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A REPORT FROM

*The State Hygienic  
Laboratory*



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AIR POLLUTION SURVEY

FORT MADISON, IOWA

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December 1970

#71-35

Report

on the

Air Quality in Fort Madison During  
a Thirteen Day Period in December

By

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Chief, Air Pollution Section

D V Vernon

Air Pollution Technician

Submitted to the Iowa Air Pollution Control Commission by the  
State Hygienic Laboratory  
February 11, 1971

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## Fort Madison Survey

On 2 December 1970, the Mobile Air Pollution Control Laboratory operated by personnel of the State Hygienic Laboratory was taken to Fort Madison, Iowa for a survey of the ambient air quality in the city. The survey was conducted in the thirteen day period from 2 December to 14 December. Four sampling sites were utilized for this survey which were selected with the advice and cooperation of local city officials.

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Each site was chosen so as to be as representative as possible of the general area surrounding the site without unduly maximizing or minimizing the effect from any point source of pollution within the area. One location was in a municipal park (Ivanhoe Park) which is partially influenced by industry and could also be considered as a semi-residential area. One site, Lions Shelter, was near the major traffic artery through Fort Madison and is considered as the site representative of the commercial or business district. The City Hall location is in a residential area and is so considered in this report. The Isaac Walton location is located in a rural area and the major industrial contributor in that area is a large chemical plant.

Data from hi-vol sampling indicates suspended particulate levels below those that have been encountered in any of our previous surveys. The geometric mean of  $57.1 \text{ ug/m}^3$  is well below the current primary standard established by the federal Environmental Protection Agency and is slightly below the secondary standards that agency has established to protect the public welfare from known or anticipated adverse effects of a pollutant.

Coefficient of haze (coh) values are among the lowest found in any urban areas of the state. Coh values correlate quite well with the hi-vol data to indicate a low level of suspended particulate material existed in Fort Madison during the survey.

Coh values did provide trend data that is normally experienced during a survey. Industrial and commercial areas have higher values than residential areas and major upward excursions in the data occur during periods of heavy vehicular traffic.

Carbon monoxide data falls into the expected ranges with peak values occurring near major traffic arteries. The data indicate that carbon monoxide levels during the survey were well within the new federal guidelines for primary standards and actually were below the secondary standard levels.

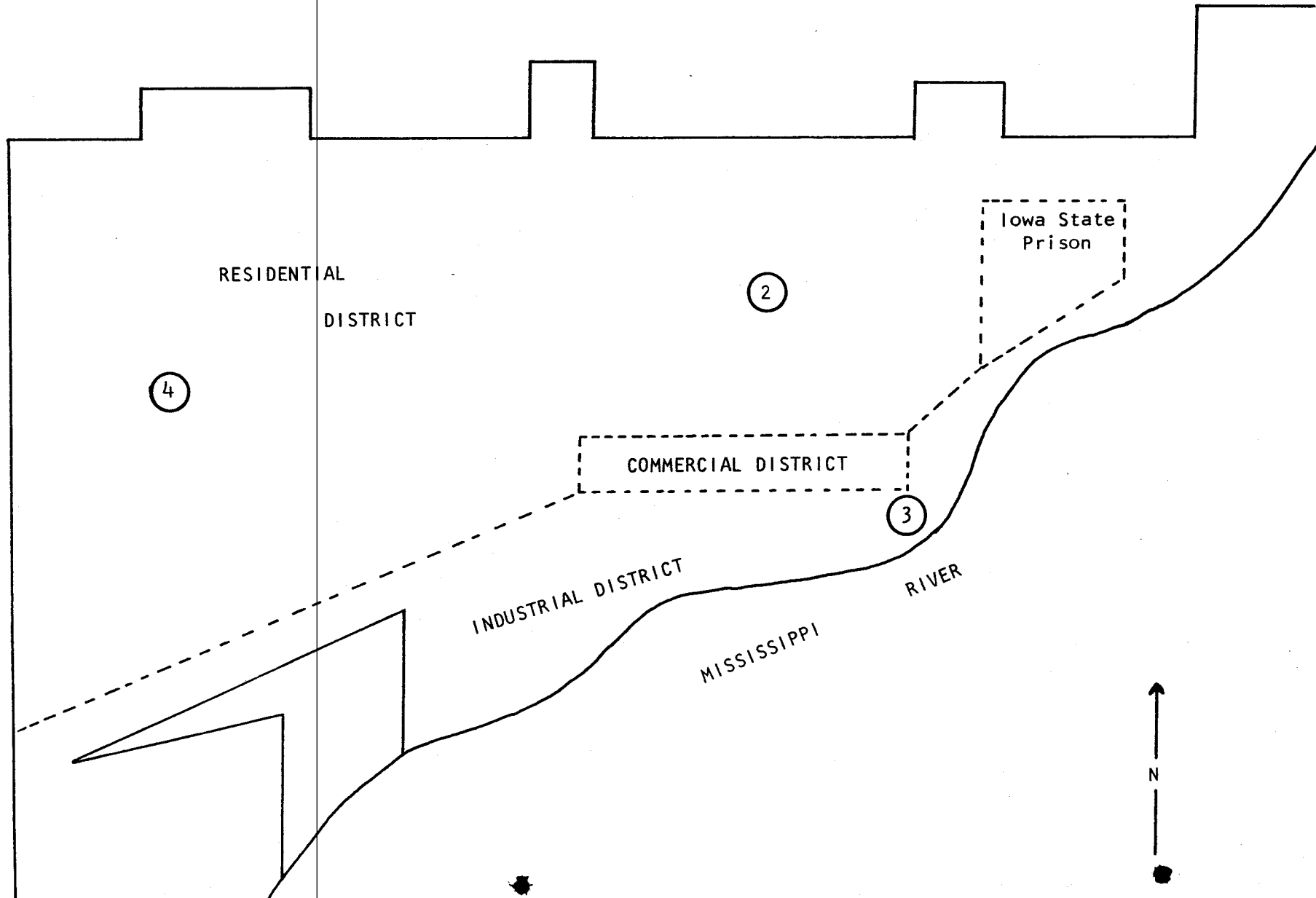
Sulfur dioxide was detected during the major portion of the survey. This is the first survey we have experienced sulfur dioxide present in detectable amounts for such an extended period. However, there was only one day when sulfur dioxide was equal to the federal primary standard of  $80 \text{ ug/m}^3$  (0.030 parts per million). The other days the  $\text{SO}_2$  level was well below the standard and the average for the survey was within the limits set by the federal standard.

It appears from our observations that Fort Madison does not have a serious air pollution problem from particulates, carbon monoxide, or sulfur oxides. However, the consistency which was observed in detecting sulfur oxides indicates that this parameter should be ~~monitored to more fully ascertain the year-round levels of  $\text{SO}_2$ .~~ We are planning to place an  $\text{SO}_2$  collection device in Fort Madison when such a device becomes available as a loan from the Federal agency. Then we will have a means of determining in a more precise manner the levels of  $\text{SO}_2$  on a yearly basis.

This report should not be considered as a comprehensive treatment of the total air quality in Fort Madison, but rather as an evaluation of specific parameters of the prevailing conditions during the survey period.

- 1 Izaak Walton Club
- 2 City Hall
- 3 Lions Club Shelter
- 4 Ivanhoe Park

FORT MADISON  
(Not to scale)



71-35

3

1

4

2

3

RESIDENTIAL  
DISTRICT

COMMERCIAL DISTRICT

INDUSTRIAL DISTRICT

MISSISSIPPI  
RIVER

Iowa State  
Prison

N

National Primary and Secondary  
Ambient Air Quality Standards

Sulfur Oxides (primary)

- a 80  $\mu\text{g}/\text{m}^3$  - annual arithmetic mean
- b 365  $\mu\text{g}/\text{m}^3$  - maximum 24 hour concentration not to be exceeded more than once per year

Sulfur Oxides (secondary)

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- a 60  $\mu\text{g}/\text{m}^3$  - annual arithmetic mean
- b 260  $\mu\text{g}/\text{m}^3$  - maximum 24 hour concentration not to be exceeded more than once per year

Particulate Matter (primary)

- a 75  $\mu\text{g}/\text{m}^3$  - annual geometric mean
- b 260  $\mu\text{g}/\text{m}^3$  - maximum 24 hour concentration not to be exceeded more than once per year

Particulate Matter (secondary)

- a 60  $\mu\text{g}/\text{m}^3$  - annual geometric mean
- b 150  $\mu\text{g}/\text{m}^3$  - maximum 24 hour concentration not to be exceeded more than once per year

Carbon Monoxide (primary and secondary)

- a 10  $\mu\text{g}/\text{m}^3$  - maximum 8 hour concentration not to be exceeded more than once per year
- b 15  $\mu\text{g}/\text{m}^3$  - maximum 1 hour concentration not to be exceeded more than once per year

Hi-Vol Data  
24 Hour Samples

| Date           | Location      | Suspended Particulate (ug/m <sup>3</sup> ) |
|----------------|---------------|--|
| 12/2-3/70      | Izaak Walton  | 86.8                                       |
| 12/3-4/70      | " "           | 63.9                                       |
| 12/4-5/70      | City Hall     | 55.6                                       |
| 1/7-8/70       | Lions Shelter | 77.8                                       |
| 12/8-9/70      | " "           | 84.8                                       |
| 12/8-10/70     | " "           | 106  |
| 12/10-11/70    | Ivanhoe Park  | 24.8                                       |
| 12/11-12/70    | " "           | 21.2                                       |
| Average        |               | 67.6                                       |
| Geometric Mean |               | 57.1                                       |

Suspended Particulate (micrograms per cubic meter) (24 hr sample)

|              | Geometric Mean       | Not to be exceeded more than once per year |
|--------------|----------------------|--|
| Illinois     | 75 ug/m <sup>3</sup> | 260 ug/m <sup>3</sup>                      |
| Indiana      | 75 ug/m <sup>3</sup> | 260 ug/m <sup>3</sup>                      |
| Pennsylvania | 80 ug/m <sup>3</sup> |  |

Particulate Matter (primary)

- a 75 ug/m<sup>3</sup> - annual geometric mean
- b 260 ug/m<sup>3</sup> - maximum 24 hour concentration not to be exceeded more than once per year

Particulate Matter (secondary)

- a 60 ug/m<sup>3</sup> - annual geometric mean
- b 150 ug/m<sup>3</sup> - maximum 24 hour concentration not to be exceeded more than once per year

Carbon Monoxide

| Date                   | Location      | Time      | Peak | Averages   |        |
|------------------------|---------------|-----------|------|------------|--------|
|                        |               |           |      | Max 1 Hour | 8 Hour |
| 12/2/70                | Izaak Walton  | 1445-1600 | 8    | 2          | -      |
|                        |               | 1600-2400 | 5    | 2          | 2      |
| 12/3/70                |               | 0001-0800 | 2    | 1          | 1      |
|                        |               | 0800-1600 | 26   | 6          | 3      |
| 12/4/70                |               | 1600-2400 | 31   | 10         | 3      |
|                        |               | 0001-0800 | 6    | 3          | 1      |
|                        |               | 0800-1130 | 14   | 4          | -      |
| 12/4/70                | City Hall     | 1230-1600 | 6    | 2          | -      |
| Instrument Malfunction |               |           |      |            |        |
| 12/7/70                | Lions Shelter | 1225-1600 | 11   | 3          | -      |
|                        |               | 1600-2400 | 7    | 3          | 2      |
| 12/8/70                |               | 0001-0800 | 5    | 2          | 1      |
|                        |               | 0800-1600 | 22   | 10         | 3      |
| 12/9/70                |               | 1600-2400 | 8    | 3          | 2      |
|                        |               | 0001-0800 | 6    | 3          | 1      |
|                        |               | 0800-1600 | 9    | 3          | 1      |
| 12/10/70               |               | 1600-2400 | 12   | 6          | 3      |
|                        |               | 0001-0800 | 6    | 2          | 1      |
| 12/10/70               | Ivanhoe Park  | 0800-1310 | 28   | 8          | 4      |
|                        |               | 1330-1600 | 7    | 3          | -      |
| 12/11/70               |               | 1600-2400 | 15   | 5          | 3      |
|                        |               | 0001-0800 | 4    | 3          | 2      |
| 10/12/70               |               | 0800-1600 | 11   | 3          | 2      |
|                        |               | 1600-2400 | 7    | 2          | 1      |
|                        |               | 0001-0800 | 6    | 3          | 1      |
| 12/13/70               |               | 0800-1600 | 9    | 3          | 2      |
|                        |               | 1600-2400 | 3    | 2          | 1      |
|                        |               | 0001-0800 | 5    | 2          | 1      |
| 12/14/70               |               | 0800-1600 | 7    | 3          | 1      |
|                        |               | 1600-2400 | 2    | 2          | 1      |
|                        |               | 0001-0800 | 9    | 3          | 2      |
|                        |               | 0800-1030 | 15   | 3          | -      |

Carbon Monoxide (parts per million)

Not to be exceeded  
1 hr      8 hr

HEW Criteria  
St Louis  
Pennsylvania

--      10 ppm  
120 ppm      30 ppm  
--      25 ppm

Carbon Monoxide (primary and secondary)

- a 10 ug/m<sup>3</sup> - maximum 8 hour concentration not to be exceeded more than once per year
- b 15 ug/m<sup>3</sup> - maximum 1 hour concentration not to be exceeded more than once per year



Sulfur Dioxide

| Date    | Location     | Time      | 1 Hour | 24 Hour       |
|---------|--------------|-----------|--------|---------------|
| 12/2/70 | Izaak Walton | 1445-1600 | Nil    | Nil           |
|         |              | -1700     | 0.020  | -             |
|         |              | -1800     | 0.020  | -             |
|         |              | -1900     | 0.010  | -             |
|         |              | -2000     | 0.010  | -             |
|         |              | -2100     | 0.005  | -             |
|         |              | -2200     | Nil    | -             |
|         |              | -2300     | Nil    | -             |
|         |              | -2400     | 0.005  | 0.008 (10 Hr) |
|         |              | 12/3/70   |        | 0001-0100     |
| -0200   | Nil          |           |        | -             |
| -0300   | 0.015        |           |        | -             |
| -0400   | 0.020        |           |        | -             |
| -0500   | 0.020        |           |        | -             |
| -0600   | 0.020        |           |        | -             |
| -0700   | 0.030        |           |        | -             |
| -0800   | 0.020        |           |        | -             |
| -0900   | 0.030        |           |        | -             |
| -1000   | 0.030        |           |        | -             |
| -1100   | 0.020        |           |        | -             |
| -1200   | 0.040        |           |        | -             |
| -1300   | 0.060        |           |        | -             |
| -1400   | 0.050        |           |        | -             |
| -1500   | 0.045        |           |        | -             |
| -1600   | 0.050        |           |        | -             |
| -1700   | 0.050        |           |        | -             |
| -1800   | 0.045        |           |        | -             |
| -1900   | 0.040        |           |        | -             |
| -2000   | 0.040        |           |        | -             |
| -2100   | 0.030        |           |        | -             |
| -2200   | 0.020        |           |        | -             |
| -2200   | 0.020        |           |        | -             |
| -2300   | 0.050        |           |        | -             |
| -2400   | Nil          | 0.030     |        |               |
| 12/4/70 |              | 0001-0100 | Nil    | -             |
|         |              | -0200     | "      | -             |
|         |              | -0300     | "      | -             |
|         |              | -0400     | "      | -             |
|         |              | -0500     | "      | -             |
|         |              | -0600     | "      | -             |
|         |              | -0700     | "      | -             |
|         |              | -0800     | "      | -             |
|         |              | -0900     | "      | -             |
|         |              | -1000     | "      | -             |
|         |              | -1100     | "      | -             |
|         |              | -1130     | "      | Nil (11.5 hr) |

Sulfur Dioxide  
Page 2

| Date    | Location  | Time          | 1 Hour | 24 Hour       |
|---------|-----------|---------------|--------|---------------|
| 12/4/70 | City Hall | 1230-1300     | Nil    | -             |
|         |           | -1400         | 0.010  | -             |
|         |           | -1500         | 0.010  | -             |
|         |           | -1600         | 0.040  | -             |
|         |           | -1700         | 0.030  | -             |
|         |           | -1800         | 0.030  | -             |
|         |           | -1900         | 0.020  | -             |
|         |           | -2000         | 0.030  | -             |
|         |           | -2100         | 0.020  | -             |
|         |           | -2200         | 0.015  | -             |
|         |           | -2300         | 0.020  | -             |
|         |           | -2400         | 0.020  | 0.020 (12 hr) |
|         |           | 12/5/70       |        | -0100         |
| -0200   | 0.020     |               |        | -             |
| -0300   | 0.015     |               |        | -             |
| -0400   | 0.020     |               |        | -             |
| -0500   | 0.020     |               |        | -             |
| -0600   | 0.015     |               |        | -             |
| -0700   | 0.005     |               |        | -             |
| -0800   | 0.010     |               |        | -             |
| -0900   | 0.015     |               |        | -             |
| -1000   | 0.010     |               |        | -             |
| -1100   | 0.010     |               |        | -             |
| -1200   | 0.015     |               |        | -             |
| -1300   | 0.020     |               |        | -             |
| -1400   | 0.015     |               |        | -             |
| -1500   | 0.020     |               |        | -             |
| -1600   | 0.030     |               |        | -             |
| -1700   | 0.010     |               |        | -             |
| -1800   | 0.005     |               |        | -             |
| -1900   | 0.010     |               |        | -             |
| -2000   | 0.010     |               |        | -             |
| -2100   | 0.020     |               |        | -             |
| -2200   | 0.015     | -             |        |               |
| -2300   | 0.005     | -             |        |               |
| -2400   | 0.010     | 0.014 (24 hr) |        |               |
| 12/6/70 |           | -0100         | 0.010  | -             |
|         |           | -0200         | Nil    | -             |
|         |           | -0300         | Nil    | -             |
|         |           | -0400         | Nil    | -             |
|         |           | -0500         | Nil    | -             |
|         |           | -0600         | Nil    | -             |
|         |           | -0700         | Nil    | -             |
|         |           | -0800         | Nil    | -             |
|         |           | -0900         | Nil    | -             |
|         |           | -1000         | Nil    | -             |
|         |           | -1100         | Nil    | -             |

Sulfur Dioxide  
Page 3

| Date    | Location      | Time      | 1 Hour | 24 Hour         |
|---------|---------------|-----------|--------|-----------------|
| 12/6/70 | City Hall     | -1200     | Nil    | -               |
|         |               | -1300     | Nil    | -               |
|         |               | -1400     | Nil    | -               |
|         |               | -1500     | 0.010  | -               |
|         |               | -1600     | 0.010  | -               |
|         |               | -1700     | 0.010  | -               |
|         |               | -1800     | Nil    | -               |
|         |               | -1900     | Nil    | -               |
|         |               | -2000     | Nil    | -               |
|         |               | -2100     | Nil    | -               |
|         |               | -2200     | 0.005  | -               |
|         |               | -2300     | 0.005  | -               |
|         |               | -2400     | 0.005  | 0.002 (24 hr)   |
| 12/7/70 |               | -0100     | 0.010  | -               |
|         |               | -0200     | 0.010  | -               |
|         |               | -0300     | 0.005  | -               |
|         |               | -0400     | Nil    | -               |
|         |               | -0500     | Nil    | -               |
|         |               | -0600     | Nil    | -               |
|         |               | -0700     | Nil    | -               |
|         |               | -0800     | Nil    | -               |
|         |               | -0900     | 0.005  | -               |
|         |               | -1000     | 0.005  | -               |
|         |               | -1100     | 0.005  | -               |
|         |               | -1200     | Nil    | 0.003 (12 hr)   |
| 12/7/70 | Lions Shelter | 1220-1300 | 0.005  | -               |
|         |               | -1400     | 0.005  | -               |
|         |               | -1500     | 0.010  | -               |
|         |               | -1600     | 0.015  | -               |
|         |               | -1700     | 0.020  | -               |
|         |               | -1800     | 0.010  | -               |
|         |               | -1900     | 0.005  | -               |
|         |               | -2000     | Nil    | -               |
|         |               | -2100     | 0.010  | -               |
|         |               | -2200     | 0.010  | -               |
|         |               | -2300     | 0.020  | -               |
|         |               | -2400     | 0.030  | 0.012 (11.5 hr) |
|         |               | 12/8/70   |        | -0100           |
| -0200   | 0.025         |           |        | -               |
| -0300   | 0.015         |           |        | -               |
| -0400   | 0.005         |           |        | -               |
| -0500   | Nil           |           |        | -               |
| -0600   | 0.005         |           |        | -               |
| -0700   | 0.005         |           |        | -               |
| -0800   | Nil           |           |        | -               |

Sulfur Dioxide  
Page 4

| Date     | Location      | Time          | 1 Hour | 24 Hour       |       |   |
|----------|---------------|---------------|--------|---------------|-------|---|
| 12/8/70  | Lions Shelter | -0900         | Nil    | -             |       |   |
|          |               | -1000         | Nil    | -             |       |   |
|          |               | -1100         | Nil    | -             |       |   |
|          |               | -1200         | Nil    | -             |       |   |
|          |               | -1300         | 0.005  | -             |       |   |
|          |               | -1400         | 0.01   | -             |       |   |
|          |               | -1500         | 0.01   | -             |       |   |
|          |               | -1600         | 0.015  | -             |       |   |
|          |               | -1700         | 0.01   | -             |       |   |
|          |               | -1800         | 0.005  | -             |       |   |
|          |               | -1900         | 0.005  | -             |       |   |
|          |               | -2000         | 0.015  | -             |       |   |
|          |               | -2100         | 0.010  | -             |       |   |
|          |               | -2200         | 0.010  | -             |       |   |
|          |               | -2300         | 0.005  | -             |       |   |
|          |               | -2400         | 0.005  | 0.008 (24 hr) |       |   |
|          |               | 12/9/70       |        | -0100         | 0.005 | - |
|          |               |               |        | -0200         | 0.010 | - |
|          |               |               |        | -0300         | 0.005 | - |
|          |               |               |        | -0400         | Nil   | - |
|          |               |               |        | -0500         | Nil   | - |
|          |               |               |        | -0600         | Nil   | - |
|          |               |               |        | -0700         | Nil   | - |
|          |               |               |        | -0800         | Nil   | - |
| -0900    | Nil           |               |        | -             |       |   |
| -1000    | Nil           |               |        | -             |       |   |
| -1100    | Nil           |               |        | -             |       |   |
| -1200    | 0.005         |               |        | -             |       |   |
| -1300    | 0.005         |               |        | -             |       |   |
| -1400    | 0.010         |               |        | -             |       |   |
| -1500    | Nil           |               |        | -             |       |   |
| -1600    | Nil           |               |        | -             |       |   |
| -1700    | Nil           |               |        | -             |       |   |
| -1800    | Nil           | -             |        |               |       |   |
| -1900    | Nil           | -             |        |               |       |   |
| -2000    | Nil           | -             |        |               |       |   |
| -2100    | Nil           | -             |        |               |       |   |
| -2200    | Nil           | -             |        |               |       |   |
| -2300    | Nil           | -             |        |               |       |   |
| -2400    | Nil           | 0.002 (24 hr) |        |               |       |   |
| 12/10/70 |               | -0100         | Nil    | -             |       |   |
|          |               | -0200         | Nil    | -             |       |   |
|          |               | -0300         | Nil    | -             |       |   |
|          |               | -0400         | Nil    | -             |       |   |
|          |               | -0500         | Nil    | -             |       |   |
|          |               | -0600         | Nil    | -             |       |   |
|          |               | -0700         | Nil    | -             |       |   |
|          |               | -0700         | Nil    | -             |       |   |

Sulfur Dioxide  
Page 5

| Date     | Location      | Time      | 1 Hour        | 24 Hour       |     |   |
|----------|---------------|-----------|---------------|---------------|-----|---|
| 12/10/70 | Lions Shelter | -0800     | 0.005         | -             |     |   |
|          |               | -0900     | 0.010         | -             |     |   |
|          |               | -1000     | 0.010         | -             |     |   |
|          |               | -1100     | 0.005         | -             |     |   |
|          |               | -1200     | 0.010         | 0.003 (24 hr) |     |   |
| 12/10/70 | Ivanhoe Park  | 1330-1400 | -             | -             |     |   |
|          |               | -1500     | Nil           | -             |     |   |
|          |               | -1600     | 0.005         | -             |     |   |
|          |               | -1700     | 0.010         | -             |     |   |
|          |               | -1800     | 0.005         | -             |     |   |
|          |               | -1900     | Nil           | -             |     |   |
|          |               | -2000     | 0.005         | -             |     |   |
|          |               | -2100     | Nil           | -             |     |   |
|          |               | -2200     | Nil           | -             |     |   |
|          |               | -2300     | Nil           | -             |     |   |
|          |               | -2400     | 0.005         | 0.003 (10 hr) |     |   |
|          |               | 12/11/70  |               | -0100         | Nil | - |
|          |               |           |               | -0200         | Nil | - |
|          | -0300         |           | Nil           | -             |     |   |
|          | -0400         |           | Nil           | -             |     |   |
|          | -0500         |           | Nil           | -             |     |   |
|          | -0600         |           | Nil           | -             |     |   |
|          | -0700         |           | Nil           | -             |     |   |
|          | -0800         |           | Nil           | -             |     |   |
|          | -0900         |           | Nil           | -             |     |   |
|          | -1000         |           | 0.010         | -             |     |   |
|          | -1100         |           | 0.010         | -             |     |   |
|          | -1200         |           | 0.015         | -             |     |   |
|          | -1300         |           | 0.015         | -             |     |   |
|          | -1400         |           | 0.020         | -             |     |   |
|          | -1500         |           | 0.015         | -             |     |   |
|          | -1600         |           | 0.020         | -             |     |   |
|          | -1700         |           | 0.005         | -             |     |   |
|          | -1800         |           | 0.010         | -             |     |   |
|          | -1900         |           | 0.010         | -             |     |   |
|          | -2000         |           | Nil           | -             |     |   |
|          | -2100         | 0.010     | -             |               |     |   |
|          | -2200         | 0.015     | -             |               |     |   |
|          | -2300         | 0.020     | -             |               |     |   |
|          | -2400         | 0.015     | 0.008 (24 hr) |               |     |   |
| 12/12/70 |               | -0100     | 0.010         | -             |     |   |
|          |               | -0200     | 0.020         | -             |     |   |
|          |               | -0300     | 0.015         | -             |     |   |
|          |               | -0400     | 0.010         | -             |     |   |
|          |               | -0500     | 0.015         | -             |     |   |
|          |               | -0600     | 0.020         | -             |     |   |
|          |               | -0700     | 0.020         | -             |     |   |
|          |               | -0800     | 0.020         | -             |     |   |

Sulfur Dioxide

Page 6

| Date     | Location     | Time        | 1 Hour | 24 Hour |       |               |
|----------|--------------|-------------|--------|---------|-------|---------------|
| 12/12/70 | Ivanhoe Park | -0900       | 0.020  | -       |       |               |
|          |              | -1000       | 0.010  | -       |       |               |
|          |              | -1100       | Nil    | -       |       |               |
|          |              | -1200       | 0.005  | -       |       |               |
|          |              | -1300       | 0.005  | -       |       |               |
|          |              | -1400       | 0.010  | -       |       |               |
|          |              | -1500       | 0.005  | -       |       |               |
|          |              | -1600       | Nil    | -       |       |               |
|          |              | -1700       | 0.020  | -       |       |               |
|          |              | -1800       | 0.010  | -       |       |               |
|          |              | -1900       | 0.010  | -       |       |               |
|          |              | -2000       | 0.010  | -       |       |               |
|          |              | 12/13/70    |        | -2100   | 0.005 | -             |
|          |              |             |        | -2200   | 0.005 | -             |
|          |              |             |        | -2300   | Nil   | -             |
|          |              |             |        | -2400   | Nil   | 0.010 (24 Hr) |
|          |              |             |        | -0100   | Nil   | -             |
|          |              |             |        | -0200   | Nil   | -             |
|          |              |             |        | -0300   | Nil   | -             |
|          |              |             |        | -0400   | Nil   | -             |
| -0500    | Nil          |             |        | -       |       |               |
| -0600    | Nil          |             |        | -       |       |               |
| -0700    | Nil          |             |        | -       |       |               |
| -0800    | Nil          |             |        | -       |       |               |
| -0900    | Nil          | -           |        |         |       |               |
| -1000    | Nil          | -           |        |         |       |               |
| -1100    | Nil          | -           |        |         |       |               |
| -1200    | Nil          | Nil (12 hr) |        |         |       |               |

Instrument Malfunction

Sulfur Dioxide (parts per million)

|              | Geometric Mean (24 hr) | Not to be exceeded |          |
|--------------|------------------------|--------------------|----------|
|              |                        | Single Sample      |          |
|              |                        | 1 hr               | 24 hr    |
| Illinois     | 0.015 ppm              | 0.42 ppm           | 0.17 ppm |
| Indiana      | 0.015 ppm              | 0.42 ppm           | --       |
| Pennsylvania | --                     | 0.5 ppm            | 0.25 ppm |

Sulfur Oxides (primary)

- a 80 ug/m<sup>3</sup> - annual arithmetic mean
- b 365 ug/m<sup>3</sup> - maximum 24 hour concentration not to be exceeded more than once per year

Sulfur Oxides (secondary)

- a 60 ug/m<sup>3</sup> - annual arithmetic mean
- b 260 ug/m<sup>3</sup> - maximum 24 hour concentration not to be exceeded more than once per year

Coefficient of Haze  
Fort Madison

| Date    | Location               | Time      | COH         |
|---------|------------------------|-----------|-------------|
| 12/2/70 | Izaak Walton League    | 1450-1600 | 0.28        |
|         |                        | -1800     | 0.36        |
|         |                        | -2000     | 0.32        |
|         |                        | -2200     | 0.20        |
|         |                        | -2400     | <u>0.20</u> |
|         |                        |           |             |
| 12/3/70 |                        | 0000-0200 | 0.32        |
|         |                        | -0400     | 0.16        |
|         |                        | -0600     | 0.28        |
|         |                        | -0800     | 0.16        |
|         |                        | -1000     | NS          |
|         |                        | -1200     | 0.04        |
|         |                        | -1400     | 0.12        |
|         |                        | -1600     | 0.16        |
|         |                        | -1800     | 0.12        |
|         |                        | -2000     | 0.12        |
|         |                        | -2200     | 0.12        |
| -2400   | <u>0.12</u>            |           |             |
|         |                        | AVG 0.16  |             |
| 12/4/70 |                        | 0000-0200 | 0.04        |
|         |                        | -0400     | 0.04        |
|         |                        | -0600     | 0.04        |
|         |                        | -0800     | 0.04        |
|         |                        | -1000     | 0.04        |
|         |                        | -1200     | <u>0.08</u> |
|         |                        | AVG 0.05  |             |
| 12/4/70 | Fort Madison City Hall | 1230-1400 | 0.24        |
|         |                        | -1600     | 0.28        |
|         |                        | -1800     | 0.57        |
|         |                        | -2000     | 0.44        |
|         |                        | -2200     | 0.40        |
|         |                        | -2400     | <u>0.28</u> |
|         |                        | AVG 0.37  |             |
| 12/5/70 |                        | 0000-0200 | 0.40        |
|         |                        | -0400     | 0.57        |
|         |                        | -0600     | 0.20        |
|         |                        | -0800     | 0.16        |
|         |                        | -1000     | 0.16        |
|         |                        | -1200     | 0.12        |
|         |                        | -1400     | 0.08        |
|         |                        | -1600     | 0.08        |
|         |                        | -1800     | 0.12        |
|         |                        | -2000     | 0.16        |
|         |                        | -2200     | 0.12        |
| -2400   | <u>0.12</u>            |           |             |
|         |                        | AVG 0.19  |             |

COH Fort Madison  
Page 2

| Date    | Location               | Time      | COH         |
|---------|------------------------|-----------|-------------|
| 12/6/70 | Fort Madison City Hall | 0000-0200 | 0.16        |
|         |                        | -0400     | 0.08        |
|         |                        | -0600     | 0.20        |
|         |                        | -0800     | 0.12        |
|         |                        | -1000     | 0.04        |
|         |                        | -1200     | 0.12        |
|         |                        | -1400     | 0.12        |
|         |                        | -1000     | 0.16        |
|         |                        | -1800     | 0.24        |
|         |                        | -2000     | 0.40        |
|         |                        | -2200     | 0.40        |
|         |                        | -2400     | <u>0.36</u> |
|         |                        |           | AVG         |
| 12/7/70 |                        | 0000-0200 | 0.28        |
|         |                        | -0400     | 0.28        |
|         |                        | -0600     | 0.24        |
|         |                        | -0800     | 0.32        |
|         |                        | -1000     | 0.65        |
|         |                        | -1200     | <u>0.48</u> |
|         |                        |           | AVG         |
| 12/7/70 | Lions Club Shelter     | 1230-1400 | 0.28        |
|         |                        | -1600     | 0.32        |
|         |                        | -1800     | 0.44        |
|         |                        | -2000     | 0.53        |
|         |                        | -2200     | 0.36        |
|         |                        | -2400     | <u>0.36</u> |
|         |                        |           | AVG         |
| 12/8/70 |                        | 0000-0200 | 0.24        |
|         |                        | -0400     | 0.12        |
|         |                        | -0600     | 0.16        |
|         |                        | -0800     | 0.32        |
|         |                        | -1000     | 0.24        |
|         |                        | -1200     | 0.28        |
|         |                        | -1400     | 0.32        |
|         |                        | -1600     | 0.40        |
|         |                        | -1800     | 0.40        |
|         |                        | -2000     | 0.48        |
|         |                        | -2200     | 0.32        |
|         |                        | -2400     | <u>0.36</u> |
|         |                        |           | AVG         |



| Date     | Location           | Time      | COH         |
|----------|--------------------|-----------|-------------|
| 12/9/70  | Lions Club Shelter | 0000-0200 | 0.40        |
|          |                    | -0400     | 0.48        |
|          |                    | -0600     | 0.40        |
|          |                    | -0800     | 0.53        |
|          |                    | -1000     | 0.44        |
|          |                    | -1200     | 0.28        |
|          |                    | -1400     | 0.44        |
|          |                    | -1600     | 0.32        |
|          |                    | -1800     | 0.44        |
|          |                    | -2000     | 0.57        |
|          |                    | -2200     | 0.44        |
|          |                    | -2400     | <u>0.24</u> |
|          |                    |           |             |
| 12/10/70 |                    | 0000-0200 | 0.16        |
|          |                    | -0400     | 0.16        |
|          |                    | -0600     | 0.16        |
|          |                    | -0800     | 0.20        |
|          |                    | -1000     | 0.28        |
|          |                    | -1200     | <u>0.24</u> |
|          |                    |           |             |
| 12/10/70 | Ivanhoe Park       | 1400-1600 | 0.28        |
|          |                    | -1800     | 0.24        |
|          |                    | -2000     | 0.24        |
|          |                    | -2200     | 0.16        |
|          |                    | -2400     | <u>0.20</u> |
|          |                    |           | AVG 0.22    |
| 12/11/70 |                    | 0000-0200 | 0.28        |
|          |                    | -0400     | 0.28        |
|          |                    | -0600     | 0.28        |
|          |                    | -0800     | 0.20        |
|          |                    | -1000     | 0.16        |
|          |                    | -1200     | 0.16        |
|          |                    | -1400     | 0.04        |
|          |                    | -1600     | 0.08        |
|          |                    | -1800     | 0.04        |
|          |                    | -2000     | 0.08        |
|          |                    | -2200     | 0.12        |
|          |                    | -2400     | <u>0.12</u> |
|          |                    |           |             |

| Date     | Location     | Time      | COH         |
|----------|--------------|-----------|-------------|
| 12/12/70 | Ivanhoe Park | 0000-0200 | 0.08        |
|          |              | -0400     | 0.12        |
|          |              | -0600     | 0.12        |
|          |              | -0800     | 0.12        |
|          |              | -1000     | 0.28        |
|          |              | -1200     | 0.16        |
|          |              | -1400     | 0.16        |
|          |              | -1600     | 0.32        |
|          |              | -1800     | 0.24        |
|          |              | -2000     | 0.20        |
|          |              | -2200     | 0.12        |
|          |              | -2400     | <u>0.12</u> |
|          |              |           | AVG 0.17    |

|          |  |           |             |
|----------|--|-----------|-------------|
| 12/13/70 |  | 0000-0200 | 0.04        |
|          |  | -0400     | 0.08        |
|          |  | -0600     | 0.08        |
|          |  | -0800     | 0.08        |
|          |  | -1000     | 0.08        |
|          |  | -1200     | 0.04        |
|          |  | -1400     | 0.04        |
|          |  | -1600     | 0.04        |
|          |  | -1800     | 0.12        |
|          |  | -2000     | 0.08        |
|          |  | -2200     | 0.20        |
|          |  | -2400     | <u>0.12</u> |
|          |  |           | AVG 0.08    |

|          |  |           |             |
|----------|--|-----------|-------------|
| 12/14/70 |  | 0000-0200 | 0.12        |
|          |  | -0400     | 0.16        |
|          |  | -0600     | 0.12        |
|          |  | -0800     | 0.08        |
|          |  | -1000     | 0.04        |
|          |  | -1100     | <u>0.04</u> |
|          |  |           | AVG 0.09    |

Average COH Value for Survey 0.22  
Geometric Mean for Survey 0.17

Soiling Index

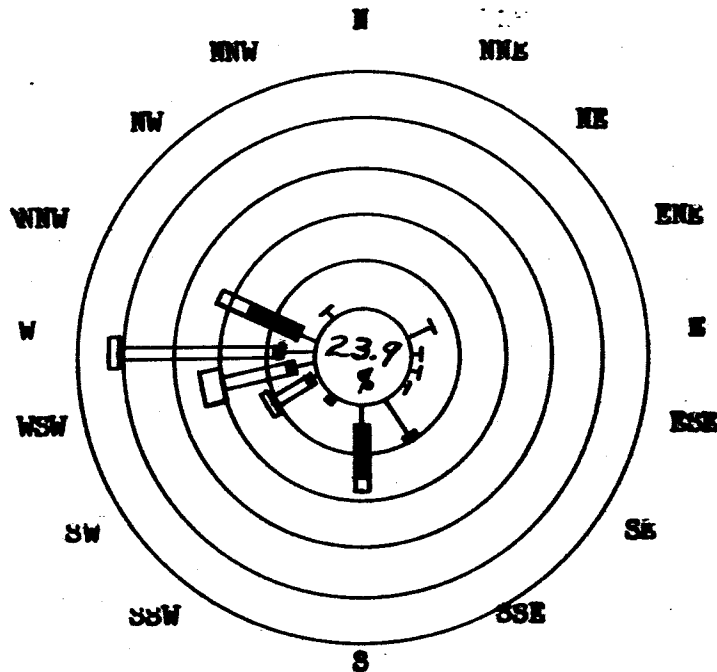
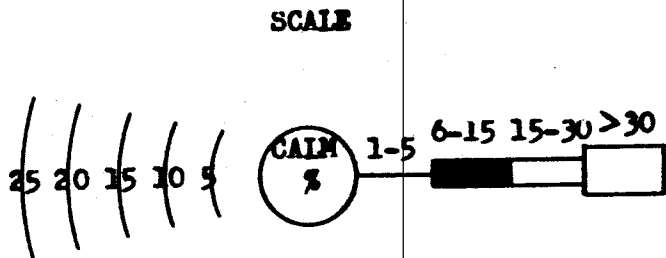
St Louis 0.4 COH/1000 lineal feet, annual geometric mean.

# WIND ROSE

DATE 12/2-4/70

CITY Fort Madison

LOCATION IWC



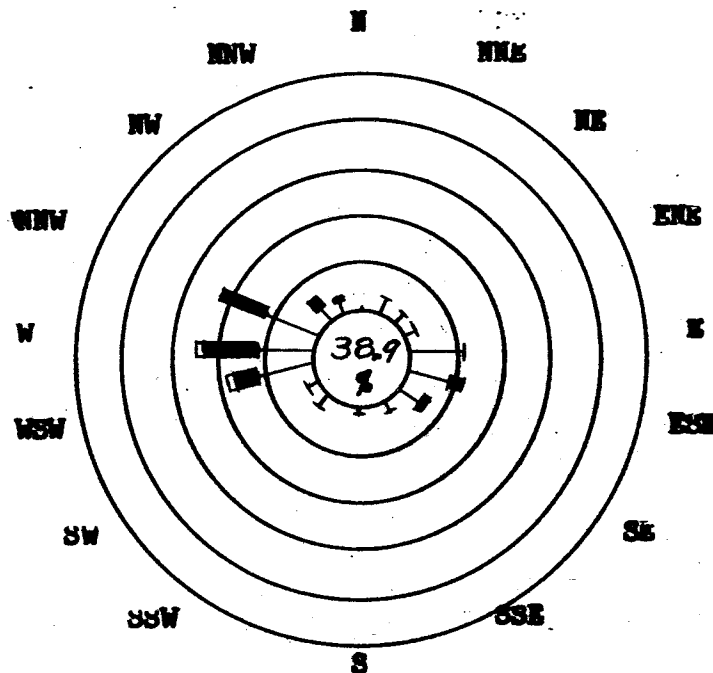
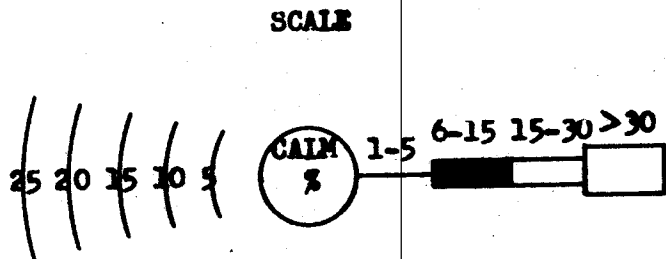
| SPEED(MPH)   | N | NNE | NE | ESE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW  | W    | WNW  | NW             | NNW | TOTAL |
|--------------|---|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|----------------|-----|-------|
| 1 - 5.9      |   |     |    | 3.3 | 1.7 | 1.7 | 0.6 | 4.4 | 2.2 |     | 0.6 | 2.2  | 3.9  | 2.2  |                |     | 22.8  |
| 6 - 14.9     |   |     |    |     |     |     |     | 0.6 | 5.6 | 1.1 | 0.6 | 0.6  | 0.6  | 5.6  | 1.7            |     | 16.1  |
| 15 - 29.9    |   |     |    |     |     |     |     |     | 0.6 | 1.1 | 3.9 | 7.2  | 17.2 | 5.9  |                |     | 33.9  |
| > 30         |   |     |    |     |     |     |     |     |     |     | 0.6 | 2.2  | 0.6  |      |                |     | 3.3   |
| <b>TOTAL</b> |   |     |    | 3.3 | 1.7 | 1.7 | 0.6 | 5.0 | 8.4 | 2.2 | 5.5 | 12.2 | 22.3 | 11.7 | 1.7            |     | 76.1  |
|              |   |     |    |     |     |     |     |     |     |     |     |      |      |      | <b>CALM</b>    |     | 23.9  |
|              |   |     |    |     |     |     |     |     |     |     |     |      |      |      | <b>MISSING</b> |     | 0.0   |
|              |   |     |    |     |     |     |     |     |     |     |     |      |      |      | <b>TOTAL</b>   |     | 100.0 |

WIND ROSE

DATE 12/4-7/70

CITY Fort Madison

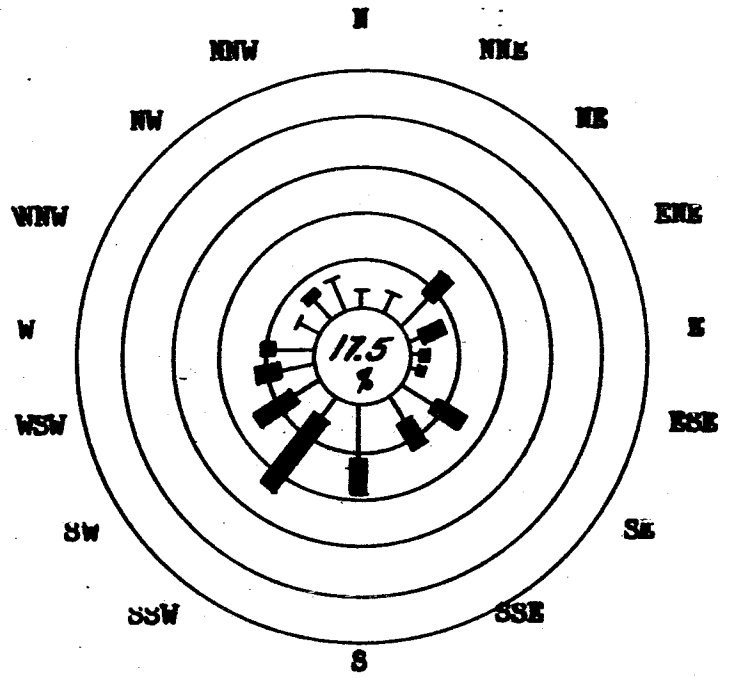
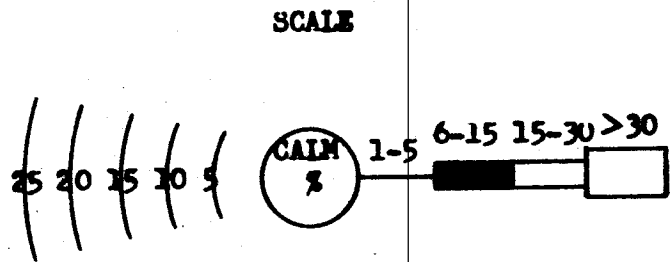
LOCATION City Hall



| SPEED(MPH)   | N | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W    | WNW  | NW             | NNW | TOTAL |
|--------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|----------------|-----|-------|
| 1 - 5.9      |   | 2.1 | 0.7 | 0.7 | 5.3 | 4.9 | 2.5 | 2.1 | 0.7 | 1.4 | 1.1 | 5.3 | 5.3  | 5.3  | 2.8            | 1.1 | 41.1  |
| 6 - 14.9     |   |     |     |     |     | 0.7 | 0.4 |     |     |     |     | 2.5 | 7.7  | 6.0  | 1.4            | 0.7 | 19.3  |
| 15 - 29.9    |   |     |     |     |     |     |     |     |     |     |     | 0.4 | 0.4  |      |                |     | 0.7   |
| > 30         |   |     |     |     |     |     |     |     |     |     |     |     |      |      |                |     |       |
| <b>TOTAL</b> |   | 2.1 | 0.7 | 0.7 | 5.3 | 5.6 | 2.9 | 2.1 | 0.7 | 1.4 | 1.1 | 8.2 | 13.4 | 11.3 | 4.2            | 1.8 | 61.1  |
|              |   |     |     |     |     |     |     |     |     |     |     |     |      |      | <b>CALM</b>    |     | 38.9  |
|              |   |     |     |     |     |     |     |     |     |     |     |     |      |      | <b>MISSING</b> |     | 0.0   |
|              |   |     |     |     |     |     |     |     |     |     |     |     |      |      | <b>TOTAL</b>   |     | 100.0 |

**WIND ROSE**

**DATE** 12/7-10/70 **CITY** Fort Madison **LOCATION** Lions Shelter

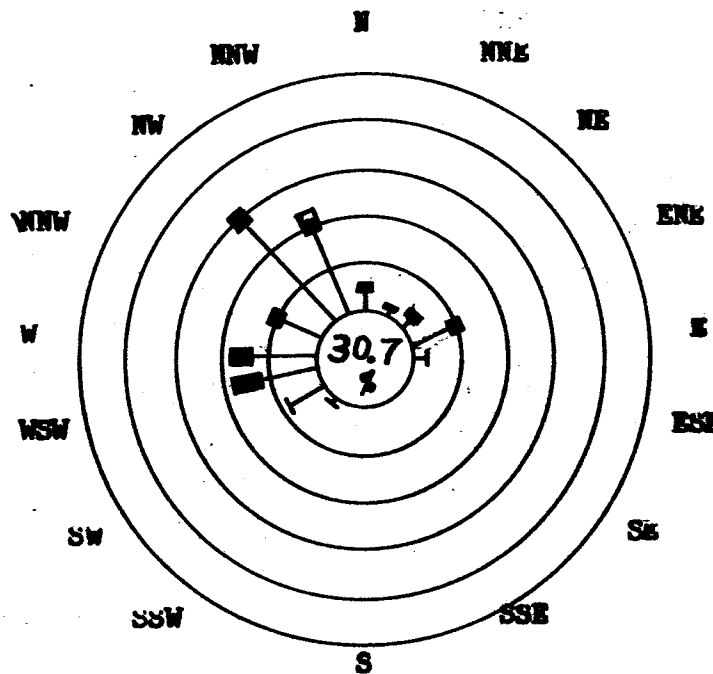
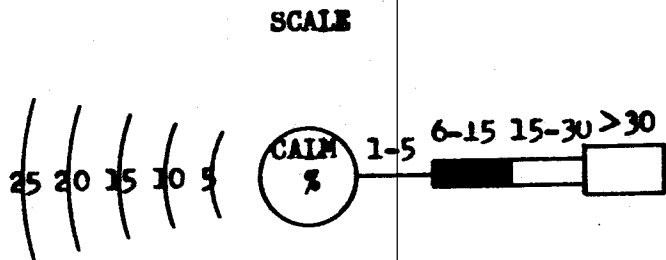


| SPEED(MPH)   | N   | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW  | SW  | WSW | W   | WNW | NW             | NNW | TOTAL |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|----------------|-----|-------|
| 1 - 5.9      | 2.1 | 2.5 | 4.6 | 1.8 | 0.4 | 0.7 | 4.6 | 3.9 | 5.6 | 2.5  | 3.9 | 4.2 | 4.6 | 2.8 | 2.8            | 4.2 | 50.2  |
| 6 -14.9      |     |     | 2.5 | 2.8 | 1.1 | 0.4 | 3.2 | 2.1 | 4.2 | 9.5  | 3.2 | 2.5 | 0.7 |     | 0.4            |     | 32.3  |
| 15 -29.9     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |                |     |       |
| >30          |     |     |     |     |     |     |     |     |     |      |     |     |     |     |                |     |       |
| <b>TOTAL</b> | 2.1 | 2.4 | 7.1 | 4.6 | 1.5 | 1.1 | 7.8 | 6.0 | 9.8 | 12.0 | 7.1 | 6.7 | 5.3 | 2.8 | 3.2            | 4.2 | 82.5  |
|              |     |     |     |     |     |     |     |     |     |      |     |     |     |     | <b>CALM</b>    |     | 17.5  |
|              |     |     |     |     |     |     |     |     |     |      |     |     |     |     | <b>MISSING</b> |     | 0.0   |
|              |     |     |     |     |     |     |     |     |     |      |     |     |     |     | <b>TOTAL</b>   |     | 100.0 |

STATE LIBRARY COMMISSION OF IOWA  
 Historical Buildings  
 DES MOINES, IOWA 50319

WIND ROSE

DATE 12/10-14/70 CITY Fort Madison LOCATION Ivanhoe Park



| SPEED(MPH) | N   | NNE | NE  | ENE | E   | ESE | SE | SSE | S | SSW | SW  | WSW | W   | WNW | NW   | NNW  | TOTAL |
|------------|-----|-----|-----|-----|-----|-----|----|-----|---|-----|-----|-----|-----|-----|------|------|-------|
| 1 - 5.9    | 2.1 | 0.5 | 1.1 | 4.3 | 1.6 |     |    |     |   | 0.5 | 4.5 | 6.1 | 7.0 | 4.8 | 14.7 | 9.6  | 57.2  |
| 6 - 14.9   | 0.5 | 0.3 | 1.6 | 0.8 |     |     |    |     |   |     |     | 2.1 | 1.1 | 1.6 | 2.1  | 1.6  | 11.8  |
| 15 - 29.9  |     |     |     |     |     |     |    |     |   |     |     |     |     |     |      | 0.3  | 0.3   |
| >30        |     |     |     |     |     |     |    |     |   |     |     |     |     |     |      |      |       |
| TOTAL      | 2.6 | 0.8 | 2.7 | 5.1 | 1.6 |     |    |     |   | 0.5 | 4.5 | 8.2 | 8.1 | 6.4 | 16.8 | 11.5 | 69.3  |
|            |     |     |     |     |     |     |    |     |   |     |     |     |     |     |      |      | 30.7  |
|            |     |     |     |     |     |     |    |     |   |     |     |     |     |     |      |      | 0.0   |
|            |     |     |     |     |     |     |    |     |   |     |     |     |     |     |      |      | TOTAL |
|            |     |     |     |     |     |     |    |     |   |     |     |     |     |     |      |      | 100.0 |