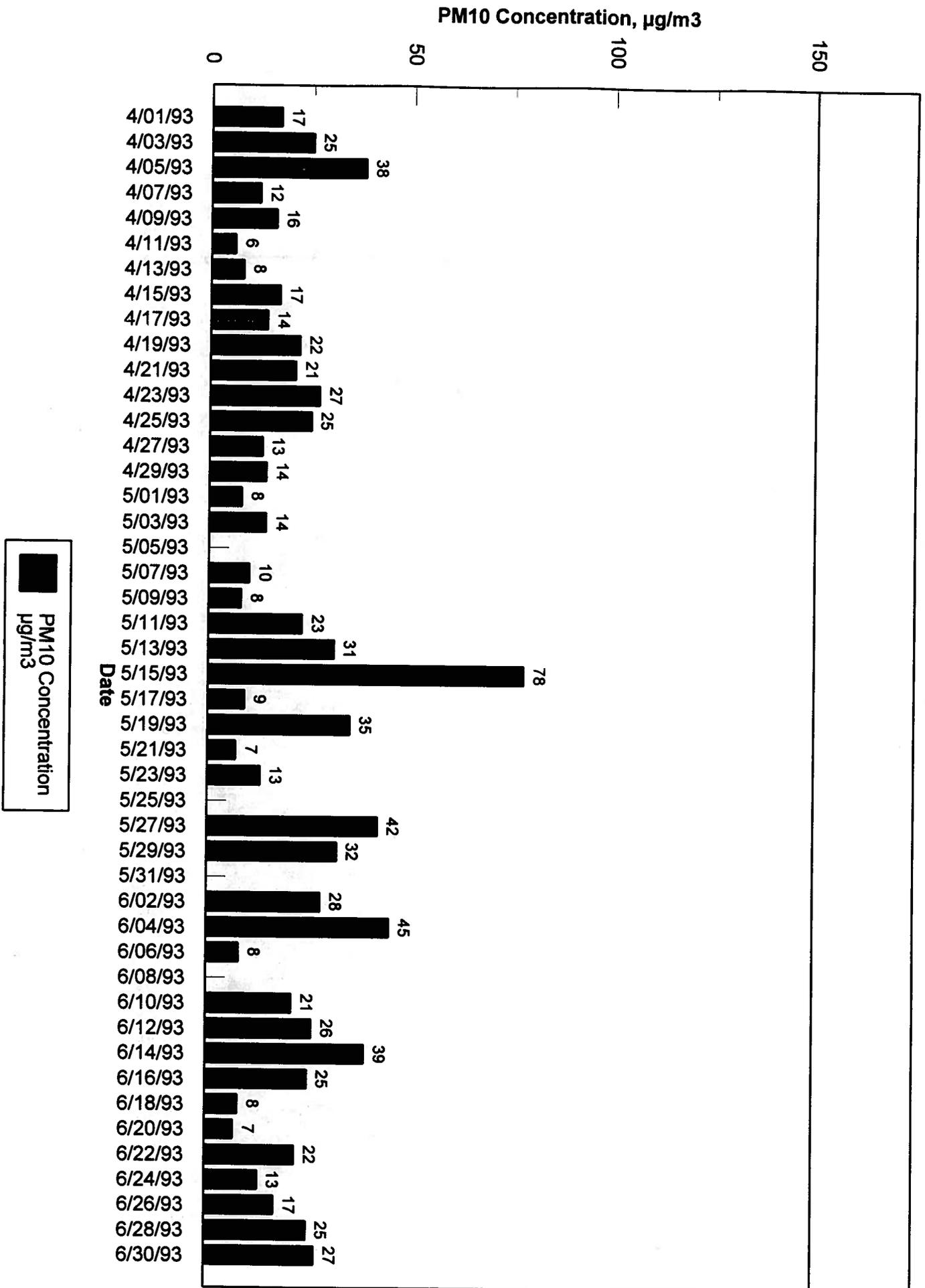


PM10 Monitoring Site - Lot #6 Pine Street
 First Calendar Quarter 1993

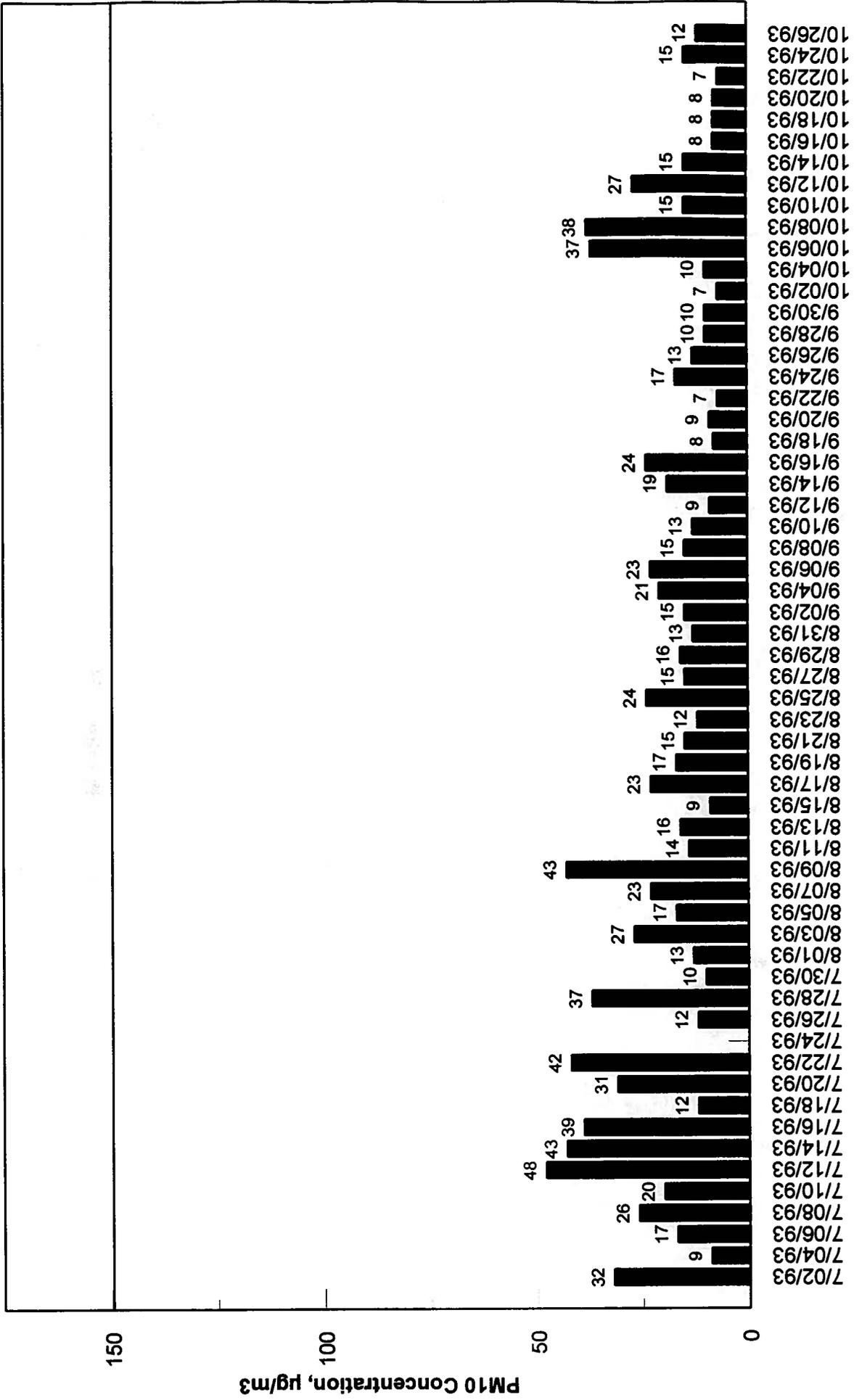


PM10 Concentration
 µg/m3

PM10 Monitoring Site - Lot #6 Pine Street
 Second Calendar Quarter 1993



PM10 Monitoring Site - Lot #6 Pine Street
 Third and Fourth Calendar Quarters 1993



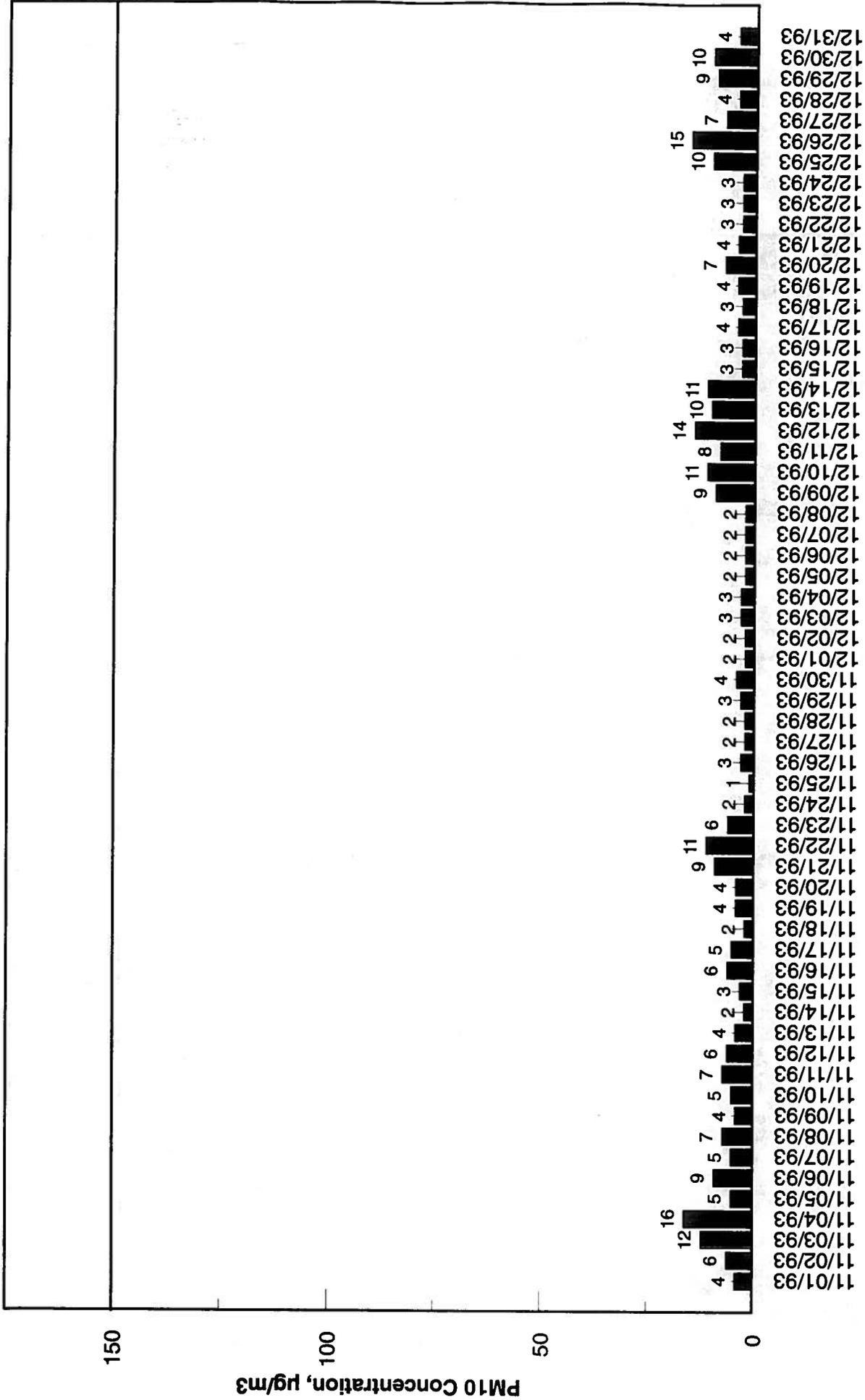
Date

PM10 Concentration
 µg/m³

Appendix C
Dzantik'i Heeni Middle School Site, Switzer Creek

PM10 Monitoring Site - Dzantik'i Heeni Middle School, Switzer Creek

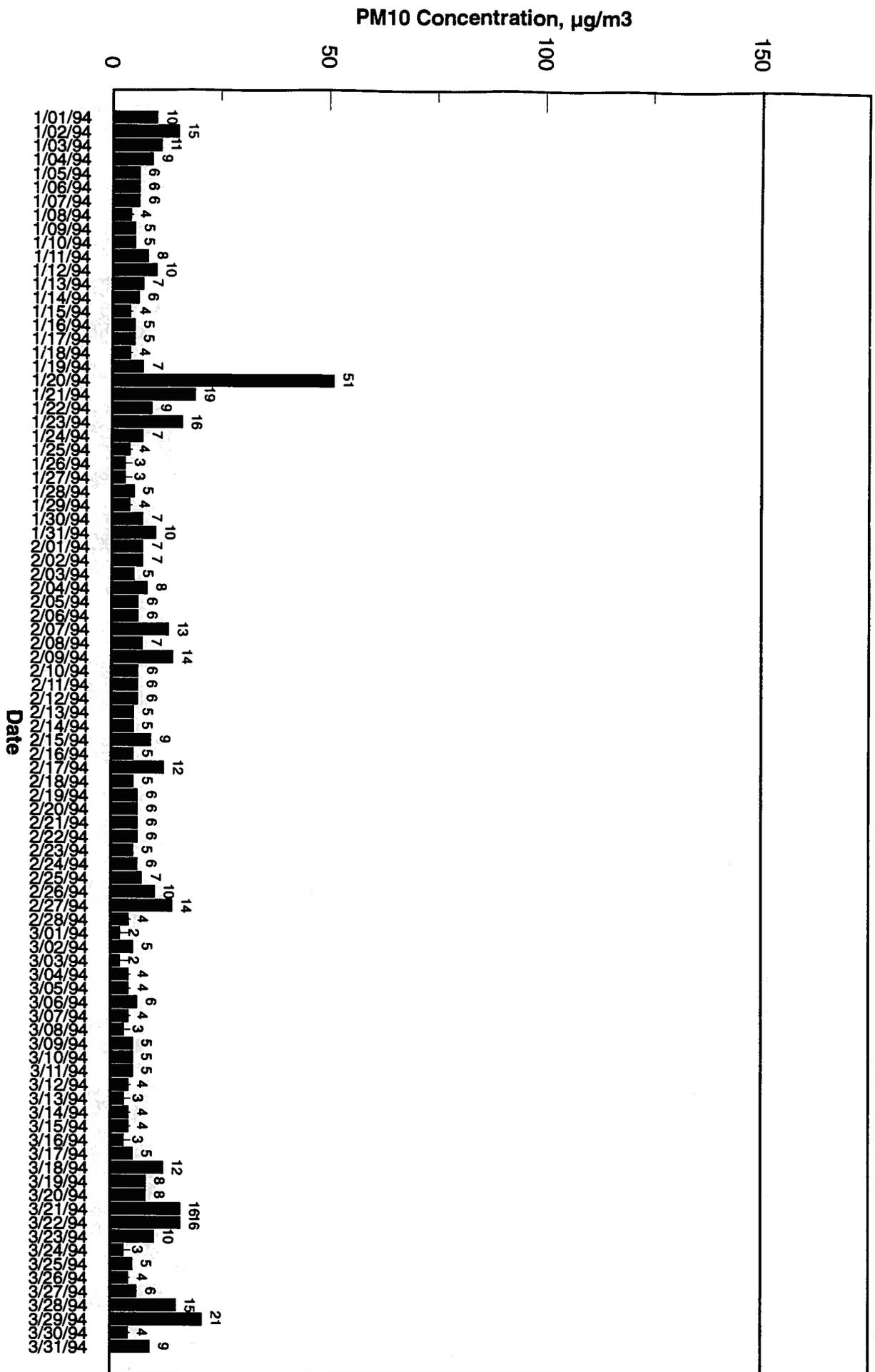
Fourth Calendar Quarter 1993



Date

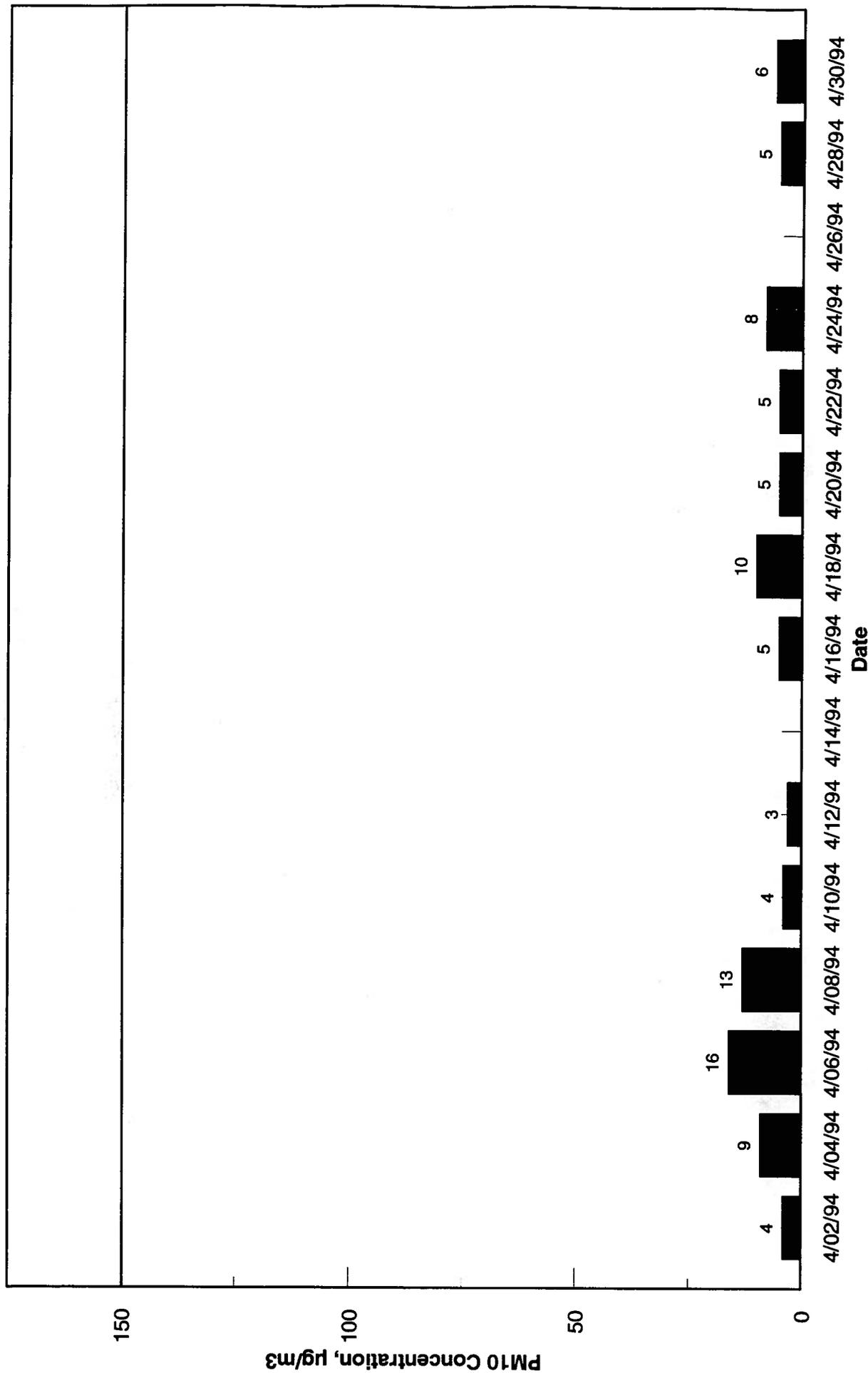
PM10 Concentration
µg/m3

PM10 Monitoring Site - Dzantiki Heeni Middle School, Switzer Creek
 First Calendar Quarter 1994



PM10 Monitoring Site - Dzantik'i Heeni Middle School, Switzer Creek

Second Calendar Quarter 1994



PM10 Concentration
µg/m³

