

Airborn Particulates Baseline of a Surface Coal Mine Expansion Area

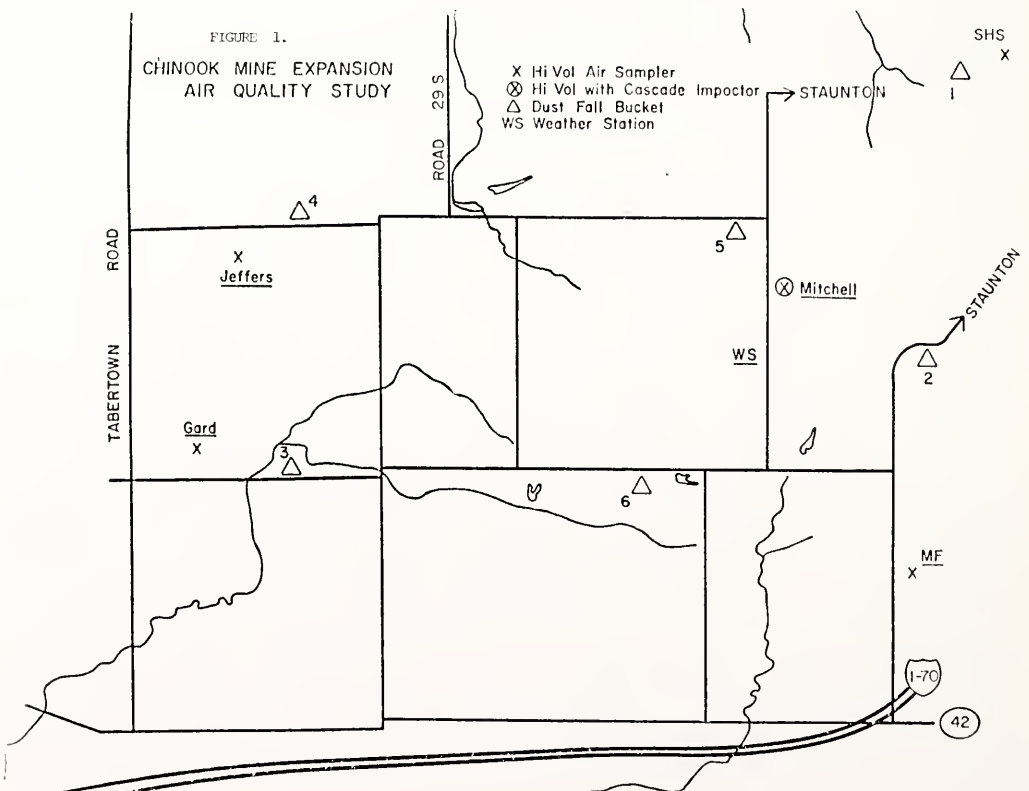
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Experiment Definition

We recently concluded a year-long study to measure the existing baseline particulate concentrations in the atmosphere in an area scheduled for coal surface mining operations.

The area of interest was several thousand acres located about 10 miles east of Terre Haute. A system of five high volume samplers was installed to cover the area as shown in Figure 1. One of the high vols, the one designated Mitchell on the map, was fitted with a cascade impactor to measure the size distribution of the suspended particulates collected. In addition, the high volume samplers were augmented by a pattern of six dustfall buckets to collect settleable particulates. In the approximate center of the area of interest an automated weather station was established to record precipitation, wind speed and direction, temperature, relative humidity, and atmospheric pressure.

The project's high volume samplers were run for 24-hour intervals (midnight to midnight) every six days to coincide with the sampling schedule followed by the Vigo County Air Pollution Control Board air quality monitoring program. All five units were operated simultaneously. The standard filters used were maintained in a drying oven at 105°C both



before and following use. All units were calibrated according to ASTM standards.

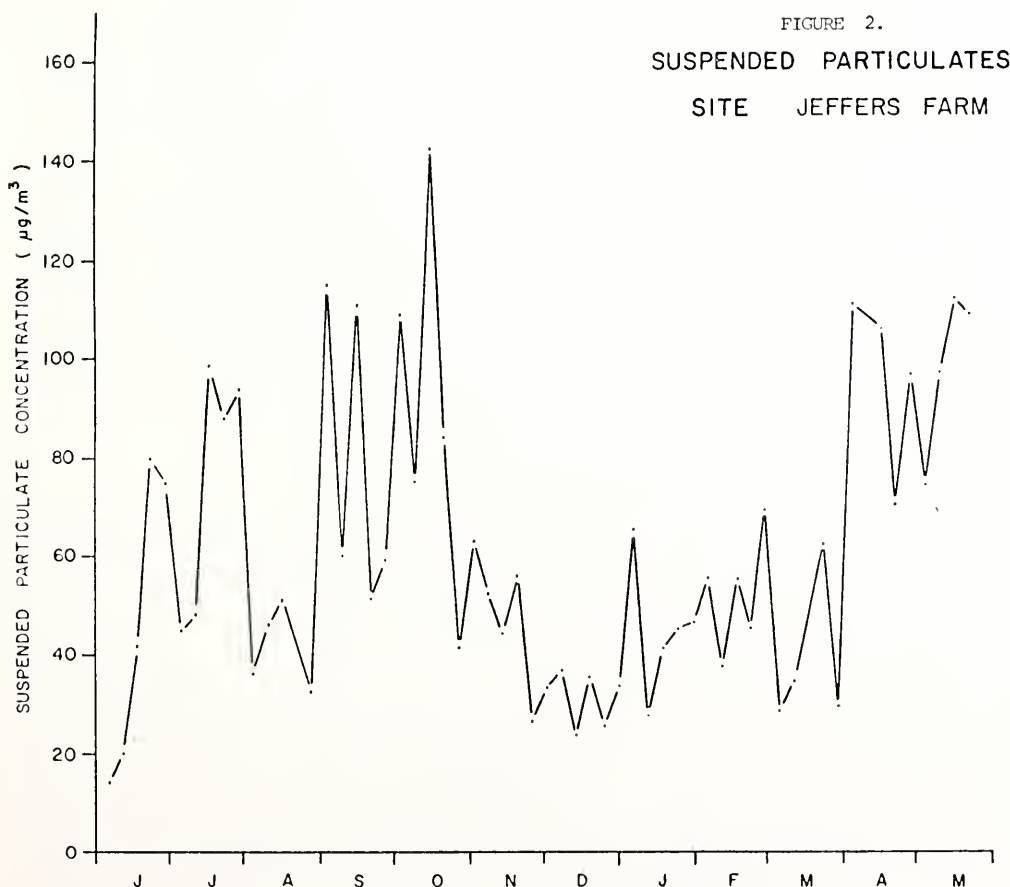
The dustfall buckets for collecting settleable particulates were mounted, guarded, and collected according to ASTM standards. Samples were collected from the buckets every 30 days and analyzed as per the standards.

Weather data collected during the study (1 June 1975 through 31 May 1976) were for the most part typical of average value records maintained at Indiana State University. For this reason the experimental results are expected to be generally applicable to the study area over time.

Data Displays

Several data displays were utilized in interpreting the results. Examples of the most useful of these are shown for the high volume sampler at the Jeffers site in Figures 2, 3, and 4. Figure 2, Suspended Particulates Concentration ($\mu\text{g}/\text{m}^3$) vs. Time (days) is more or less typical of the corresponding graphs for the other sites. It shows generally higher levels during the summer and fall and lower levels during the winter.

Figure 3 is a Concentration Histogram of the number of occurrences in intervals $10 \mu\text{g}/\text{m}^3$. It indicates the most probable concentration during the year to be $40\text{-}50 \mu\text{g}/\text{m}^3$ at this site.



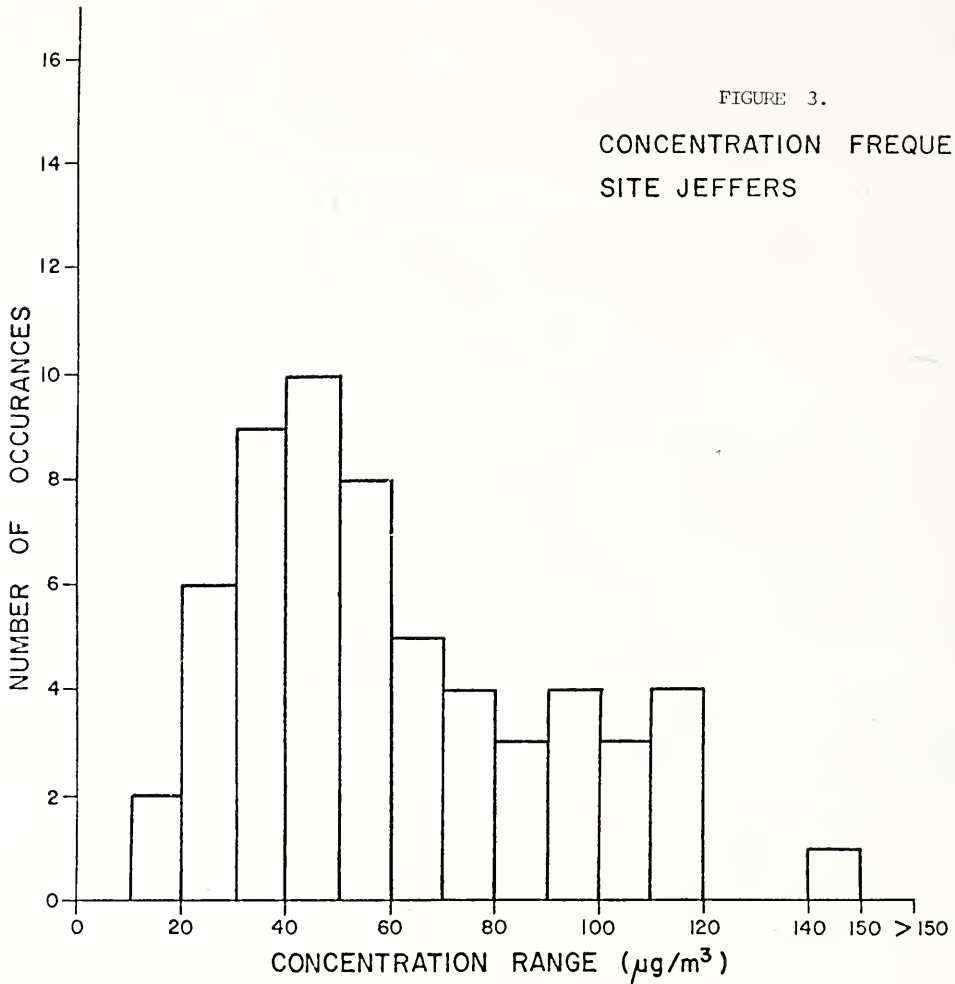


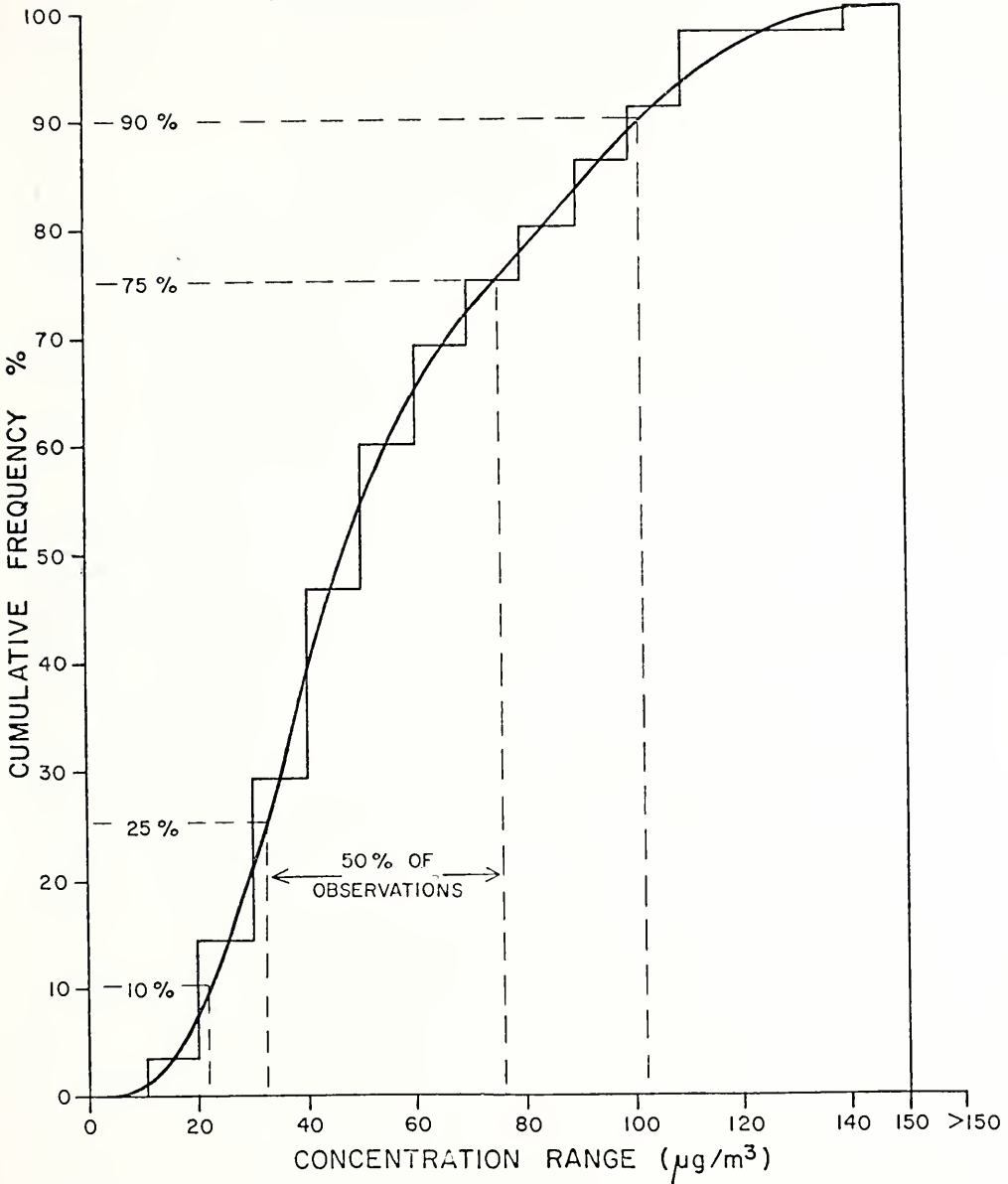
Figure 4 shows the Frequency Distribution Analysis which illustrates the percent of concentration range occurrences smaller than a given concentration. At the Jeffers site; e.g., 90% of the measurements yielded concentrations less than $102 \mu\text{g}/\text{m}^3$. The impactor frequency distribution analysis of samples collected at the Mitchell site, shown Figure 5, indicates that 75% of the suspended particulates to be smaller than $2.1 \times 10^{-6}\text{m}$.

Results

The results of the study are summarized in Tables 1 and 2. They indicate that suspended particulate concentrations in the test area did not exceed national and Indiana primary standards during the test year. However, the value of the annual geometric mean at one site (MF), when considered together with the direction of prevailing winds and the location of the expected mining activity suggests that the national primary standard may be exceeded, perhaps by a substantial margin, during mining operations. That particular site was also noteworthy in that the 24-hour primary and secondary standards were both exceeded several times during the test year. Federal regulations permit only one such occurrence annually. Careful monitoring and control will be

FIGURE

FREQUENCY DISTRIBUTION ANALYSIS
SITE JEFFERS



necessary if surface mining operations in this area are to be in compliance with existing standards.

TABLE 1. Annual mean particulate concentrations.

Hi Vol Site	Annual Mean Concentration $\mu\text{g}/\text{m}^3$
SHS	49.40
MF	71.49
Mitchell	31.40
Gard	49.64
Jeffers	52.85

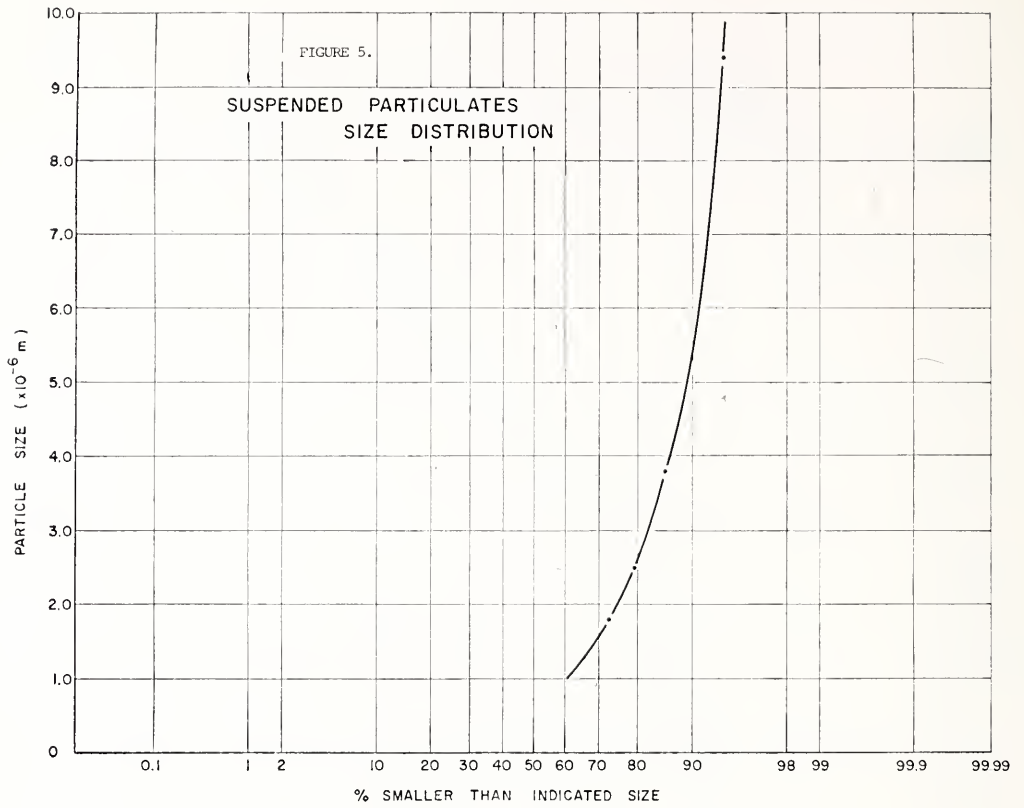


TABLE 2. Number of times 24-hour standard was exceeded during year.

Site	Primary (260 $\mu\text{g}/\text{m}^3$)	Secondary (150 $\mu\text{g}/\text{m}^3$)
SHS	0	0
MF	5	4
Mitchell	0	0
Gard	2	2
Jeffers	0	0