A WIND TUNNEL STUDY OF PEDESTRIAN LEVEL WINDS IN THE VICINITY OF THE PROPOSED HEALTH SCIENCES CENTER, UNIVERSITY OF MINNESOTA, MINNEAPOLIS, MINNESOTA

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by

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ABSTRACT

A series of wind tunnel tests were carried out for the purpose of measuring ground level winds on a model of the proposed hospital and the adjoining area of the Health Sciences Campus of the University of Minnesota.

1:400 scale models of the Health Sciences Center and proposed new hospital and the surrounding 1600-foot radius circular area of the campus were placed in a simulated Earth's boundary layer in the MIT Wright Brothers Memorial Wind Tunnel.

Three tests were run. One used the campus model with the existing buildings in place, the second used the campus model with the new hospital in place. A third model used the campus configuration with the new hospital included as well as proposed schemes that were introduced to reduce ground winds at selected locations on the campus. All three configurations* were tested using hot wire instrumentation, and the first two configurations were tested using the wind erosion technique. The locations of the ground wind station points in all tests were identical whenever possible, so that a comparison could be made between the tests.

During the hot wire tests, measurements were made of the average, root-mean-square (RMS), and peak ground winds. The wind tunnel data was then combined with winds aloft data from St. Cloud, Minnesota to predict the wind speed which is exceeded 2% of the time at each station. Evaluation of the effect of each configuration on the ground wind environment for the campus is made by comparing the 2% exceedance winds and the relative gustiness of each ground wind station with a generally accepted international standard.

*See Figs. 16, 17, and 18.

Full scale on-site data was also taken, and compared with the wind tunnel results. A large amount of scatter was found in the data. Some of this scatter is due to the small size of the sample. A portion of the scatter was shown to be due to the presence of thermal effects in the full scale data, which are not simulated in the wind tunnel.

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LIST OF SYMBOLS

Roman Letters

a_0, a_1	Linear regression constants for hot wire voltage to wind tunnel velocity calibration
A_θ	Total probability of wind originating from direction θ (Weibull distribution constant)
D	Characteristic dimension (full scale)
d	Characteristic dimension (model scale)
e	2.71828
g_θ	Gust strength factor from single wind.direction
g_{g_θ}	Gustiness factor from single wind direction
g_{TOT}	Total gust strength factor
h	Height above ground
h_g	Gradient height of boundary layer in wind tunnel
h_G	Gradient height of boundary layer, full scale
K_θ	Weibull distribution shape constant
L	Gust wavelength
m	Reciprocal of scale factor D/d
n, N	Frequency, cycles per second
P[ ]	Probability of expression within parentheses
PSD	Power Spectral Density
RMS	Root-mean-square variation about the average
S(n)	Power spectral density function
V	Average wind velocity
V_G	Wind velocity at full scale gradient height
V_t	Trial velocity of interest
V_{wt}	Wind tunnel velocity
V_θ	Weibull distribution constant
$\bar{V}$	Hourly average wind velocity
V	Velocity that is exceeded 2% of the time

V_g	Wind velocity at wind tunnel gradient height
V_{ave}	Average velocity
V_{peak}	Peak velocity
V_{rms}	RMS velocity
V_{wt}	General hot wire voltage
V_1	Average wind velocity at 1 foot above floor in wind tunnel
V_{33}	Average wind velocity at 33 feet above ground (full scale)

Greek Letters

α	Velocity power law exponent
σ	RMS of fluctuating wind velocity
χ_D	nL/V_{33}, Nondimensional frequency-Davenport
χ_V	nL/V_{33}, Nondimensional frequency-Von Karman
θ	Wind direction

FOREWORD

Tnis report was prepared by the staff of the Wright Brothers Wind Tunnel for the Health Sciences Planning Office of the University of Minnesota. The research program was carried out from May 1981 to June 1982, under the supervision of Professor Judson R. Baron.

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1. Introduction

At the request of the Health Sciences Planning Office of the University of Minnesota, a series of wind tunnel tests were conducted at the Wright Brothers Memorial Wind Tunnel (WBWT) of the Massachusetts Institute of Technology. The purpose of these tests was to determine the general wind environment of the Health Sciences Campus with and without the proposed new hospital structure. A third test was run to evaluate proposed solutions to relatively high ground winds at certain areas on the campus. On-site wind measurements were also made at 35 stations at the site as it existed during April, May, and June of 1981.

The new hospital will be 10 stories high. It will occupy the area bounded by Essex Street on the North, Harvard Street on the East, River Road East on the South, and the DWAN Variety Club/Hospital on the West, measuring a maximum of about 460 feet by 276 feet (see Figure 8). It will be about 110 feet tall.

There are two buildings within 1600 feet of the site that are taller than the proposed hospital--the tower of the Mayo Memorial Building (14 stories tall, about 400 feet to the northwest), and the Health Sciences Unit A/Wangensteen Building Complex (about 260 feet tall, about 300-550 feet to the north). Also of note is the Mississippi River valley, which abruptly starts to slope downward about 100 feet directly south of the site to a depth 90 feet lower than the site elevation.

Three configurations were tested in the wind tunnel:

1. A scale model of the campus with the present site (Powell Hall)
2. A scale model of the campus with the proposed hospital

3. A scale model of the campus with the proposed hospital plus some proposed remedies to reduce ground winds at certain ground stations.

To aid in the choosing of the location of ground station points, a wind erosion test was performed on configurations 1 and 2 using the 8 major compass directions.

In the hot wire tests described herein, ground winds at 40 stations on the model were measured for gradient winds from the 16 major compass directions using two hot wire anemometers. The voltages from the two hot wire anemometers were sampled by a PDP-11/20 computer, and stored on disk for later analysis. All testing was done in a simulated Earth's boundary layer. The boundary layer profile used was selected according to the upwind terrain in the manner suggested by Davenport and Isyumov [5].

In order to make a meaningful evaluation of the wind tunnel data, it must be combined with weather data from the Minnesota area in order to calculate the probability of exceedance for any wind velocity at any ground station point. By comparing the ground wind environment at each point for the three configurations, and with an international standard, conclusions were drawn about the effect of each configuration on the ground wind environment of the campus. The two parameters that were used to measure the ground wind environment were the 2% exceedance wind, and the relative gustiness at each point.

Full scale data was taken at 35 ground wind locations identical to the locations that were tested in the wind tunnel. A comparison was made between the full scale and wind tunnel results. The method of analysis and the results are discussed in more detail later in this report. The next eight sections describe the various phases and the procedures used in the tests described above.

2. Analysis of Weather Data

Two types of weather data were obtained from the National Climatic Center in Asheville, North Carolina. One type was surface winds data, which consisted of wind velocity and direction observations taken approximately once every three hours. This data was obtained for both Minneapolis, Minnesota and St. Cloud, Minnesota for the period 1945-1979 (34 years). The other type was winds aloft data, which consisted of wind speed and direction observations, taken at various altitudes once every twelve hours. This data was only available for St. Cloud for the period 1961-1979 (19 years). There are problems with both types of data; some prove to be correctable, but some others are not.

One problem with the surface winds data is that it was not obtained in a very consistent way (i.e., the observers read the data by making a best guess at the average velocity and direction by observing the output of the anemometer for an uncertain period of time once every three hours). Standard practice is to assume that the data is a one minute average; that assumption was made for this analysis (see Sachs [18]).

Another problem is that the height of the anemometer at the weather station was changed during the period that the data was taken. If uncorrected, the data would have a significant error, since the average wind velocity increases with height. A fairly accurate approximation to the velocity gradient is given by the following formula:

$$\left(\frac{V}{V_g}\right) = \left(\frac{h}{h_g}\right)^{\alpha}$$

where:

V = the measured velocity at the surface wind station

h = the height of the anemometer at the ground wind station

h_G = the gradient height (the height at which the average wind velocity no longer changes with height)

V_g = the wind velocity at gradient height

α = velocity gradient power law constant (related to the type of terrain at the weather station (typically 0.17)

Since all the wind tunnel data is ratioed to the simulated hourly average gradient wind velocity, it is convenient to convert all the surface wind data to an estimated hourly gradient velocity. Assuming the weather station records are accurate, the height of the anemometer can be determined for each day the data was taken, and each piece of surface wind data can then be individually converted to an hourly gradient velocity.

Winds aloft data also has limitations. Because of the difficulty in launching the weather balloons when there are high wind speeds, the highest wind speeds are probably not recorded. Also, there are fewer observations than with surface wind data, decreasing the statistical reliability of the data. The advantage of the winds aloft data is that it is taken in a consistent way, and that data is obtained at the surface and at various elevations above the surface of the earth. The winds aloft data for St. Cloud gives wind velocities at the surface, and approximately 224, 624, and 1084 meters above the airport.

Examination of the surface winds data and the winds aloft data for the various heights reveals that the shape of the wind rose varies dramatically from the ground surface to gradient height (see Figures 1 to 5). It is suspected that the data taken at the ground has been significantly modified by either the terrain or local obstructions near the anemometer which was used to take the data. For this reason, it was decided that the St. Cloud winds aloft data should be used.

Using the St. Cloud winds aloft data available from different heights, the power law constant α was computed, and found to be equal to approximately 0.22. When using surface winds, the value of α commonly used in correcting the data to gradient height is 0.17 (see Sach's [4]). The difference between the standard procedure, which appears to be in error (at least for St. Cloud), and using the winds aloft data directly, results in the 2% exceedance velocities being 20% greater than those that would be obtained using the standard procedure. This means that the wind velocities predicted are now significantly greater than would be the case if only surface wind data were used when compared to the international standard proposed by Melbourne [14]. Since all the data was increased by approximately the same factor, the relative effects of the existing building and the proposed hospital structure are unaffected.

In the analysis, the winds aloft data at 624 meters was fitted to a Weibull type distribution curve (see Simiu and Scanlan [19]), which has the form:

$$P(V > V_t) = A_\theta e^{-(V/V_\theta)^{K_\theta}}$$

where A_θ, V_θ, and K_θ are constants determined from the data, V_t is the trial velocity of interest, and A_θ is the total probability of the wind coming from the direction θ. A typical result is shown in Figure 6. A Weibull fit was calculated for each of the three sets of data. Sixteen compass directions were used corresponding to the directions modeled in the wind tunnel. The Weibull constants for the winds aloft data at 624 meters from St. Cloud are listed in Table 2.1. The directions labeled include all data [$A_{(\theta)} = 1$) and are what is shown in Figure 6.

3. Description of Experimental Equipment

3.1 The Wind Tunnel

The Wright Brothers Memorial Wind Tunnel is a closed return wind tunnel with a 7.5 x 10.0 foot elliptical test section approximately 15 feet long. Wind speeds up to 185 mph are possible (Fig. 7).

For non-aeronautical tests such as this one, a special floor is mounted one foot above the regular floor of the tunnel, extending from two feet into the contraction section to four feet into the diffuser. This "ground board" provides a flat plane on which to develop a simulated Earth's boundary layer. An eight foot diameter turntable is mounted flush with the ground board in order to rotate the model to simulate wind from all directions. The center of the turntable is sixteen feet from the leading edge of the ground board (see Fig. 8).

A "scaled" Earth's boundary layer was developed in the wind tunnel using spires installed near the leading edge of the ground board, and roughness blocks $1^1/2$ inches square and 2 inches high between the spires and turntable. The boundary layer simulation is discussed in detail in Section 4.2.

For the wind erosion test, a screen 18 inches high was installed behind the turntable to catch the granules of plastic as they were swept off the model by the air flow. The granules were saved for later reuse. The average size of the granules used was approximately 2 x 2.5 x 3 mm. There are between 105-110 particles per gram. For this test, an Olympus OM-1 SLR camera with an automatic rewind was mounted 5 feet directly over the center of the turntable to record the results. A schematic of the wind tunnel and test setup used for simulating natural winds is shown in Figures 7 and 8 (the screen is not shown).

3.2 Description of the Model

The model scale for this test was chosen to be 1:400. The model scale is determined by two factors:

1. It must be consistent with the Earth's boundary layer simulation.
2. The amount of blockage with respect to the cross-sectional area must be small (<5%).

A more detailed description of the criteria for selecting a model scale can be found in Luh and Durgin [12].

At a scale of 1:400, the proposed hospital measured 3.4 inches tall, and building A_1 measured 7.8 inches tall. Wind blockage due to the model of the campus with the proposed hospital is estimated to be about 5 percent. The model of the campus sits on an 8-foot diameter base, which in turn sits on the turntable. A 3200 foot diameter circular area of the campus was thus modeled. Photos of the model in the wind tunnel are shown in Figure 10. Figures 16 and 17 are plan views of the model showing the location of the measuring stations.

3.3 Instrumentation

A pitot static probe located 15 inches below the tunnel ceiling and directly above the model of the campus was used to measure the tunnel gradient velocity. The leads from the pitot and static taps were connected to an alcohol manometer and pressure transducer/digital voltmeter setup to measure tunnel gradient velocity. A Flow Corporation hot wire setup (900-1) and linearizer (900-3) was used to make the ground wind measurements. The hot wire was modified as described in references [6] and [17]. The hot wire extended a distance from the ground floor from 0.2 inches to 0.4 inches in elevation. This corresponds to a full scale dimension of 6.7 feet to 13.3 feet in elevation. Photos of the hot wires as they were during the test are shown in Figure 10.

All data was measured using an appropriate program on a PDP-11/20 computer to digitally sample the data at a specified rate. An Ad11-K analog to digital converter was used to convert the voltage from the linearized to digital data. A DR11-C was used to interface the control box with the PDP-11/20 computer. After each direction was tested, the computer stored the data on disk for later use.

Data reduction was also carried out on the PDP-11/20. A more detailed discussion of the data reduction process will follow in Section 6.

4. Calibration

4.1 Similarity Relation

Wind tunnel velocities were sampled over a period of 16 seconds, at a rate of 512 samples per second. This is the equivalent of between approximately one to two hours full scale (depending on the full scale gradient velocity). This correspondence is described by the following similarity relation:

$$\left(\frac{V_g}{nd}\right)_{model} = \left(\frac{V_G}{ND}\right)_{full\ scale}$$

where, in general,

V_g, V_G = gradient velocity
d, D = characteristic linear dimension
$(1/n)$, $(1/N)$ = characteristic period of the sample.

In this test,

V_g model = 30 mph

$d_{model}/D_{full\ scale}$ = 1/400

$(1/n)_{model}$ = 16 sec .

At a full scale gradient velocity of 30 mph, 16 seconds of wind tunnel data corresponds to 6400 seconds full scale, or 1.78 hours. This extra long sampling time results in a higher and more conservative peak. The average and the RMS are not affected. A sampling rate of 512 samples per second (0.00195 sec/sample) corresponds to a full scale sampling rate of 1.28 samples/sec (0.78 sec/sample). This is adequate to capture any phenomenon of interest in a pedestrian level ground study, in view of the fact that gusts of less than 2 to 3 seconds duration have been shown not to affect pedestrians [15].

4.2 Simulation of the Earth's Boundary Layer

Proper wind tunnel simulation of the Earth's atmospheric boundary layer requires that the velocity gradient, the longitudinal root-mean-square (RMS) turbulence intensity, and the wind's longitudinal velocity power spectral density be appropriately scaled. Scaling on the basis of these three parameters represents the current state of the art of wind tunnel testing of buildings. Each parameter is discussed in detail below.

4.2.1 Velocity Gradient Simulation

The velocity gradient, or velocity variation with height, is the easiest parameter to simulate [7]. Davenport [4] states that while more sophisticated approximations exist to the vertical velocity gradient of the Earth's boundary layer. the overall accuracy is not significantly better than the simple approximation

$$\left(\frac{V}{V_G}\right) = \left(\frac{h}{h_G}\right)^{\alpha}$$

where V, V_G, h, h_G, and α are defined as in Section 2.

It has been shown [4] that for a given gradient velocity V_G, h_G and α vary approximately with the terrain as in the following table.

Table 4.1 Gradient Height and Power Law Characteristics for Varying Terrains [4]

Terrain Types	α	h_G (feet)
Open field or ocean	0.16	900
Wooded and suburban areas	0.28	1300
Built-up urban areas	0.40	1700

Typical power law profiles for various terrains are depicted in Figure 11.

The boundary layer used for these tests had values equivalent to $\alpha = 0.31$, and $h_G = 1250$ feet full scale. Figure 12 depicts the velocity gradient that was measured with $h_g = 37.5$ inches, $\alpha = 0.31$.

4.2.2 Longitudinal Turbulence Intensity [6]

Longitudinal turbulence intensity is the root-mean-squared variation of the velocity about the average velocity. In Figure 13, the longitudinal turbulence intensity divided by the gradient velocity is compared with strong wind data from Brookhaven, USA ($\alpha = 0.28$, $h_G = 1300$ ft), and Sale, Australia ($\alpha = 0.16$, $h_G = 900$ ft) [1]. The turbulence intensity in the simulated boundary layer falls within the range of the turbulence intensity measured at both locations. Because the data taken at Brookhaven and Sale was taken in conditions that were not truly adiabatic, the wind tunnel and full scale data must be compared for general, not exact, agreement. The wind tunnel data was taken at a velocity of about 30 mph.

4.2.3 Power Spectral Density

The power spectrum of the longitudinal velocity component for the simulated flow described above, was obtained on WBWT's PDP-11/20 computer as described in ref [11]. The wind velocity was sampled at a specified rate, the data passed through a Henning filter and then a fast Fourier transform. The output was the values of the power spectrum. Data was taken at 12 inches above the wind tunnel floor, corresponding to 400 feet full scale. The power spectrum is shown in Figure 14. The shape of the spectrum shown is in reasonable agreement with the strong wind spectrum proposed by Davenport [3]. This spectrum is defined by the equation:

$$\frac{nS(n)}{\sigma^2} = \left(\frac{2}{3}\right)\left\{\frac{\chi_D^2}{\left(1+\chi_D^2\right)^{4/3}}\right\}$$

where

$\chi_D = nL/V_{33}$

$S(n)$ = power spectral density function

n = frequency

V_{33} = average wind velocity at 33 feet above ground surface

L = 2800 feet

σ = RMS of fluctuating wind velocity

According to Davenport, the power spectral density function is independent of height for much of the boundary layer height. Wind velocity is a function of height, h. To convert n/V_{33} full scale to h/V_1 in the tunnel (V_1 is the average wind velocity at 1 foot above the floor of the tunnel), the following relationship is used:

$$\left(\frac{V}{V_1}\right) = m\left(\frac{33}{m}\right)^{\alpha}\left(\frac{V}{V_{33}}\right)$$

where m is the reciprocal of the scale factor and α is the velocity gradient power law constant. In this test, m = 400, and α = 0.31. The measured spectrum is compared with Davenport's spectrum in Figure 14. Comparison is also made with Von Karman's spectrum which has the form

$$\frac{nS(n)}{\sigma^2} = \frac{2}{\pi}\frac{\chi_V}{\left(1+k(\chi_V^2)\right)^{5/6}}$$

where $\chi_V = 2\pi n \ell_x / V_1$

ℓ_x = the integral scale

k = 1.8

5. Testing

5.1 Introduction

Two types of test were performed: a wind erosion test to determine optimum locations for ground wind stations, and a hot-wire test which accurately measures the average, RMS, and peak velocities at each ground station point. The procedure for each test will be discussed in sequence.

5.2 Wind Erosion Test

The data from the wind erosion test consists of a set of photos for each of the eight major compass directions. The procedure was to sprinkle grains of plastic (described in Section 3) evenly over the ground surface of the model. Then the wind speed in the tunnel was increased to no more than 20 mph. After waiting for 15-20 seconds for the erosion patterns to stabilize, a photo was taken from the camera mounted directly above the model. Then the wind speed was increased to the next nominal speed (in this test, 30 mph). After waiting 15-20 seconds, another photo was taken. This process was continued through all the nominal speeds. After a photo was taken at the maximum nominal speed, the wind speed was decreased to zero and the plastic granules were redistributed so that they again covered the ground surface uniformly. The turntable was then rotated to a new compass direction, and the above-described process was repeated. After this process was performed for the eight major compass directions, the configuration of the model was changed, and the model was tested again in the eight major directions. Two configurations were tested using this technique: (1) The model with the existing building in place; (2) the model with the proposed building in place.

5.3 Hot-Wire Calibration and Test

The data for the hot-wire test was taken using two hot wires simultaneously and WBWT's PDP-11/20 computer. Using the equipment described in Section 3, the voltage from the hot-wire setup was sampled at a rate of 512 Hz and converted into a digital form that could be read by the computer. For each ground wind station 16 seconds of data were taken. After this data was taken, the computer program calculated the average, RMS, and peak velocities, and divided each of them by the wind tunnel gradient velocity to obtain the three quantities

$$\frac{V_{ave}}{V_g}, \quad \frac{V_{RMS}}{V_g}, \quad \frac{V_{peak}}{V_g}$$

After the calculations were completed, the computer signaled the operators to move the two hot-wires to the next two ground stations. The operators then entered the test section and moved the hot-wire anemometers by hand to the next ground wind stations. Before moving the anemometer to that station, however, the operators placed a rod with a thin thread attached to the end over each new ground wind station location to determine the direction of flow at that location (not necessarily the same direction as the gradient flow). When the anemometer was placed at the new location, it was positioned to point in the general direction of flow. The operators then left the test section and signaled the computer to resume taking data. This procedure was repeated until data from all ground wind stations was obtained. At this point, the computer saved the data on disk for later use, the turntable was rotated to a new direction, and the whole process was repeated for all the ground wind stations. This procedure was continued until all 16 major directions of the compass were tested. Then the model was altered to a new configuration, and the test was repeated through all 16 wind directions. In all, three configurations were tested using hot-wire anemometers: (1) The model with the existing building in place; (2) The model with the proposed building in place; (3) The model with the proposed building in place with additional modifications made to the campus.

The hot wire itself was calibrated to obtain the calibration constants with which to convert the voltage to wind velocities. Hot-wire average voltages were recorded at several known tunnel velocities (verified using an alcohol manometer). The 900-3 linearizer made the variation of velocity with voltage roughly linear, and it can be described by the following relation: $V_{wt} = a_0 + a_1 v_{wt}$

where

V_{wt} = general wind tunnel velocity

v_{wt} = general hot-wire voltage

a_0, a_1 = calibration constants

Using a linear regression analysis, the values of a_0 and a_1 were found for each calibration. Each of the hot-wire anemometers was put in the uniform flow at the top of the tunnel before taking data for each direction and the value of a_1 was corrected to obtain a fit to the measured voltage (a_0 is usuallly quite small).

6. Data Reduction

The wind tunnel data taken for each ground station is in the form of 16 sets of the following three quantities, one set for each wind direction:

$$\frac{V_{ave}}{V_g}, \quad \frac{V_{RMS}}{V_g}, \quad \frac{V_{peak}}{V_g}$$

Thus, each ground station has 16 average wind velocities (one from each direction), and similarly 16 RMS quantities, and 16 peak velocities, all divided by the gradient velocity. These quantities are tabulated in Tables 6.2, 6.3 and 6.4.

Using the ratio V_{ave}/V_g and the A_θ's, V_θ's and K_θ's determined for the St. Cloud winds, the wind velocity that is exceeded two percent of the time at each ground station point was obtained. The probability that each wind direction contributed to this 2% exceedance probability was also calculated, and is included in Tables 6.2, 6.3, and 6.4 for the configurations tested. An average 2% exceedance velocity for all the ground stations is also given for each configuration tested in Table 6.1.

The 2% exceedance winds given in Table 6.1 are the primary results of this study. However, it is also important to take note of the relative gustiness of each location. Though the RMS is one measure of this, a second important measure is the relative strength of the peak gust in terms of the average and the RMS. The commonly used gust strength factor (g_θ), for a single wind direction of a ground station point, is given by the following relation:

$$g_\theta = \frac{V_{peak} - V_{ave}}{V_{RMS}}$$

The total gust strength factor at a point, g_{TOT}, is the summation of the product of the individual gust strength factor from a single direction g_θ, and the probability of the wind originating from that direction, A_θ:

$$g_{TOT} = \sum_{n=1}^{16} g_\theta A_\theta$$

It is also important to identify those stations that have very high peak velocities combined with high gust factors. These are ground stations that have low average wind speeds combined with infrequently occurring high peak gusts. To measure this phenomenon, a gustiness factor g_g is calculated:

$$g_{g_\theta} = g_\theta \frac{V_{peak}}{V_{gradient}}$$

$$= \left(\frac{V_{peak} - V_{ave}}{V_{RMS}}\right)\left(\frac{V_{peak}}{V_{gradient}}\right)$$

For each ground station, the gustiness factor was calculated for each wind direction. An average of all the gustiness factors was also calculated. The gustiness factors which were greater than 5.0 for each configuration are given in Tables 6.5, 6.6, and 6.7.

7. Data Analysis - First Two Configurations

The results from the tests have been analyzed in two ways: first, by comparing the two percent exceedance winds for the model with the existing building (Powell Hall) with the results for the model with the proposed hospital in place; and second, by comparing the two percent exceedance winds with a generally accepted international criteria for pedestrian level winds. Before considering these results, a discussion of some of the factors that went into establishing the international criteria is appropriate.

Most authors [9], [10], [13], [14], [15], [16], [19] attempting to set up pedestrian level criteria present their criteria in a form that essentially says that a certain wind speed should not be exceeded more than a specific percent of the time. This is quite a convenient way of stating the criteria, but nevertheless can lead to confusion, i.e., one is actually defining the criteria in terms of only a single point on a probability curve. As a result, some authors have defined two or more points that are essentially on this same curve.

In 1978 Melbourne [14] reviewed the existing literature and compared all the criteria on a single plot of velocity vs probability of exceedance. Figure 15 reproduces his results. The average hourly wind speed is along the horizontal axis and the log of the probability of exceeding that velocity is given along the vertical axis. The data of Radovsky and Durgin [14] and that of T.I. McLaren [13] have been added to this figure. Note that both the two criteria of Hunt et al and two pairs of criteria from McLaren fall on the same curve and thus are really identical.

Also included in Figure 15 is an estimate of the probability of exceeding a given velocity at the six foot elevation at Minneapolis Airport. The result falls between that acceptable and unacceptable/ dangerous curve, ($V_{2\%}$ = 22.3 mph).

In this report we will be dealing with 2% exceedance winds. Using Melbourne's criteria one obtains:

	m/sec	Knots	mph
Stationary - long exposure	5.0	9.7	11.2
Stationary - short exposure	6.5	12.6	14.5
Walking (acceptable)	8.0	15.5	17.8
Unacceptable/Dangerous	11.5	23.3	25.6

The 2% exceedance winds can be compared by examining Table 6.1. The average of the 2% exceedance winds for the existing building is 15.12 mph. For the proposed building, the average is 14.15 mph--a decrease of 0.97 mph. Note that since the locations of stations 27 and 28 are different in configurations 1 and 2, they were not used when computing the average of the two percent exceedance velocities for configurations 1 and 2.

The classifications of the ground wind stations are summarized in the following table and on the site plan (see Figures 16 and 17).

Table 7.1 Ground Wind Stations - Configurations 1 and 2

	Number of Ground Wind Stations	
	Present Bldg. (1)	Proposed Bldg. (2)
Stationary - long exposure	4	6
Stationary - short exposure	11	15
Walking (acceptable)	17	12
Unacceptable/Dangerous	6	5
Total	38	38

A change in the 2% exceedance average velocity of more than one mph was considered to be significant. Two ground stations showed a significant increase in wind speed, fourteen stations showed a significant decrease in wind speed, and twenty-two stations showed no significant change (see Table 6.1 and Figure 18). The general impact of the new building is a small decrease in the ground winds on the campus.

Next, Tables 6.2 and 6.3 can be examined to determine what wind directions contribute most to the 2% exceedance velocity at the ground wind locations. This data is also depicted graphically in Figures 19 to 28 where the contribution to the total 2% is depicted graphically as a function of direction as in the wind rose in Figures 1-5. These figures clearly show that, for most of the ground wind locations, one or two of the 16 major compass directions contribute almost all of the probability for the two percent exceedance winds.

8. Test with Proposed Building and Modified Campus

After the tests of the first two configurations were completed, and the results were discussed with representatives from the University of Minnesota, the architectural firm of Hellmuth, Obata, and Kasselbaum, Inc., and those from the Wright Brothers Wind Tunnel, it was decided that a third configuration of the model should be tested, in which modifications to the campus were made. The modifications, which were tested simultaneously, are as follows:

1. Closing off the passageway that is between Unit A and the Wangensteen Building.

2. Adding the cupola in the open space to the west of Diehl Hall.

3. Removal of the upper-level walkway between the proposed hospital and the Masonic Memorial Hospital.

4. Closing the vertical opening just above the main entrance to the proposed hospital.

It was decided to retest only 16 of the 40 original ground stations. For these ground stations, the same procedures for testing and data analysis were used as were used when testing the first two configurations. The numbers of the ground wind stations that were retested with the model in the third configuration are as follows: 6, 7, 8, 11, 12, 13, 18, 19, 20, 21, 22, 23, 24, 27, 28, and 31.

The 2% exceedance winds for the 16 retested ground stations can be compared by examining Table 2.1. For the existing building, the average 2% exceedance velocity for the 16 ground stations considered is 15.08 mph. For the proposed building (configuration 2) the average is 13.75, a decrease of 1.33 mph. The average for the proposed hospital with the modified campus is 13.85 mph--a slight increase of 0.10 mph from the unmodified campus, and a net decrease of 1.23 mph from the average with the existing building. The classifications of the ground wind stations for the third configuration are summarized in the following table and in Figure 29.

Table 8.1 Comparison of Three Configurations for 16 Ground Stations

Category	Number of Ground Wind Stations			
Configuration:	1	2		3
Stationary - long exposure	1	3	3	3
Stationary - short exposure	5	6	8	7
Walking	7	4	4	5
Unacceptable	1	1	1	1
Dangerous	0	0	0	0
Total	14	14	16	16

Note: For total = 14, stations 27, 28 not included.

A change in the 2% exceedance velocity of more than one mph was considered to be significant. Comparing configuration 3 with configuration 2, four stations showed a significant increase in wind speed, one station showed a significant decrease in wind speed, and eleven stations showed no significant change. This data is depicted in Figure 30.

When comparing configuration 3 with configuration 1, only 14 stations should be considered, since the locations of stations 27 and 28 were moved. Of these 14 stations, no stations showed a significant increase in wind speed, six stations showed a significant decrease in wind speed, and eight stations showed no significant change in wind speed. This data is given in Table 6.1 and is depicted in Figure 31.

The contribution from each direction of the two percent exceedance velocities is listed in Table 6.4 and plotted in Figures 32 and 33 for the final configuration.

9. Comparison of Full Scale Data with Wind Tunnel Results

Full scale data was obtained by personnel of the Health Sciences Planning Office for some of the same locations on the campus that were tested in the wind tunnel. A comparison was made between the full scale and wind tunnel results.

A portable anemometer and recording system has been developed at WBWT to record full scale weather data at ground level [2]. It consists of a three-cup anemometer on a stand, a sensor to convert resolutions of the anemometer to an FM signal, and a portable tape recorder to record the signal on tape (Figure 34). The anemometer and recording system are described in detail in Wright Brothers Wind Tunnel report WBWT-TR-1138 [2]. A 34-minute sample was taken at 23 of the ground wind locations that were also tested in the wind tunnel. A second sample was taken at 11 of the stations, making a total of 34 samples.

Each tape containing the FM signal (~60 hz/mph) recorded by the anemometer was analyzed using WBWT's PDP-11/20 computer [2]. The FM signal was sampled at an effective frequency of 1 hz, and plots were made of the time history of the sample. Sample plots are depicted in Figures 35, 36 and 37 respectively. Figure 35 shows the wind velocity at a ground location where the wind velocity at the ground was quite large. Figure 36 depicts the velocity at a relatively calm location. Figure 37 falls somewhere between the two extremes. The data from each ground wind station was also analyzed to obtain average and RMS (root-mean-square) velocities. (The RMS is equivalent to the standard deviation of a sample. When the sample is a time history of a signal, it is called an RMS.) The average velocity is plotted as a solid line in Figures 35, 36, and 37. The average plus or minus the RMS is plotted as a dashed line in Figures 35, 36, and 37. The RMS thus is an approximate measure of the gustiness of the flow at the location considered.

In the full scale data, it is suspected that thermal effects are present. The data in the wind tunnel does not model such effects. One purpose of comparing the full scale data with the wind tunnel data is to access the impact of thermal effects on the accuracy of the wind tunnel estimation of the velocity at a given ground location. Since thermal effects would be more significant at slower wind velocities, it was decided to order the full scale data in decreasing order of full scale average velocity measured at the ground. The correspondence of the original labels of the ground wind locations with the sorted labels is listed in columns 1 and 2 of Table 9.1. A total of 34 samples were used. It was judged that ground wind location 3 (original label) was an anomalous point. It may be that the full scale situation at this location was not modeled properly on the wind tunnel model. The full scale average velocities are listed in column 3 of Table 9.1.

To compare the full scale results with the wind tunnel results, it is necessary to convert the full scale results to a ratio of the velocity measured at the ground divided by the velocity at gradient height. Airport weather data was used for this purpose. Since the airport data was taken at ground level, it was converted to gradient height using the procedure outlined in Section 2. Since the weather data was taken every three hours, the gradient velocity used was interpolated between what was read at the airport when necessary. The gradient velocities that were used are listed in column 4 of Table 9.1. The ratio of full scale average and rms anemometer data divided by the full scale gradient velocity is plotted in Figure 38 for the samples considered.

The wind tunnel data was taken in the sixteen compass directions. The weather data was recorded such that the wind directions are divided into ten degree increments. To obtain the appropriate wind tunnel velocity ratio for comparison with the full scale data, the direction of the weather data was first interpolated to obtain an estimate of the direction at the time the full scale data was taken. Then appropriate weighting factors were applied to the wind tunnel data if the weather data occurred between two of the sixteen compass directions. This was usually the case. This process was conducted for the wind tunnel ratios of average/gradient, and RMS/gradient. The ratios for the average and the RMS coefficients corresponding to the full scale data are listed in columns 5 and 6, respectively, of Table 9.1, and are also plotted in Figure 39.

At this point, both sets of data have been converted to non-dimensional form. The next step is to compute the ratio of the full scale velocity ratio divided by the wind tunnel velocity ratio. The variation of this ratio will give a measure of the accuracy of the wind tunnel in estimating the full scale wind environment. Columns 5, 6, 7, and 8 from Table 9.1 are reproduced in Table 9.2. The ratios of the average are listed in column 9 of Table 9.2 and are plotted in Figure 40. The ratios of the RMS are listed in column 10 of Table 9.2

and are plotted in Figure 41 (i.e. column 9 equals column 5 divided by column 7, column 10 equals column 6 divided by column 8). Since the size of the sample is small (=34), the large scatter evident in the data is to be expected. The scatter also is in part due to the fact that the hot wires in the wind tunnel test measured the flow centered at a full scale elevation of 10 feet, while the full scale elevation measured the flow of air at about 6 feet. In other tests conducted since this test this difference in height has contributed to increased scatter in the data [8].

One way to measure the scatter, or variation, in the data is to calculate the coefficient of variation for the data. The coefficient of variation is defined as the standard deviation divided by the mean, or average. It is thus a nondimensional measure of the variation in the data. To measure how the variation in the data changes as the full scale velocity decreases, a moving average was computed, starting with the sorted data numbers with the higher velocities:

Point 1: average of data numbers 1, 2, 3, 4, 5
Point 2: average of data numbers 2, 3, 4, 5, 6
Point 3: average of data numbers 3, 4, 5, 6, 7

etc

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Point 29: average of data numbers 29, 30, 31, 32, 33
Point 30: average of data numbers 30, 31, 32, 33, 34

Using this procedure with 5 points in the moving average, the co-efficients for the average velocity and RMS velocity are plotted in

Figures 42 and 43, respectively. (The moving average is called the "mean" in the plot to avoid confusion with the ratio of the coefficients of average velocity.) Increasing the number of points in the moving average to 15 tends to make the graph smoother.

In the same manner as the moving average, a moving coefficient of variation was also calculated, for both 5 points and 15 points. Again, using 15 points tended to make the graph smoother.

In Figure 42, the fact that the coefficient of variation increases as the full scale velocity decreases tends to confirm the idea that thermal effects significantly alter the correlation between full scale and wind tunnel data when the full scale data is low velocity data. Figure 42 also indicates that the wind tunnel overestimates the full scale wind velocity when the full scale velocity is low, or it underestimates the full scale velocity when the wind velocity is high. No explanation for this trend is known at this time.

The comparison of full scale data with wind tunnel data has revealed that the correlation is quite sensitive to matching the heights of the anemometers in both situations. The large amount of scatter in the data is partially due to this discrepancy. Another cause of scatter in the data is the fact that the weather data is sampled only every three hours, and a linear interpolation between the two readings could be very different to the actual wind at that time. Add to this the fact that the airport is some distance from the campus, that the airport data is altered by local obstructions, and that the shape of the boundary layer changes from day to day; it is evident that some degree of scatter is to be expected in the data. It remains for future investigations to both refine the present techniques and assemble a greater base of data to adequately confirm the validity of the similarity between what happens in the wind tunnel and what happens full scale.

Murakami et al [15] placed several anemometers about a site and recorded wind velocity and direction for about a year. They found very poor correlation between wind tunnel and on-site wind data on an hour-to-hour basis, but over the year the correlation was quite good.

10. Conclusions

(1) Adding the new hospital structure will reduce the average winds at most stations, but only slightly. The general impact of the new structure is to reduce the ground wind velocities at locations close to the structure, and slightly increase the ground wind velocities at locations on the campus further from the structure.

(2) The ground stations with an unacceptable average ground wind speed are station numbers 10, 11, 17, 32, 33, and 35. Addition of the proposed building reduced stations 10 and 35 to acceptable levels while station 2 became unacceptable.

(3) With the present building in place, ground stations 2, 4, 7, 8, 9, 12, 14, 18, 22, 24, 25, 29, 30, 31, 34, 36, and 37 were found to have wind speeds that are acceptable only for walking.

(4) With the proposed building in place, ground stations 22, 34, 36, and 37 changed to a lower category compared to configuration 1. Station 2 was raised to the unacceptable category; station 1 was raised from a lower category to acceptable only for walking.

(5) The gustiness factors (g_{g_θ}) calculated show that station 3 is by far the most gusty, and that the gustiness factors are made more severe by the addition of the new building. Stations 6, 9, 13, 14, 18, 23, 30, 31, 33, 34, 36, and 39 also have high gustiness factors, such that pedestrians may regard them as windy.

(6) The test of configuration 3 indicated that the modifications to the campus do not significantly change the ground wind velocities.

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Table 2.1 - Weibull Constants Obtained From Weather Data for St. Cloud at 624 meters

WEATHER DATA:

WIND DIR	ATHETA	VTHETA	KTHETA
N	0.07165	18.98623	1.87630
NNE	0.04449	15.85869	1.66616
NE	0.03086	14.47157	1.60312
ENE	0.02684	14.77038	1.47842
E	0.02452	15.23291	1.61551
ESE	0.03122	17.87757	1.57528
SE	0.03783	18.12083	1.66990
SSE	0.05458	19.49822	1.79386
S	0.07179	21.43827	1.88122
SSW	0.08375	22.26190	1.95489
SW	0.07583	21.75960	1.98888
WSW	0.06217	19.58446	1.85449
W	0.06258	18.66472	1.89140
WNW	0.09116	19.93941	2.04588
NW	0.12078	21.17726	2.05987
NNW	0.10997	20.85320	2.15929
TOTAL	1.00000	19.58336	1.90379

Table 6.1 - 2% Exceedance Wind Velocities

Ground Station	Configuration 1	Configuration 2	Configuration 3
1	13.19	15.39	
2	16.98	17.93	
3	8.11	6.55	
4	16.07	15.90	
5	12.52	13.09	
6	13.67	12.79	12.73
7	17.35	17.21	16.55
8	16.89	17.44	16.32
9	16.67	16.88	
10	18.61	16.96	
11	21.05	19.37	19.08
12	15.67	16.68	16.31
13	14.24	13.88	13.66
14	15.13	14.68	
15	9.03	8.96	
16	7.95	8.20	
17	18.43	19.41	
18	15.70	15.79	15.16
19	14.11	11.56	11.95
20	10.35	9.64	10.37
21	13.79	10.31	10.10
22	17.09	12.03	13.32
23	13.83	14.30	14.44
24	14.57	9.66	10.84
25	14.58	14.62	
26	14.01	14.35	
27	11.68	12.98	13.99
28	13.62	11.96	13.14
29	15.80	16.25	
30	17.13	15.79	
31	17.60	14.42	13.70
32	20.24	18.85	
33	18.86	20.75	
34	17.15	13.56	
35	19.02	11.13	
36	15.97	12.51	
37	14.88	12.68	
38	12.94	12.81	
39	13.09	13.62	
40	12.32	11.75	
Average 2% Wind Speeds			
All stations	15.00	14.07	--
Excluding 27 and 28	15.12	14.15	--
Only Configuration 3 Stations	--	13.75	13.85

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******************** GROUND POSITION 1   *************************
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************************ Table 6.2.1 ****************************

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.308	0.123	0.88	4.7	0.071
NNE	0.317	0.115	0.78	4.0	0.030
NE	0.280	0.123	0.79	4.1	0.004
ENE	0.351	0.109	0.73	3.5	0.050
E	0.363	0.123	0.80	3.5	0.041
ESE	0.335	0.112	0.74	3.6	0.097
SE	0.245	0.095	0.63	4.0	0.008
SSE	0.145	0.086	0.55	4.7	0.000
S	0.225	0.097	0.60	3.9	0.009
SSW	0.366	0.106	0.74	3.5	0.645
SW	0.407	0.110	0.82	3.8	0.834
WSW	0.347	0.126	0.89	4.3	0.203
W	0.115	0.070	0.50	5.5	0.000
WNW	0.172	0.089	0.52	4.0	0.000
NW	0.161	0.101	0.76	5.9	0.000
NNW	0.217	0.113	0.72	4.5	0.000
TOTAL:					1.993

THE WEIGHTED GUST STRENGTH FACTOR IS 4.4

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******************** GROUND POSITION 2 ***********************
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Table 6.2.2

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.448	0.089	0.72	3.0	0.186
NNE	0.498	0.094	0.88	4.0	0.124
NE	0.462	0.093	0.82	3.8	0.036
ENE	0.525	0.074	0.88	4.9	0.111
E	0.460	0.085	0.74	3.3	0.038
ESE	0.276	0.087	0.58	3.6	0.003
SE	0.219	0.092	0.54	3.5	0.000
SSE	0.103	0.061	0.42	5.1	0.000
S	0.303	0.089	0.67	4.1	0.016
SSW	0.470	0.078	0.75	3.6	0.635
SW	0.508	0.076	0.82	4.1	0.723
WSW	0.400	0.087	0.76	4.1	0.094
W	0.341	0.131	0.75	3.1	0.011
WNW	0.222	0.146	0.74	3.5	0.000
NW	0.159	0.113	0.77	5.4	0.000
NNW	0.342	0.122	1.14	6.6	0.016
TOTAL:					1.991

THE WEIGHTED GUST STRENGTH FACTOR IS 4.3

GROUND POSITION 3

Table 6.2.3

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.133	0.116	0.86	6.2	0.001
NNE	0.136	0.064	0.44	4.8	0.001
NE	0.121	0.082	0.74	7.5	0.000
ENE	0.306	0.134	0.69	2.8	0.249
E	0.194	0.123	0.60	3.3	0.015
ESE	0.081	0.053	0.44	6.7	0.000
SE	0.090	0.064	0.44	5.5	0.000
SSE	0.201	0.108	0.60	3.7	0.136
S	0.304	0.162	0.76	2.8	1.585
SSW	0.100	0.059	0.57	8.0	0.000
SW	0.139	0.059	0.51	6.3	0.006
WSW	0.088	0.050	0.41	6.5	0.000
W	0.063	0.044	0.39	7.3	0.000
WNW	0.059	0.035	0.28	6.3	0.000
NW	0.060	0.047	0.38	6.8	0.000
NNW	0.075	0.061	0.57	8.2	0.000
TOTAL:					1.992

THE WEIGHTED GUST STRENGTH FACTOR IS 6.2

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******************** GROUND POSITION 4 ************************
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Table 6.2.4

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.424	0.141	0.86	3.1	0.186
NNE	0.470	0.146	1.03	3.8	0.122
NE	0.527	0.086	0.95	5.0	0.114
ENE	0.526	0.064	0.83	4.7	0.144
E	0.465	0.084	0.76	3.5	0.058
ESE	0.187	0.087	0.49	3.5	0.000
SE	0.189	0.077	0.48	3.7	0.000
SSE	0.297	0.133	0.75	3.4	0.011
S	0.287	0.097	0.69	4.1	0.016
SSW	0.392	0.084	0.78	4.7	0.311
SW	0.447	0.085	0.77	3.9	0.503
WSW	0.329	0.095	0.77	4.6	0.026
W	0.517	0.116	1.00	4.1	0.455
WNW	0.348	0.097	0.75	4.1	0.034
NW	0.236	0.129	0.68	3.4	0.000
NNW	0.325	0.157	1.01	4.4	0.017
TOTAL:					1.996

THE WEIGHTED GUST STRENGTH FACTOR IS   4.0

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******************** GROUND POSITION 5   ************************
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Table 6.2.5

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.323	0.130	0.73	3.1	0.158
NNE	0.351	0.126	0.74	3.1	0.094
NE	0.326	0.127	0.78	3.6	0.026
ENE	0.385	0.129	0.70	2.4	0.108
E	0.326	0.133	0.74	3.1	0.028
ESE	0.190	0.130	0.81	4.8	0.001
SE	0.179	0.105	0.64	4.4	0.000
SSE	0.304	0.172	0.85	3.2	0.119
S	0.230	0.118	0.64	3.5	0.023
SSW	0.265	0.100	0.60	3.3	0.108
SW	0.349	0.104	0.75	3.9	0.511
WSW	0.310	0.110	0.84	4.8	0.136
W	0.408	0.100	0.83	4.2	0.485
WNW	0.323	0.095	0.74	4.4	0.183
NW	0.235	0.115	0.77	4.7	0.015
NNW	0.196	0.100	0.66	4.6	0.000
TOTAL:					1.998

THE WEIGHTED GUST STRENGTH FACTOR IS 4.0

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********************  GROUND POSITION  6     *************************
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Table 6.2.6

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.217	0.101	0.59	3.7	0.001
NNE	0.186	0.085	0.50	3.8	0.000
NE	0.178	0.090	0.54	4.0	0.000
ENE	0.172	0.089	0.51	3.8	0.000
E	0.115	0.078	0.53	5.3	0.000
ESE	0.082	0.055	0.42	6.2	0.000
SE	0.117	0.064	0.44	5.0	0.000
SSE	0.105	0.065	0.52	6.3	0.000
S	0.116	0.079	0.52	5.1	0.000
SSW	0.279	0.105	0.64	3.4	0.078
SW	0.399	0.119	0.85	3.7	0.644
WSW	0.296	0.146	0.82	3.6	0.046
W	0.297	0.094	0.67	3.9	0.025
WNW	0.449	0.122	0.91	3.8	0.852
NW	0.346	0.110	0.78	3.9	0.325
NNW	0.280	0.104	0.69	3.9	0.021
TOTAL:					1.990

THE WEIGHTED GUST STRENGTH FACTOR IS 4.2

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******************* GROUND POSITION 7 **************************
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Table 6.2.7

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.321	0.123	0.69	3.0	0.006
NNE	0.241	0.134	0.83	4.3	0.000
NE	0.493	0.095	0.86	3.9	0.048
ENE	0.573	0.094	0.97	4.2	0.149
E	0.619	0.093	0.98	3.9	0.168
ESE	0.615	0.100	1.07	4.6	0.401
SE	0.710	0.108	1.11	3.7	0.728
SSE	0.440	0.104	0.86	4.0	0.160
S	0.169	0.090	0.52	3.9	0.000
SSW	0.314	0.102	0.70	3.8	0.022
SW	0.421	0.121	0.91	4.1	0.215
WSW	0.281	0.130	0.80	4.0	0.001
W	0.306	0.089	0.60	3.3	0.002
WNW	0.383	0.114	0.81	3.7	0.043
NW	0.354	0.110	0.86	4.6	0.043
NNW	0.334	0.103	0.75	4.0	0.009
TOTAL:					1.995

THE WEIGHTED GUST STRENGTH FACTOR IS 3.9

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********************    GROUND POSITION  8      *****************************
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Table 6.2.8

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.124	0.087	0.55	4.9	0.000
NNE	0.225	0.105	0.69	4.4	0.000
NE	0.442	0.082	0.78	4.1	0.027
ENE	0.487	0.072	0.82	4.6	0.079
E	0.549	0.081	0.93	4.7	0.109
ESE	0.582	0.093	0.99	4.4	0.366
SE	0.696	0.112	1.05	3.2	0.742
SSE	0.475	0.100	0.96	4.9	0.289
S	0.182	0.112	0.61	3.9	0.000
SSW	0.341	0.082	0.62	3.4	0.070
SW	0.395	0.080	0.72	4.1	0.165
WSW	0.204	0.079	0.58	4.7	0.000
W	0.346	0.134	0.74	2.9	0.013
WNW	0.225	0.125	0.64	3.4	0.000
NW	0.110	0.076	0.55	5.7	0.000
NNW	0.408	0.112	0.79	3.4	0.136
TOTAL:					1.996

THE WEIGHTED GUST STRENGTH FACTOR IS 4.2

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*******************   GROUND POSITION 9   ************************
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Table 6.2.9

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.143	0.083	0.50	4.3	0.000
NNE	0.339	0.101	0.66	3.1	0.006
NE	0.466	0.091	0.86	4.4	0.044
ENE	0.490	0.131	0.93	3.4	0.086
E	0.377	0.140	0.81	3.1	0.009
ESE	0.241	0.128	0.76	4.0	0.001
SE	0.177	0.074	0.64	6.2	0.000
SSE	0.157	0.074	0.54	5.2	0.000
S	0.136	0.075	0.53	5.3	0.000
SSW	0.429	0.101	0.85	4.2	0.431
SW	0.568	0.117	1.13	4.8	1.235
WSW	0.431	0.143	0.96	3.7	0.182
W	0.160	0.114	0.75	5.2	0.000
WNW	0.290	0.144	0.95	4.6	0.001
NW	0.235	0.129	0.77	4.1	0.000
NNW	0.180	0.107	0.64	4.3	0.000
TOTAL:					1.995

THE WEIGHTED GUST STRENGTH FACTOR IS 4.4

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*******************                           ************************
*******************   GROUND POSITION 10      ************************
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Table 6.2.10

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.227	0.104	0.66	4.2	0.000
NNE	0.276	0.099	0.60	3.2	0.000
NE	0.216	0.088	0.59	4.2	0.000
ENE	0.172	0.079	0.58	5.2	0.000
E	0.198	0.095	0.60	4.2	0.000
ESE	0.225	0.107	0.67	4.1	0.000
SE	0.402	0.129	0.83	3.3	0.031
SSE	0.244	0.111	0.74	4.4	0.000
S	0.142	0.077	0.49	4.5	0.000
SSW	0.193	0.089	0.64	5.0	0.000
SW	0.224	0.096	0.66	4.5	0.000
WSW	0.213	0.103	0.64	4.1	0.000
W	0.452	0.134	1.00	4.1	0.072
WNW	0.604	0.114	1.05	3.9	0.800
NW	0.566	0.107	1.00	4.1	1.013
NNW	0.426	0.114	0.93	4.4	0.080
TOTAL:					1.996

THE WEIGHTED GUST STRENGTH FACTOR IS 4.2

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********************                                 ************************
********************   GROUND POSITION 11            ************************
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Table 6.2.11

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.297	0.131	0.75	3.5	0.000
NNE	0.269	0.115	0.72	4.0	0.000
NE	0.410	0.083	0.72	3.7	0.002
ENE	0.404	0.078	0.75	4.4	0.004
E	0.416	0.078	0.73	4.0	0.002
ESE	0.415	0.074	0.69	3.8	0.018
SE	0.447	0.089	0.75	3.4	0.027
SSE	0.394	0.077	0.68	3.7	0.012
S	0.150	0.079	0.48	4.1	0.000
SSW	0.107	0.067	0.45	5.2	0.000
SW	0.204	0.118	0.68	4.0	0.000
WSW	0.197	0.124	0.78	4.7	0.000
W	0.545	0.129	1.14	4.6	0.120
WNW	0.651	0.112	1.09	3.9	0.621
NW	0.639	0.109	1.08	4.0	1.008
NNW	0.529	0.113	0.98	4.0	0.195
TOTAL:					2.009

THE WEIGHTED GUST STRENGTH FACTOR IS 4.1

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********************   GROUND POSITION 12    *************************
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Table 6.2.12

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.272	0.117	0.65	3.2	0.002
NNE	0.262	0.112	0.61	3.1	0.000
NE	0.460	0.106	0.87	3.9	0.060
ENE	0.516	0.110	0.92	3.6	0.147
E	0.575	0.090	0.91	3.7	0.190
ESE	0.564	0.088	0.86	3.4	0.421
SE	0.666	0.093	0.97	3.2	0.808
SSE	0.435	0.103	0.79	3.4	0.271
S	0.106	0.072	0.40	4.1	0.000
SSW	0.062	0.033	0.34	8.3	0.000
SW	0.114	0.066	0.57	6.9	0.000
WSW	0.109	0.085	0.58	5.6	0.000
W	0.196	0.066	0.50	4.6	0.000
WNW	0.320	0.071	0.60	3.9	0.017
NW	0.333	0.076	0.62	3.7	0.068
NNW	0.306	0.103	0.73	4.1	0.010
TOTAL:					1.996

THE WEIGHTED GUST STRENGTH FACTOR IS 4.5

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********************   GROUND POSITION 13       *************************
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Table 6.2.13

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.185	0.090	0.54	3.9	0.000
NNE	0.271	0.121	0.68	3.4	0.003
NE	0.158	0.108	0.73	5.3	0.000
ENE	0.075	0.048	0.36	5.9	0.000
E	0.079	0.053	0.39	5.8	0.000
ESE	0.189	0.108	0.73	5.0	0.000
SE	0.172	0.100	0.69	5.2	0.000
SSE	0.253	0.111	0.65	3.6	0.007
S	0.187	0.107	0.61	3.9	0.000
SSW	0.385	0.094	0.72	3.5	0.562
SW	0.454	0.101	0.85	3.9	0.963
WSW	0.429	0.143	0.88	3.2	0.435
W	0.287	0.101	0.68	3.9	0.011
WNW	0.214	0.082	0.58	4.4	0.000
NW	0.267	0.136	0.70	3.2	0.015
NNW	0.244	0.101	0.69	4.4	0.001
TOTAL:					1.996

THE WEIGHTED GUST STRENGTH FACTOR IS 4.[illegible]

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*******************                         ************************
********************   GROUND POSITION 14   ************************
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Table 6.2.14

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.285	0.134	0.81	3.9	0.007
NNE	0.405	0.149	1.11	4.7	0.070
NE	0.335	0.131	0.86	4.0	0.006
ENE	0.267	0.112	0.60	3.0	0.002
E	0.298	0.116	0.69	3.4	0.002
ESE	0.377	0.136	0.83	3.4	0.088
SE	0.540	0.136	1.01	3.5	0.476
SSE	0.445	0.108	0.83	3.6	0.363
S	0.394	0.125	0.89	3.9	0.360
SSW	0.294	0.101	0.74	4.4	0.049
SW	0.324	0.103	0.71	3.8	0.080
WSW	0.238	0.099	0.71	4.7	0.001
W	0.376	0.109	0.84	4.2	0.086
WNW	0.414	0.101	0.83	4.1	0.290
NW	0.337	0.113	0.73	3.5	0.111
NNW	0.251	0.112	0.71	4.1	0.001
TOTAL:					1.992

THE WEIGHTED GUST STRENGTH FACTOR IS 4.0

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******************* GROUND POSITION 15 ************************
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Table 6.2.15

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.215	0.091	0.59	4.1	0.085
NNE	0.248	0.088	0.59	3.9	0.083
NE	0.128	0.063	0.46	5.2	0.000
ENE	0.103	0.067	0.48	5.7	0.000
E	0.158	0.105	0.68	4.9	0.001
ESE	0.180	0.080	0.55	4.6	0.020
SE	0.191	0.083	0.52	4.0	0.026
SSE	0.128	0.070	0.44	4.5	0.000
S	0.136	0.069	0.46	4.7	0.002
SSW	0.144	0.079	0.50	4.5	0.004
SW	0.144	0.071	0.48	4.8	0.002
WSW	0.118	0.073	0.54	5.7	0.000
W	0.279	0.115	0.71	3.8	0.370
WNW	0.297	0.109	0.68	3.5	0.850
NW	0.239	0.114	0.83	5.2	0.453
NNW	0.212	0.097	0.64	4.4	0.101
TOTAL:					1.995

THE WEIGHTED GUST STRENGTH FACTOR IS 4.5

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********************   GROUND POSITION 16   ************************
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Table 6.2.16

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.204	0.096	0.60	4.1	0.154
NNE	0.186	0.107	0.71	4.9	0.025
NE	0.262	0.112	0.69	3.8	0.117
ENE	0.143	0.097	0.58	4.5	0.002
E	0.198	0.115	0.70	4.3	0.020
ESE	0.160	0.066	0.47	4.7	0.021
SE	0.167	0.070	0.56	5.7	0.025
SSE	0.151	0.064	0.43	4.4	0.015
S	0.165	0.060	0.45	4.8	0.072
SSW	0.161	0.069	0.43	3.9	0.072
SW	0.178	0.069	0.46	4.1	0.114
WSW	0.146	0.072	0.47	4.5	0.008
W	0.168	0.083	0.56	4.7	0.019
WNW	0.188	0.088	0.52	3.8	0.086
NW	0.216	0.107	0.66	4.1	0.530
NNW	0.239	0.116	0.76	4.5	0.720
TOTAL:					2.000

THE WEIGHTED GUST STRENGTH FACTOR IS 4.3

GROUND POSITION 17

Table 6.2.17

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.300	0.139	0.78	3.4	0.001
NNE	0.138	0.085	0.61	5.6	0.000
NE	0.127	0.084	0.54	5.0	0.000
ENE	0.168	0.098	0.56	4.0	0.000
E	0.333	0.116	0.72	3.4	0.001
ESE	0.497	0.104	0.88	3.7	0.134
SE	0.605	0.115	0.99	3.3	0.350
SSE	0.445	0.097	0.80	3.7	0.116
S	0.428	0.120	0.88	3.8	0.175
SSW	0.306	0.096	0.66	3.7	0.008
SW	0.348	0.103	0.74	3.9	0.022
WSW	0.225	0.107	0.65	4.0	0.000
W	0.329	0.138	0.95	4.5	0.002
WNW	0.595	0.091	0.94	3.8	0.780
NW	0.429	0.127	1.03	4.8	0.164
NNW	0.477	0.105	0.91	4.1	0.248
TOTAL:					1.999

THE WEIGHTED GUST STRENGTH FACTOR IS 4.1

GROUND POSITION 18

Table 6.2.18

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.174	0.080	0.57	4.9	0.000
NNE	0.343	0.114	0.82	4.2	0.013
NE	0.405	0.129	0.80	3.1	0.024
ENE	0.412	0.163	0.91	3.0	0.046
E	0.225	0.139	1.05	6.0	0.000
ESE	0.215	0.102	0.60	3.8	0.000
SE	0.214	0.085	0.52	3.7	0.000
SSE	0.258	0.107	0.72	4.3	0.003
S	0.198	0.074	0.59	5.3	0.000
SSW	0.184	0.091	0.57	4.3	0.000
SW	0.294	0.114	0.65	3.1	0.020
WSW	0.311	0.102	0.68	3.7	0.019
W	0.326	0.144	0.97	4.5	0.015
WNW	0.451	0.113	0.86	3.6	0.401
NW	0.511	0.114	0.95	3.9	1.398
NNW	0.349	0.111	0.77	3.8	0.057
TOTAL:					1.996

THE WEIGHTED GUST STRENGTH FACTOR IS 4.0

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********************   GROUND POSITION 19    ************************
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Table 6.2.19

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.170	0.107	0.73	5.2	0.000
NNE	0.100	0.058	0.46	6.2	0.000
NE	0.143	0.061	0.42	4.5	0.000
ENE	0.199	0.078	0.49	3.7	0.000
E	0.231	0.076	0.51	3.6	0.000
ESE	0.227	0.112	0.58	3.2	0.002
SE	0.147	0.088	0.64	5.7	0.000
SSE	0.178	0.079	0.49	3.9	0.000
S	0.157	0.098	0.63	4.8	0.000
SSW	0.166	0.087	0.56	4.5	0.000
SW	0.239	0.101	0.69	4.5	0.005
WSW	0.208	0.085	0.58	4.4	0.000
W	0.233	0.109	0.66	4.0	0.001
WNW	0.370	0.116	0.83	3.9	0.211
NW	0.481	0.122	0.99	4.2	1.701
NNW	0.321	0.127	0.77	3.5	0.074
TOTAL:					1.994

THE WEIGHTED GUST STRENGTH FACTOR IS 4.3

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******************* GROUND POSITION 20 ***********************
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Table 6.2.20

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.090	0.071	0.48	5.5	0.000
NNE	0.054	0.037	0.26	5.6	0.000
NE	0.077	0.052	0.32	4.7	0.000
ENE	0.083	0.049	0.37	6.0	0.000
E	0.110	0.058	0.36	4.4	0.000
ESE	0.125	0.068	0.50	5.6	0.000
SE	0.127	0.077	0.52	5.1	0.000
SSE	0.080	0.049	0.37	6.0	0.000
S	0.072	0.042	0.38	7.2	0.000
SSW	0.134	0.086	0.56	5.0	0.000
SW	0.281	0.127	0.69	3.3	0.441
WSW	0.207	0.106	0.69	4.5	0.021
W	0.211	0.108	0.66	4.2	0.012
WNW	0.317	0.106	0.68	3.4	0.591
NW	0.309	0.109	0.71	3.7	0.927
NNW	0.148	0.082	0.48	4.1	0.000
TOTAL:					1.993

THE WEIGHTED GUST STRENGTH FACTOR IS 4.7

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******************* GROUND POSITION 21 ***********************
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Table 6.2.21

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.114	0.069	0.44	4.7	0.000
NNE	0.170	0.089	0.59	4.7	0.000
NE	0.260	0.115	0.68	3.6	0.001
ENE	0.356	0.089	0.65	3.3	0.042
E	0.301	0.094	0.60	3.2	0.007
ESE	0.220	0.118	0.68	3.9	0.002
SE	0.188	0.094	0.68	5.3	0.000
SSE	0.266	0.115	0.79	4.5	0.017
S	0.188	0.092	0.68	5.3	0.000
SSW	0.206	0.096	0.59	4.0	0.001
SW	0.188	0.097	0.58	4.0	0.000
WSW	0.174	0.086	0.60	5.0	0.000
W	0.235	0.120	0.68	3.7	0.001
WNW	0.422	0.115	0.88	4.0	0.585
NW	0.443	0.111	0.92	4.3	1.319
NNW	0.278	0.115	0.83	4.8	0.017
TOTAL:					1.992

THE WEIGHTED GUST STRENGTH FACTOR IS 4.4

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********************  GROUND POSITION 22     *************************
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Table 6.2.22

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.096	0.062	0.49	6.3	0.000
NNE	0.175	0.077	0.65	6.2	0.000
NE	0.278	0.094	0.62	3.7	0.000
ENE	0.369	0.075	0.64	3.7	0.012
E	0.305	0.075	0.64	4.5	0.001
ESE	0.346	0.099	0.73	3.9	0.022
SE	0.378	0.114	0.83	4.0	0.038
SSE	0.459	0.113	0.86	3.5	0.224
S	0.430	0.196	1.02	3.0	0.296
SSW	0.278	0.093	0.73	4.9	0.006
SW	0.222	0.088	0.58	4.1	0.000
WSW	0.195	0.096	0.63	4.5	0.000
W	0.295	0.137	0.83	3.9	0.001
WNW	0.481	0.111	0.86	3.4	0.351
NW	0.523	0.121	0.99	3.9	1.045
NNW	0.239	0.099	0.63	4.0	0.000
TOTAL:					1.995

THE WEIGHTED GUST STRENGTH FACTOR IS 4.2

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******************* GROUND POSITION 23 ***********************
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Table 6.2.23

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.138	0.060	0.41	4.6	0.000
NNE	0.159	0.072	0.54	5.3	0.000
NE	0.181	0.086	0.59	4.7	0.000
ENE	0.156	0.078	0.51	4.6	0.000
E	0.159	0.083	0.73	6.9	0.000
ESE	0.213	0.104	0.67	4.4	0.001
SE	0.284	0.130	0.81	4.0	0.021
SSE	0.284	0.102	0.78	4.8	0.031
S	0.324	0.108	0.77	4.1	0.186
SSW	0.229	0.126	0.81	4.6	0.007
SW	0.386	0.124	0.84	3.6	0.511
WSW	0.427	0.100	0.84	4.1	0.491
W	0.270	0.101	0.70	4.3	0.007
WNW	0.307	0.110	0.76	4.2	0.045
NW	0.392	0.132	0.92	4.0	0.693
NNW	0.161	0.086	0.59	5.0	0.000
TOTAL:					1.994

THE WEIGHTED GUST STRENGTH FACTOR IS 4.5

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*******************   GROUND POSITION 24       ************************
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Table 6.2.24

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.093	0.052	0.41	6.1	0.000
NNE	0.143	0.069	0.46	4.5	0.000
NE	0.247	0.090	0.57	3.5	0.000
ENE	0.234	0.079	0.60	4.7	0.001
E	0.212	0.086	0.58	4.3	0.000
ESE	0.344	0.094	0.79	4.7	0.063
SE	0.361	0.119	0.84	4.0	0.083
SSE	0.405	0.095	0.75	3.6	0.270
S	0.472	0.141	0.92	3.2	0.981
SSW	0.190	0.101	0.71	5.1	0.000
SW	0.381	0.107	0.79	3.8	0.349
WSW	0.331	0.093	0.70	4.0	0.069
W	0.186	0.087	0.59	4.7	0.000
WNW	0.218	0.089	0.63	4.7	0.000
NW	0.341	0.132	0.82	3.6	0.174
NNW	0.132	0.076	0.56	5.5	0.000
TOTAL:					1.992

THE WEIGHTED GUST STRENGTH FACTOR IS 4.4

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GROUND POSITION 25

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Table 6.2.25

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.113	0.063	0.52	6.5	0.000
NNE	0.165	0.060	0.42	4.2	0.000
NE	0.232	0.101	0.70	4.6	0.000
ENE	0.320	0.123	0.81	3.9	0.014
E	0.253	0.093	0.72	5.0	0.000
ESE	0.322	0.096	0.76	4.5	0.042
SE	0.378	0.106	0.83	4.3	0.111
SSE	0.469	0.133	0.92	3.4	0.542
S	0.232	0.128	0.88	5.1	0.004
SSW	0.325	0.095	0.80	5.0	0.163
SW	0.402	0.097	0.79	4.0	0.480
WSW	0.442	0.102	0.89	4.4	0.451
W	0.230	0.095	0.72	5.1	0.000
WNW	0.331	0.125	0.96	5.0	0.059
NW	0.331	0.111	0.80	4.3	0.132
NNW	0.175	0.081	0.61	5.3	0.000
TOTAL:					1.998

THE WEIGHTED GUST STRENGTH FACTOR IS 4.8

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******************** GROUND POSITION 26   ************************
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Table 6.2.26

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.175	0.065	0.46	4.4	0.000
NNE	0.103	0.054	0.37	5.0	0.000
NE	0.156	0.085	0.58	5.0	0.000
ENE	0.344	0.111	0.80	4.1	0.030
E	0.404	0.096	0.75	3.6	0.056
ESE	0.361	0.109	0.77	3.8	0.105
SE	0.457	0.120	1.12	5.5	0.342
SSE	0.459	0.145	0.98	3.6	0.586
S	0.178	0.113	0.80	5.5	0.000
SSW	0.291	0.094	0.77	5.1	0.093
SW	0.363	0.100	0.77	4.1	0.336
WSW	0.424	0.123	0.81	3.2	0.448
W	0.199	0.106	0.71	4.9	0.000
WNW	0.091	0.053	0.34	4.6	0.000
NW	0.146	0.069	0.45	4.4	0.000
NNW	0.240	0.088	0.54	3.3	0.001
TOTAL:					1.997

THE WEIGHTED GUST STRENGTH FACTOR IS   4.4

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********************  GROUND POSITION 27    ************************
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Table 6.2.27

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.121	0.072	0.53	5.6	0.000
NNE	0.134	0.089	0.67	6.0	0.000
NE	0.266	0.148	0.88	4.2	0.008
ENE	0.338	0.129	0.88	4.2	0.081
E	0.306	0.098	0.73	4.4	0.030
ESE	0.337	0.085	0.72	4.6	0.184
SE	0.361	0.081	0.65	3.6	0.271
SSE	0.396	0.086	0.69	3.5	0.668
S	0.284	0.144	0.77	3.4	0.241
SSW	0.296	0.081	0.58	3.5	0.390
SW	0.254	0.090	0.58	3.6	0.091
WSW	0.162	0.073	0.53	5.0	0.000
W	0.260	0.112	0.77	4.5	0.033
WNW	0.183	0.092	0.63	4.9	0.000
NW	0.180	0.100	0.69	5.1	0.001
NNW	0.133	0.072	0.53	5.6	0.000
TOTAL:					1.997

THE WEIGHTED GUST STRENGTH FACTOR IS 4.6

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********************   GROUND POSITION 28     **************************
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Table 6.2.28

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.111	0.074	0.56	6.1	0.000
NNE	0.229	0.123	0.67	3.6	0.001
NE	0.277	0.112	0.82	4.8	0.003
ENE	0.338	0.111	0.82	4.3	0.033
E	0.308	0.097	0.65	3.5	0.009
ESE	0.314	0.112	0.89	5.1	0.055
SE	0.298	0.090	0.64	3.7	0.035
SSE	0.377	0.088	0.70	3.7	0.265
S	0.263	0.146	0.87	4.1	0.038
SSW	0.204	0.079	0.53	4.2	0.002
SW	0.308	0.081	0.60	3.5	0.128
WSW	0.354	0.079	0.61	3.2	0.188
W	0.388	0.087	0.81	4.9	0.230
WNW	0.389	0.093	0.75	3.8	0.388
NW	0.376	0.112	0.84	4.2	0.593
NNW	0.283	0.130	0.86	4.4	0.025
TOTAL:					1.991

THE WEIGHTED GUST STRENGTH FACTOR IS 4.2

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********************   GROUND POSITION 29   *************************
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Table 6.2.29

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.326	0.109	0.78	4.2	0.021
NNE	0.411	0.109	0.91	4.6	0.056
NE	0.447	0.102	0.87	4.2	0.047
ENE	0.398	0.098	0.86	4.7	0.036
E	0.399	0.128	0.95	4.3	0.023
ESE	0.312	0.114	0.85	4.8	0.018
SE	0.244	0.128	0.84	4.6	0.001
SSE	0.316	0.119	0.79	4.0	0.024
S	0.456	0.102	0.83	3.7	0.612
SSW	0.453	0.146	0.95	3.4	0.756
SW	0.401	0.127	0.91	4.0	0.294
WSW	0.373	0.091	0.73	3.9	0.095
W	0.251	0.101	0.62	3.7	0.000
WNW	0.256	0.125	0.72	3.7	0.000
NW	0.294	0.141	0.81	3.6	0.013
NNW	0.173	0.101	0.63	4.5	0.000
TOTAL:					1.998

THE WEIGHTED GUST STRENGTH FACTOR IS 4.0

GROUND POSITION 30

Table 6.2.30

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.309	0.112	0.80	4.4	0.004
NNE	0.397	0.118	0.82	3.6	0.022
NE	0.403	0.104	0.97	5.4	0.011
ENE	0.390	0.099	0.76	3.8	0.018
E	0.354	0.103	0.83	4.6	0.004
ESE	0.228	0.105	0.69	4.4	0.000
SE	0.177	0.090	0.59	4.6	0.000
SSE	0.355	0.121	0.77	3.5	0.034
S	0.475	0.097	0.83	3.6	0.501
SSW	0.557	0.120	0.96	3.4	1.272
SW	0.387	0.142	0.95	3.9	0.126
WSW	0.295	0.110	0.70	3.7	0.003
W	0.193	0.090	0.57	4.2	0.000
WNW	0.186	0.107	0.71	4.9	0.000
NW	0.200	0.115	0.67	4.1	0.000
NNW	0.171	0.093	0.56	4.2	0.000
TOTAL:					1.996

THE WEIGHTED GUST STRENGTH FACTOR IS 4.1

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*******************   GROUND POSITION 31   ************************
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Table 6.2.31

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.163	0.098	0.67	5.1	0.000
NNE	0.352	0.108	0.93	5.4	0.005
NE	0.411	0.092	0.77	3.9	0.010
ENE	0.374	0.098	0.83	4.7	0.010
E	0.366	0.109	0.79	3.9	0.004
ESE	0.204	0.100	0.84	6.4	0.000
SE	0.176	0.100	0.64	4.7	0.000
SSE	0.419	0.101	0.76	3.3	0.105
S	0.562	0.105	0.99	4.1	0.932
SSW	0.528	0.191	1.01	2.5	0.927
SW	0.261	0.152	0.90	4.2	0.001
WSW	0.224	0.085	0.76	6.3	0.000
W	0.142	0.064	0.59	7.0	0.000
WNW	0.139	0.070	0.53	5.6	0.000
NW	0.164	0.093	0.68	5.5	0.000
NNW	0.120	0.073	0.54	5.8	0.000
TOTAL:					1.995

THE WEIGHTED GUST STRENGTH FACTOR IS 5.0

GROUND POSITION 32

Table 6.2.32

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.301	0.117	0.72	5.6	0.000
NNE	0.363	0.120	0.87	4.2	0.001
NE	0.399	0.100	0.85	4.5	0.002
ENE	0.371	0.097	0.78	4.2	0.003
E	0.333	0.106	0.77	4.1	0.000
ESE	0.197	0.092	0.59	4.3	0.000
SE	0.160	0.091	0.64	5.3	0.000
SSE	0.367	0.113	0.81	4.0	0.009
S	0.513	0.105	0.85	3.2	0.306
SSW	0.600	0.100	1.07	4.7	0.877
SW	0.589	0.110	1.10	4.6	0.634
WSW	0.506	0.110	0.88	3.5	0.145
W	0.447	0.113	0.90	4.0	0.030
WNW	0.217	0.107	0.66	4.2	0.000
NW	0.181	0.105	0.76	5.5	0.000
NNW	0.150	0.086	0.63	5.6	0.000
TOTAL:					2.007

THE WEIGHTED GUST STRENGTH FACTOR IS 4.4

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******************* GROUND POSITION 33 **********************
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Table 6.2.33

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.278	0.108	0.70	3.9	0.000
NNE	0.236	0.109	0.75	4.7	0.000
NE	0.199	0.095	0.61	4.3	0.000
ENE	0.178	0.095	0.64	4.9	0.000
E	0.186	0.095	0.59	4.3	0.000
ESE	0.172	0.097	0.77	6.1	0.000
SE	0.279	0.141	0.81	3.8	0.000
SSE	0.530	0.126	0.99	3.7	0.289
S	0.470	0.124	0.92	3.6	0.278
SSW	0.511	0.115	0.98	4.0	0.572
SW	0.505	0.111	0.90	3.6	0.405
WSW	0.518	0.105	0.88	3.4	0.264
W	0.489	0.092	0.89	4.4	0.120
WNW	0.430	0.117	1.04	5.2	0.061
NW	0.242	0.114	0.84	5.3	0.000
NNW	0.197	0.100	0.61	4.2	0.000
TOTAL:					1.991

THE WEIGHTED GUST STRENGTH FACTOR IS 4.3

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******************** GROUND POSITION 34   *************************
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Table 6.2.34

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.132	0.079	0.50	4.7	0.000
NNE	0.291	0.108	0.74	4.1	0.001
NE	0.386	0.085	0.78	4.6	0.007
ENE	0.408	0.101	0.84	4.3	0.025
E	0.386	0.106	0.85	4.4	0.009
ESE	0.296	0.108	0.83	5.0	0.005
SE	0.204	0.109	0.68	4.3	0.000
SSE	0.343	0.097	0.76	4.2	0.024
S	0.378	0.106	0.82	4.2	0.119
SSW	0.415	0.106	0.78	3.4	0.294
SW	0.508	0.110	0.94	3.9	0.692
WSW	0.575	0.106	1.02	4.2	0.702
W	0.443	0.095	0.78	3.6	0.117
WNW	0.310	0.103	0.73	4.1	0.003
NW	0.130	0.066	0.43	4.6	0.000
NNW	0.105	0.067	0.51	6.0	0.000
TOTAL:					1.997

THE WEIGHTED GUST STRENGTH FACTOR IS 4.4

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********************   GROUND POSITION 35   *************************
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Table 6.2.35

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.086	0.050	0.37	5.6	0.000
NNE	0.166	0.074	0.52	4.8	0.000
NE	0.161	0.069	0.54	5.5	0.000
ENE	0.195	0.113	0.85	5.8	0.000
E	0.266	0.130	0.69	3.2	0.000
ESE	0.318	0.102	0.73	4.1	0.004
SE	0.296	0.108	0.74	4.1	0.001
SSE	0.371	0.114	0.84	4.1	0.019
S	0.352	0.122	0.80	3.7	0.024
SSW	0.462	0.119	0.91	3.7	0.301
SW	0.573	0.119	1.04	4.0	0.747
WSW	0.654	0.114	1.03	3.3	0.774
W	0.493	0.098	0.88	4.0	0.121
WNW	0.331	0.104	0.75	4.0	0.002
NW	0.188	0.084	0.60	4.9	0.000
NNW	0.118	0.070	0.55	6.1	0.000
TOTAL:					1.991

THE WEIGHTED GUST STRENGTH FACTOR IS 4.5

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********************   GROUND POSITION 36    *************************
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Table 6.2.36

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.097	0.053	0.39	5.6	0.000
NNE	0.136	0.078	0.59	5.8	0.000
NE	0.221	0.105	0.74	5.0	0.000
ENE	0.185	0.093	0.77	6.3	0.000
E	0.201	0.104	0.67	4.5	0.000
ESE	0.317	0.110	0.84	4.7	0.019
SE	0.332	0.098	0.68	3.6	0.023
SSE	0.330	0.105	0.71	3.6	0.033
S	0.287	0.112	0.77	4.3	0.018
SSW	0.370	0.119	0.79	3.5	0.218
SW	0.470	0.120	0.92	3.7	0.669
WSW	0.560	0.120	1.05	4.1	0.833
W	0.436	0.101	0.95	5.0	0.174
WNW	0.300	0.096	0.72	4.4	0.005
NW	0.199	0.077	0.53	4.3	0.000
NNW	0.112	0.060	0.42	5.1	0.000
TOTAL:					1.992

THE WEIGHTED GUST STRENGTH FACTOR IS 4.5

GROUND POSITION 37

Table 6.2.37

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.090	0.049	0.35	5.3	0.000
NNE	0.130	0.063	0.46	5.2	0.000
NE	0.164	0.075	0.51	4.6	0.000
ENE	0.151	0.077	0.61	5.9	0.000
E	0.206	0.099	0.67	4.7	0.000
ESE	0.325	0.106	0.87	5.1	0.038
SE	0.317	0.095	0.75	4.5	0.028
SSE	0.317	0.106	0.71	3.7	0.043
S	0.265	0.103	0.80	5.2	0.015
SSW	0.368	0.114	0.80	3.8	0.339
SW	0.444	0.120	0.94	4.1	0.716
WSW	0.497	0.106	1.03	5.0	0.691
W	0.386	0.105	0.82	4.2	0.122
WNW	0.252	0.096	0.74	5.1	0.001
NW	0.199	0.078	0.52	4.1	0.000
NNW	0.107	0.055	0.45	6.2	0.000
TOTAL:					1.993

THE WEIGHTED GUST STRENGTH FACTOR IS 4.8

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********************   GROUND POSITION 38   **************************
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Table 6.2.38

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.095	0.054	0.39	5.5	0.000
NNE	0.106	0.056	0.39	5.0	0.000
NE	0.151	0.083	0.54	4.6	0.000
ENE	0.145	0.080	0.57	5.3	0.000
E	0.204	0.100	0.65	4.5	0.000
ESE	0.329	0.118	0.98	5.5	0.098
SE	0.292	0.084	0.65	4.3	0.045
SSE	0.254	0.089	0.73	5.3	0.020
S	0.246	0.100	0.72	4.8	0.032
SSW	0.310	0.108	0.72	3.8	0.276
SW	0.384	0.100	0.80	4.1	0.696
WSW	0.429	0.104	0.91	4.6	0.674
W	0.344	0.104	0.74	3.8	0.146
WNW	0.248	0.088	0.64	4.5	0.007
NW	0.162	0.070	0.50	4.8	0.000
NNW	0.093	0.049	0.38	6.0	0.000
TOTAL:					1.992

THE WEIGHTED GUST STRENGTH FACTOR IS 4.8

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******************** GROUND POSITION 39   ************************
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Table 6.2.39

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.090	0.049	0.30	4.2	0.000
NNE	0.109	0.056	0.46	6.2	0.000
NE	0.143	0.072	0.51	5.1	0.000
ENE	0.157	0.081	0.73	7.1	0.000
E	0.203	0.099	0.62	4.2	0.000
ESE	0.311	0.095	0.71	4.3	0.066
SE	0.307	0.086	0.67	4.2	0.058
SSE	0.276	0.101	0.65	3.7	0.039
S	0.241	0.099	0.68	4.4	0.023
SSW	0.311	0.110	0.73	3.8	0.257
SW	0.373	0.114	0.79	3.7	0.571
WSW	0.447	0.118	0.93	4.1	0.751
W	0.366	0.117	0.74	3.2	0.203
WNW	0.276	0.092	0.63	3.8	0.025
NW	0.177	0.080	0.56	4.7	0.000
NNW	0.093	0.049	0.39	6.0	0.000
TOTAL:					1.994

THE WEIGHTED GUST STRENGTH FACTOR IS 4.5

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********************   GROUND POSITION 40  ************************
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Table 6.2.40

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.068	0.043	0.35	6.7	0.000
NNE	0.075	0.043	0.31	5.6	0.000
NE	0.107	0.061	0.43	5.3	0.000
ENE	0.141	0.074	0.49	4.6	0.000
E	0.159	0.082	0.57	5.0	0.000
ESE	0.283	0.097	0.70	4.3	0.054
SE	0.314	0.102	0.76	4.4	0.101
SSE	0.297	0.112	0.75	4.1	0.113
S	0.204	0.088	0.69	5.6	0.007
SSW	0.262	0.104	0.78	5.0	0.111
SW	0.397	0.120	0.84	3.7	0.999
WSW	0.397	0.111	0.82	3.8	0.593
W	0.256	0.080	0.60	4.3	0.015
WNW	0.216	0.087	0.63	4.8	0.002
NW	0.114	0.057	0.38	4.7	0.000
NNW	0.065	0.040	0.35	7.1	0.000
TOTAL:					1.994

THE WEIGHTED GUST STRENGTH FACTOR IS 5.0

GROUND POSITION 1

Table 6.3.1

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.331	0.131	0.81	3.7	0.034
NNE	0.325	0.120	0.92	5.0	0.009
NE	0.285	0.121	0.78	4.1	0.001
ENE	0.409	0.112	0.82	3.7	0.050
E	0.412	0.131	0.87	3.5	0.035
ESE	0.372	0.127	0.88	4.0	0.073
SE	0.234	0.095	0.59	3.8	0.001
SSE	0.159	0.101	0.57	4.0	0.000
S	0.180	0.078	0.57	5.0	0.000
SSW	0.442	0.110	0.86	3.8	0.759
SW	0.451	0.114	0.92	4.1	0.659
WSW	0.450	0.123	1.01	4.6	0.373
W	0.130	0.077	0.47	4.5	0.000
WNW	0.166	0.092	0.60	4.7	0.000
NW	0.159	0.096	0.64	5.0	0.000
NNW	0.227	0.109	0.77	5.0	0.000
TOTAL:					1.994

THE WEIGHTED GUST STRENGTH FACTOR IS 4.4

GROUND POSITION 2

Table 6.3.2

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.451	0.097	0.76	3.2	0.130
NNE	0.498	0.093	0.86	3.8	0.088
NE	0.483	0.096	0.85	3.8	0.033
ENE	0.540	0.080	0.85	3.9	0.098
E	0.470	0.082	0.77	3.7	0.030
ESE	0.307	0.089	0.62	3.6	0.005
SE	0.169	0.093	0.51	3.7	0.000
SSE	0.191	0.100	0.55	3.6	0.000
S	0.268	0.087	0.63	4.2	0.001
SSW	0.515	0.075	0.84	4.3	0.760
SW	0.529	0.082	0.91	4.7	0.675
WSW	0.457	0.085	0.78	3.8	0.166
W	0.327	0.123	0.69	3.0	0.003
WNW	0.227	0.141	0.68	3.2	0.000
NW	0.157	0.106	0.58	4.0	0.000
NNW	0.316	0.128	0.75	3.4	0.002
TOTAL:					1.991

THE WEIGHTED GUST STRENGTH FACTOR IS 3.7

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********************   GROUND POSITION  3    *************************
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Table 6.3.3

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.139	0.140	0.84	5.0	0.028
NNE	0.112	0.077	0.78	8.7	0.001
NE	0.136	0.082	0.64	6.1	0.003
ENE	0.203	0.112	0.60	3.5	0.113
E	0.176	0.106	0.65	4.5	0.036
ESE	0.095	0.066	0.44	5.3	0.001
SE	0.093	0.069	0.46	5.3	0.000
SSE	0.299	0.143	0.69	2.7	1.593
S	0.138	0.114	0.65	4.5	0.083
SSW	0.141	0.090	0.66	5.8	0.122
SW	0.106	0.051	0.60	9.7	0.003
WSW	0.096	0.051	0.39	5.7	0.000
W	0.059	0.038	0.32	6.9	0.000
WNW	0.054	0.033	0.22	5.1	0.000
NW	0.066	0.045	0.41	7.5	0.000
NNW	0.070	0.059	0.73	11.3	0.000
TOTAL:					1.984

THE WEIGHTED GUST STRENGTH FACTOR IS 6.6

GROUND POSITION 4

Table 6.3.4

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.422	0.148	0.89	3.2	0.192
NNE	0.477	0.145	0.98	3.5	0.141
NE	0.509	0.098	0.91	4.0	0.100
ENE	0.564	0.074	0.84	3.7	0.199
E	0.456	0.092	0.76	3.3	0.054
ESE	0.221	0.090	0.55	3.6	0.000
SE	0.184	0.088	0.63	5.1	0.000
SSE	0.347	0.138	0.77	3.0	0.054
S	0.220	0.081	0.57	4.3	0.000
SSW	0.400	0.083	0.74	4.1	0.375
SW	0.466	0.087	0.79	3.8	0.653
WSW	0.386	0.093	0.78	4.3	0.118
W	0.369	0.093	0.77	4.3	0.049
WNW	0.363	0.092	0.68	3.4	0.061
NW	0.213	0.128	0.70	3.8	0.000
NNW	0.198	0.132	0.73	4.0	0.000
TOTAL:					1.995

THE WEIGHTED GUST STRENGTH FACTOR IS 3.9

GROUND POSITION 7

Table 6.3.7

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.292	0.120	0.75	3.8	0.002
NNE	0.294	0.135	0.79	3.7	0.001
NE	0.510	0.081	0.83	3.9	0.063
ENE	0.566	0.089	0.95	4.3	0.146
E	0.577	0.087	0.88	3.6	0.127
ESE	0.644	0.118	0.99	2.9	0.475
SE	0.648	0.103	1.02	3.6	0.570
SSE	0.520	0.116	0.94	3.6	0.413
S	0.316	0.125	0.73	3.3	0.022
SSW	0.317	0.111	0.73	3.7	0.027
SW	0.347	0.108	0.76	3.8	0.044
WSW	0.355	0.127	0.79	3.4	0.029
W	0.278	0.097	0.68	4.2	0.000
WNW	0.313	0.097	0.64	3.4	0.003
NW	0.363	0.107	0.78	4.0	0.063
NNW	0.331	0.113	0.76	3.8	0.008
TOTAL:					1.994

THE WEIGHTED GUST STRENGTH FACTOR IS 3.7

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******************* GROUND POSITION 8 *********************
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Table 6.3.8

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.136	0.099	0.55	4.2	0.000
NNE	0.210	0.094	0.59	4.0	0.000
NE	0.466	0.074	0.77	4.1	0.032
ENE	0.507	0.078	0.80	3.8	0.082
E	0.524	0.068	0.84	4.6	0.071
ESE	0.619	0.097	0.94	3.3	0.402
SE	0.580	0.112	0.96	3.4	0.370
SSE	0.616	0.105	0.95	3.2	0.773
S	0.313	0.124	0.67	2.9	0.017
SSW	0.350	0.080	0.66	3.9	0.067
SW	0.396	0.074	0.66	3.6	0.131
WSW	0.320	0.080	0.68	4.6	0.008
W	0.355	0.127	0.75	3.1	0.012
WNW	0.355	0.153	0.81	3.0	0.016
NW	0.321	0.160	0.76	2.7	0.012
NNW	0.315	0.127	0.66	2.7	0.003
TOTAL:					1.996

THE WEIGHTED GUST STRENGTH FACTOR IS 3.4

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********************   GROUND POSITION  9      ************************
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Table 6.3.9

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.129	0.074	0.47	4.6	0.000
NNE	0.299	0.098	0.77	4.8	0.001
NE	0.484	0.087	0.82	3.9	0.051
ENE	0.459	0.142	1.03	4.0	0.057
E	0.304	0.156	0.93	4.0	0.001
ESE	0.253	0.153	0.79	3.5	0.001
SE	0.197	0.091	0.66	5.1	0.000
SSE	0.162	0.075	0.75	7.8	0.000
S	0.153	0.075	0.51	4.8	0.000
SSW	0.483	0.113	0.90	3.7	0.746
SW	0.538	0.096	0.96	4.4	0.956
WSW	0.437	0.122	0.89	3.7	0.184
W	0.145	0.098	0.57	4.4	0.000
WNW	0.260	0.127	0.71	3.5	0.000
NW	0.192	0.120	0.66	3.9	0.000
NNW	0.125	0.080	0.52	4.9	0.000
TOTAL:					1.997

THE WEIGHTED GUST STRENGTH FACTOR IS   4.4

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*******************   GROUND POSITION 10     ***************************
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Table 6.3.10

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.236	0.114	0.63	3.4	0.000
NNE	0.282	0.107	0.70	3.9	0.000
NE	0.202	0.083	0.59	4.7	0.000
ENE	0.188	0.091	0.68	5.4	0.000
E	0.173	0.087	0.55	4.3	0.000
ESE	0.201	0.107	0.72	4.9	0.000
SE	0.343	0.131	0.83	3.7	0.018
SSE	0.393	0.107	0.75	3.4	0.086
S	0.217	0.116	0.66	3.8	0.000
SSW	0.191	0.105	0.64	4.3	0.000
SW	0.151	0.075	0.58	5.7	0.000
WSW	0.219	0.104	0.70	4.6	0.000
W	0.393	0.115	0.81	3.6	0.047
WNW	0.538	0.099	0.94	4.0	0.713
NW	0.522	0.106	1.00	4.5	1.080
NNW	0.370	0.121	0.97	4.9	0.046
TOTAL:					1.991

THE WEIGHTED GUST STRENGTH FACTOR IS 4.3

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*******************   GROUND POSITION 5   ************************
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Table 6.3.5

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.307	0.132	0.78	3.6	0.075
NNE	0.323	0.125	0.74	3.3	0.037
NE	0.413	0.147	0.96	3.7	0.092
ENE	0.415	0.133	0.94	3.9	0.125
E	0.323	0.142	0.72	2.8	0.019
ESE	0.181	0.122	0.86	5.6	0.000
SE	0.178	0.141	0.85	4.8	0.000
SSE	0.242	0.149	0.92	4.6	0.011
S	0.153	0.082	0.65	6.1	0.000
SSW	0.329	0.106	0.73	3.8	0.372
SW	0.373	0.112	0.80	3.9	0.566
WSW	0.354	0.099	0.79	4.4	0.240
W	0.379	0.100	0.79	4.1	0.255
WNW	0.340	0.097	0.76	4.3	0.193
NW	0.241	0.119	0.77	4.5	0.011
NNW	0.203	0.111	0.70	4.4	0.000
TOTAL:					1.997

THE WEIGHTED GUST STRENGTH FACTOR IS   4.3

GROUND POSITION 6

Table 6.3.6

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.216	0.100	0.59	3.8	0.002
NNE	0.190	0.091	0.52	3.7	0.000
NE	0.192	0.092	0.60	4.4	0.000
ENE	0.179	0.093	0.56	4.2	0.000
E	0.128	0.072	0.48	4.8	0.000
ESE	0.092	0.067	0.52	6.4	0.000
SE	0.109	0.073	0.49	5.2	0.000
SSE	0.112	0.067	0.52	6.1	0.000
S	0.075	0.054	0.42	6.5	0.000
SSW	0.285	0.115	0.66	3.3	0.162
SW	0.313	0.122	0.98	5.5	0.229
WSW	0.338	0.156	0.91	3.7	0.211
W	0.288	0.080	0.58	3.6	0.036
WNW	0.414	0.098	0.88	4.7	0.785
NW	0.349	0.106	0.71	3.4	0.542
NNW	0.271	0.100	0.69	4.2	0.032
TOTAL:					1.999

THE WEIGHTED GUST STRENGTH FACTOR IS 4.4

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********************   GROUND POSITION 11   ***********************
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Table 6.3.11

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.268	0.162	0.85	3.6	0.000
NNE	0.216	0.107	0.61	3.7	0.000
NE	0.345	0.083	0.71	4.4	0.000
ENE	0.376	0.082	0.69	3.9	0.005
E	0.295	0.077	0.62	4.3	0.000
ESE	0.355	0.074	0.63	3.8	0.009
SE	0.398	0.081	0.64	3.0	0.021
SSE	0.371	0.092	0.68	3.3	0.016
S	0.181	0.071	0.45	3.7	0.000
SSW	0.115	0.082	0.55	5.3	0.000
SW	0.148	0.103	0.59	4.4	0.000
WSW	0.109	0.091	0.71	6.6	0.000
W	0.477	0.109	0.96	4.5	0.081
WNW	0.593	0.097	1.00	4.2	0.584
NW	0.603	0.109	1.10	4.5	1.139
NNW	0.469	0.114	0.97	4.4	0.137
TOTAL:					1.992

THE WEIGHTED GUST STRENGTH FACTOR IS 4.3

GROUND POSITION 12

Table 6.3.12

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.211	0.103	0.63	4.1	0.000
NNE	0.342	0.134	0.85	3.8	0.007
NE	0.433	0.095	0.78	3.6	0.025
ENE	0.541	0.099	0.91	3.7	0.137
E	0.534	0.083	0.89	4.2	0.100
ESE	0.561	0.084	0.88	3.8	0.335
SE	0.570	0.086	0.85	3.3	0.409
SSE	0.502	0.083	0.79	3.5	0.405
S	0.233	0.109	0.58	3.2	0.000
SSW	0.177	0.098	0.60	4.3	0.000
SW	0.130	0.091	0.59	5.1	0.000
WSW	0.089	0.076	0.62	6.9	0.000
W	0.288	0.081	0.56	3.3	0.001
WNW	0.408	0.065	0.73	4.9	0.117
NW	0.409	0.073	0.70	4.1	0.257
NNW	0.421	0.100	0.84	4.2	0.203
TOTAL:					1.997

THE WEIGHTED GUST STRENGTH FACTOR IS 4.2

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********************   GROUND POSITION 13            **********************
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Table 6.3.13

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.195	0.096	0.58	4.1	0.000
NNE	0.225	0.103	0.63	3.9	0.000
NE	0.199	0.097	0.56	3.7	0.000
ENE	0.073	0.043	0.41	7.7	0.000
E	0.097	0.066	0.43	5.1	0.000
ESE	0.176	0.099	0.61	4.4	0.000
SE	0.196	0.108	0.78	5.4	0.000
SSE	0.217	0.121	0.67	3.7	0.001
S	0.088	0.069	0.50	6.0	0.000
SSW	0.338	0.124	0.74	3.3	0.304
SW	0.437	0.105	1.01	5.4	0.908
WSW	0.468	0.114	0.89	3.7	0.717
W	0.259	0.098	0.75	5.0	0.004
WNW	0.297	0.117	0.80	4.3	0.030
NW	0.274	0.124	0.76	3.9	0.029
NNW	0.205	0.098	0.61	4.1	0.000
TOTAL:					1.994

THE WEIGHTED GUST STRENGTH FACTOR IS 4.4

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******************* GROUND POSITION 14   ***********************
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Table 6.3.14

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.301	0.149	0.97	4.5	0.020
NNE	0.418	0.161	1.20	4.9	0.104
NE	0.308	0.120	0.72	3.4	0.004
ENE	0.306	0.113	0.75	3.9	0.009
E	0.291	0.103	0.65	3.4	0.002
ESE	0.414	0.152	0.96	3.6	0.165
SE	0.510	0.136	0.98	3.5	0.434
SSE	0.504	0.107	0.94	4.1	0.700
S	0.215	0.101	0.71	4.9	0.001
SSW	0.276	0.093	0.76	5.2	0.035
SW	0.314	0.110	0.68	3.3	0.078
WSW	0.238	0.104	0.68	4.3	0.001
W	0.382	0.118	0.94	4.8	0.125
WNW	0.374	0.099	0.86	4.9	0.167
NW	0.337	0.119	0.81	4.0	0.146
NNW	0.246	0.108	0.74	4.5	0.001
TOTAL:					1.993

THE WEIGHTED GUST STRENGTH FACTOR IS 4.3

GROUND POSITION 15

Table 6.3.15

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.242	0.114	0.71	4.1	0.219
NNE	0.201	0.079	0.59	5.0	0.017
NE	0.131	0.064	0.48	5.5	0.000
ENE	0.123	0.074	0.50	5.1	0.000
E	0.162	0.094	0.57	4.3	0.001
ESE	0.292	0.094	0.64	3.7	0.302
SE	0.150	0.080	0.54	4.8	0.003
SSE	0.127	0.088	0.61	5.5	0.000
S	0.098	0.065	0.41	4.9	0.000
SSW	0.115	0.070	0.49	5.3	0.000
SW	0.112	0.067	0.45	5.1	0.000
WSW	0.109	0.066	0.45	5.2	0.000
W	0.242	0.094	0.69	4.7	0.164
WNW	0.275	0.110	0.67	3.6	0.592
NW	0.245	0.116	0.78	4.6	0.558
NNW	0.217	0.108	0.79	5.3	0.142
TOTAL:					1.999

THE WEIGHTED GUST STRENGTH FACTOR IS 4.8

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********************   GROUND POSITION 16   ************************
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Table 6.3.16

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.219	0.111	0.77	5.0	0.198
NNE	0.214	0.121	0.71	4.1	0.058
NE	0.312	0.125	0.91	4.7	0.230
ENE	0.167	0.105	0.76	5.6	0.007
E	0.202	0.104	0.60	3.9	0.019
ESE	0.289	0.105	0.63	3.2	0.393
SE	0.171	0.085	0.58	4.8	0.023
SSE	0.128	0.070	0.49	5.1	0.001
S	0.121	0.062	0.51	6.3	0.001
SSW	0.169	0.081	0.49	3.9	0.084
SW	0.190	0.096	0.78	6.1	0.156
WSW	0.147	0.072	0.48	4.6	0.006
W	0.158	0.080	0.51	4.4	0.006
WNW	0.174	0.086	0.62	5.2	0.027
NW	0.202	0.097	0.59	4.0	0.262
NNW	0.235	0.119	0.80	4.8	0.527
TOTAL:					1.998

THE WEIGHTED GUST STRENGTH FACTOR IS 4.8

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********************   GROUND POSITION 17   *************************
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Table 6.3.17

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.294	0.146	0.88	4.0	0.000
NNE	0.152	0.099	0.70	5.5	0.000
NE	0.172	0.092	0.63	5.0	0.000
ENE	0.266	0.121	0.72	3.7	0.000
E	0.305	0.126	0.79	3.8	0.000
ESE	0.531	0.107	0.95	3.9	0.143
SE	0.562	0.106	0.97	3.9	0.200
SSE	0.556	0.098	0.93	3.8	0.317
S	0.267	0.116	0.73	4.0	0.000
SSW	0.278	0.096	0.67	4.1	0.001
SW	0.270	0.097	0.70	4.4	0.000
WSW	0.210	0.094	0.64	4.6	0.000
W	0.389	0.128	0.87	3.8	0.010
WNW	0.536	0.091	0.97	4.7	0.309
NW	0.568	0.103	0.99	4.1	0.832
NNW	0.485	0.111	0.90	3.8	0.184
TOTAL:					1.996

THE WEIGHTED GUST STRENGTH FACTOR IS 4.2

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********************   GROUND POSITION 18      ************************
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Table 6.3.18

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.240	0.126	0.72	3.8	0.000
NNE	0.370	0.136	1.06	5.0	0.024
NE	0.553	0.148	1.04	3.3	0.158
ENE	0.531	0.194	1.26	3.8	0.160
E	0.365	0.134	0.89	3.9	0.011
ESE	0.352	0.113	0.92	5.0	0.044
SE	0.448	0.116	0.90	3.9	0.181
SSE	0.503	0.102	0.97	4.6	0.519
S	0.343	0.109	0.78	4.0	0.106
SSW	0.250	0.096	0.62	3.8	0.004
SW	0.291	0.094	0.58	3.1	0.016
WSW	0.240	0.097	0.55	3.2	0.000
W	0.271	0.121	0.71	3.6	0.001
WNW	0.396	0.111	0.80	3.6	0.146
NW	0.429	0.111	0.93	4.5	0.531
NNW	0.368	0.121	0.81	3.6	0.094
TOTAL:					1.996

THE WEIGHTED GUST STRENGTH FACTOR IS 3.9

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********************   GROUND POSITION 19    *************************
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Table 6.3.19

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.146	0.099	0.63	4.8	0.000
NNE	0.143	0.083	0.58	5.2	0.000
NE	0.195	0.076	0.53	4.3	0.000
ENE	0.289	0.106	0.60	2.9	0.034
E	0.179	0.083	0.49	3.7	0.000
ESE	0.122	0.077	0.47	4.6	0.000
SE	0.116	0.061	0.43	5.2	0.000
SSE	0.190	0.110	0.67	4.3	0.003
S	0.255	0.112	0.69	3.9	0.122
SSW	0.229	0.094	0.70	5.0	0.060
SW	0.209	0.080	0.51	3.8	0.013
WSW	0.180	0.082	0.53	4.2	0.001
W	0.188	0.093	0.62	4.6	0.000
WNW	0.326	0.113	0.76	3.8	0.358
NW	0.370	0.115	0.89	4.5	1.307
NNW	0.271	0.124	0.71	3.6	0.101
TOTAL:					1.998

THE WEIGHTED GUST STRENGTH FACTOR IS 4.3

GROUND POSITION 20

Table 6.3.20

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.084	0.068	0.49	6.0	0.000
NNE	0.091	0.059	0.41	5.4	0.000
NE	0.123	0.070	0.47	4.9	0.000
ENE	0.137	0.074	0.55	5.5	0.000
E	0.119	0.065	0.47	5.4	0.000
ESE	0.090	0.047	0.28	4.1	0.000
SE	0.068	0.033	0.30	6.9	0.000
SSE	0.074	0.039	0.31	6.2	0.000
S	0.081	0.048	0.43	7.2	0.000
SSW	0.197	0.094	0.55	3.7	0.079
SW	0.142	0.072	0.45	4.2	0.001
WSW	0.151	0.068	0.45	4.4	0.001
W	0.160	0.092	0.61	4.9	0.001
WNW	0.293	0.102	0.74	4.3	0.560
NW	0.311	0.104	0.71	3.9	1.346
NNW	0.177	0.098	0.53	3.6	0.004
TOTAL:					1.990

THE WEIGHTED GUST STRENGTH FACTOR IS 4.8

GROUND POSITION 21

Table 6.3.21

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.211	0.112	0.66	4.0	0.020
NNE	0.399	0.095	0.77	3.9	0.464
NE	0.446	0.098	0.84	4.0	0.370
ENE	0.370	0.081	0.66	3.6	0.209
E	0.293	0.081	0.58	3.6	0.051
ESE	0.184	0.082	0.49	3.8	0.007
SE	0.191	0.082	0.51	3.9	0.008
SSE	0.191	0.087	0.54	4.0	0.011
S	0.128	0.073	0.45	4.4	0.000
SSW	0.164	0.086	0.56	4.6	0.004
SW	0.192	0.112	0.66	4.2	0.018
WSW	0.242	0.111	0.70	4.1	0.090
W	0.235	0.099	0.63	4.0	0.041
WNW	0.276	0.097	0.65	3.9	0.246
NW	0.274	0.115	0.74	4.0	0.458
NNW	0.175	0.095	0.65	5.0	0.001
TOTAL:					1.997

THE WEIGHTED GUST STRENGTH FACTOR IS 4.2

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******************** GROUND POSITION 22   ***********************
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Table 6.3.22

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.237	0.107	0.63	3.6	0.013
NNE	0.414	0.090	0.78	4.1	0.286
NE	0.459	0.081	0.80	4.2	0.232
ENE	0.412	0.070	0.66	3.5	0.173
E	0.313	0.078	0.56	3.2	0.029
ESE	0.242	0.083	0.55	3.7	0.021
SE	0.206	0.073	0.53	4.5	0.003
SSE	0.222	0.091	0.61	4.3	0.011
S	0.140	0.069	0.50	5.2	0.000
SSW	0.210	0.097	0.62	4.2	0.015
SW	0.213	0.087	0.59	4.3	0.010
WSW	0.271	0.083	0.64	4.4	0.064
W	0.316	0.095	0.73	4.3	0.132
WNW	0.376	0.101	0.81	4.3	0.653
NW	0.308	0.122	0.85	4.4	0.356
NNW	0.195	0.080	0.55	4.5	0.000
TOTAL:					1.998

THE WEIGHTED GUST STRENGTH FACTOR IS 4.3

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********************   GROUND POSITION 23   ************************
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Table 6.3.23

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.115	0.051	0.38	5.3	0.000
NNE	0.115	0.052	0.36	4.7	0.000
NE	0.129	0.057	0.41	5.0	0.000
ENE	0.191	0.088	0.63	5.0	0.000
E	0.225	0.120	0.90	5.6	0.000
ESE	0.384	0.091	0.78	4.4	0.130
SE	0.368	0.108	0.79	3.9	0.106
SSE	0.317	0.094	0.65	3.5	0.061
S	0.128	0.118	0.61	4.1	0.000
SSW	0.093	0.061	0.39	4.9	0.000
SW	0.148	0.064	0.41	4.1	0.000
WSW	0.130	0.066	0.38	3.8	0.000
W	0.208	0.094	0.58	4.0	0.000
WNW	0.396	0.091	0.75	3.9	0.315
NW	0.463	0.093	0.82	3.9	1.375
NNW	0.267	0.105	0.69	4.0	0.005
TOTAL:					1.993

THE WEIGHTED GUST STRENGTH FACTOR IS 4.3

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******************** GROUND POSITION 24   ***********************
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Table 6.3.24

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.239	0.099	0.65	4.2	0.115
NNE	0.293	0.081	0.61	3.9	0.151
NE	0.332	0.072	0.71	5.2	0.144
ENE	0.327	0.081	0.72	4.9	0.165
E	0.319	0.089	0.65	3.7	0.118
ESE	0.291	0.113	0.72	3.8	0.219
SE	0.291	0.106	0.62	3.1	0.242
SSE	0.252	0.118	0.71	3.9	0.181
S	0.086	0.055	0.38	5.3	0.000
SSW	0.073	0.055	0.38	5.5	0.000
SW	0.141	0.079	0.51	4.6	0.000
WSW	0.123	0.088	0.47	3.9	0.000
W	0.136	0.080	0.54	5.1	0.000
WNW	0.212	0.088	0.55	3.8	0.041
NW	0.264	0.072	0.58	4.4	0.552
NNW	0.218	0.086	0.63	4.8	0.068
TOTAL:					1.996

THE WEIGHTED GUST STRENGTH FACTOR IS 4.5

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*******************   GROUND POSITION 25        **********************
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Table 6.3.25

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.205	0.093	0.57	3.9	0.000
NNE	0.317	0.091	0.66	3.8	0.012
NE	0.320	0.103	0.64	3.1	0.006
ENE	0.230	0.085	0.60	4.4	0.000
E	0.157	0.078	0.48	4.1	0.000
ESE	0.153	0.076	0.54	5.1	0.000
SE	0.229	0.080	0.57	4.2	0.001
SSE	0.219	0.087	0.57	4.0	0.001
S	0.150	0.083	0.57	5.0	0.000
SSW	0.347	0.106	0.71	3.4	0.258
SW	0.485	0.124	0.92	3.5	1.123
WSW	0.470	0.130	1.00	4.0	0.589
W	0.259	0.121	0.69	3.6	0.002
WNW	0.106	0.063	0.43	5.1	0.000
NW	0.168	0.088	0.53	4.1	0.000
NNW	0.111	0.054	0.41	5.5	0.000
TOTAL:					1.991

THE WEIGHTED GUST STRENGTH FACTOR IS 4.3

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*******************   GROUND POSITION 26   ***********************
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Table 6.3.26

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.317	0.106	0.68	3.4	0.044
NNE	0.440	0.089	0.76	3.6	0.160
NE	0.458	0.108	0.83	3.5	0.098
ENE	0.366	0.101	0.74	3.5	0.053
E	0.309	0.092	0.64	3.6	0.006
ESE	0.083	0.061	0.54	7.6	0.000
SE	0.164	0.087	0.49	3.8	0.000
SSE	0.417	0.109	0.81	3.6	0.342
S	0.198	0.117	0.63	3.7	0.000
SSW	0.285	0.087	0.63	3.9	0.059
SW	0.385	0.080	0.67	3.6	0.407
WSW	0.448	0.086	0.86	4.8	0.516
W	0.273	0.104	0.72	4.4	0.005
WNW	0.191	0.111	0.66	4.2	0.000
NW	0.359	0.138	0.78	3.0	0.299
NNW	0.259	0.126	0.67	3.2	0.003
TOTAL:					1.993

THE WEIGHTED GUST STRENGTH FACTOR IS 3.8

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********************   GROUND POSITION 27   *************************
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Table 6.3.27

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.293	0.111	0.77	4.3	0.054
NNE	0.385	0.125	1.00	4.9	0.133
NE	0.335	0.142	0.82	3.4	0.024
ENE	0.275	0.103	0.76	4.7	0.010
E	0.248	0.090	0.67	4.6	0.002
ESE	0.326	0.093	0.73	4.4	0.092
SE	0.431	0.079	0.75	4.1	0.367
SSE	0.504	0.122	0.89	3.2	1.048
S	0.140	0.107	0.77	5.9	0.000
SSW	0.180	0.093	0.47	3.1	0.000
SW	0.279	0.069	0.52	3.5	0.082
WSW	0.259	0.071	0.50	3.3	0.021
W	0.208	0.093	0.64	4.6	0.000
WNW	0.100	0.067	0.51	6.1	0.000
NW	0.063	0.034	0.36	8.6	0.000
NNW	0.319	0.116	0.83	4.4	0.160
TOTAL:					1.995

THE WEIGHTED GUST STRENGTH FACTOR IS 4.8

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*******************   GROUND POSITION 28   ************************
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Table 6.3.28

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.294	0.117	0.77	4.1	0.111
NNE	0.325	0.124	0.91	4.7	0.076
NE	0.290	0.135	0.81	3.8	0.014
ENE	0.182	0.092	0.61	4.7	0.000
E	0.160	0.080	0.52	4.5	0.000
ESE	0.211	0.120	0.69	4.0	0.007
SE	0.351	0.094	0.68	3.5	0.214
SSE	0.539	0.093	0.85	3.3	1.544
S	0.219	0.157	0.83	3.9	0.022
SSW	0.095	0.051	0.34	4.9	0.000
SW	0.177	0.085	0.41	2.7	0.001
WSW	0.203	0.074	0.45	3.3	0.003
W	0.063	0.045	0.25	4.1	0.000
WNW	0.087	0.055	0.29	3.6	0.000
NW	0.063	0.036	0.20	3.9	0.000
NNW	0.067	0.055	0.32	4.7	0.000
TOTAL:					1.991

THE WEIGHTED GUST STRENGTH FACTOR IS 4.0

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********************   GROUND POSITION 29     *************************
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Table 6.3.29

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.364	0.101	0.82	4.6	0.049
NNE	0.377	0.102	0.74	3.6	0.022
NE	0.365	0.132	0.85	3.7	0.007
ENE	0.244	0.122	0.81	4.6	0.000
E	0.236	0.127	0.82	4.6	0.000
ESE	0.220	0.096	0.62	4.1	0.000
SE	0.344	0.107	0.73	3.6	0.027
SSE	0.557	0.100	0.92	3.6	0.695
S	0.555	0.119	0.99	3.7	1.189
SSW	0.172	0.130	0.80	4.8	0.000
SW	0.123	0.059	0.40	4.6	0.000
WSW	0.132	0.062	0.43	4.8	0.000
W	0.111	0.056	0.48	6.6	0.000
WNW	0.195	0.100	0.59	3.9	0.000
NW	0.232	0.096	0.59	3.7	0.000
NNW	0.224	0.088	0.74	5.9	0.000
TOTAL:					1.991

THE WEIGHTED GUST STRENGTH FACTOR IS 4.5

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*******************   GROUND POSITION 30   ************************
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Table 6.3.30

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.239	0.088	0.74	5.7	0.000
NNE	0.339	0.102	0.83	4.8	0.011
NE	0.361	0.091	0.68	3.5	0.009
ENE	0.362	0.101	0.82	4.6	0.019
E	0.341	0.118	0.90	4.8	0.006
ESE	0.303	0.126	0.82	4.1	0.014
SE	0.344	0.105	0.86	4.9	0.034
SSE	0.487	0.087	0.91	4.9	0.451
S	0.574	0.114	0.98	3.6	1.449
SSW	0.225	0.153	0.84	4.0	0.001
SW	0.176	0.087	0.77	6.9	0.000
WSW	0.218	0.054	0.42	3.8	0.000
W	0.160	0.051	0.41	4.9	0.000
WNW	0.110	0.060	0.48	6.1	0.000
NW	0.115	0.054	0.32	3.7	0.000
NNW	0.131	0.076	0.46	4.3	0.000
TOTAL:					1.993

THE WEIGHTED GUST STRENGTH FACTOR IS 4.7

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********************   GROUND POSITION 31   *************************
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Table 6.3.31

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.244	0.088	0.59	4.0	0.002
NNE	0.298	0.090	0.74	4.9	0.007
NE	0.310	0.078	0.63	4.2	0.005
ENE	0.303	0.081	0.73	5.3	0.010
E	0.235	0.081	0.54	3.7	0.000
ESE	0.169	0.084	0.53	4.3	0.000
SE	0.216	0.111	0.65	3.9	0.001
SSE	0.494	0.097	0.86	3.7	0.695
S	0.502	0.212	1.01	2.4	1.270
SSW	0.217	0.100	0.84	6.2	0.002
SW	0.119	0.061	0.45	5.3	0.000
WSW	0.087	0.047	0.30	4.5	0.000
W	0.069	0.043	0.24	3.9	0.000
WNW	0.067	0.036	0.22	4.2	0.000
NW	0.082	0.049	0.28	4.0	0.000
NNW	0.058	0.051	0.33	5.5	0.000
TOTAL:					1.991

THE WEIGHTED GUST STRENGTH FACTOR IS 4.4

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******************** GROUND POSITION 32 *************************
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Table 6.3.32

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.228	0.077	0.59	4.7	0.000
NNE	0.332	0.102	0.72	3.8	0.001
NE	0.404	0.087	0.87	5.4	0.005
ENE	0.467	0.100	0.87	4.0	0.032
E	0.444	0.120	0.89	3.7	0.013
ESE	0.345	0.122	0.79	3.7	0.009
SE	0.267	0.117	0.75	4.1	0.000
SSE	0.456	0.096	0.79	3.5	0.116
S	0.637	0.108	1.02	3.6	1.147
SSW	0.527	0.225	1.15	2.8	0.668
SW	0.233	0.172	0.98	4.3	0.000
WSW	0.114	0.055	0.42	5.6	0.000
W	0.100	0.037	0.22	3.4	0.000
WNW	0.064	0.040	0.29	5.7	0.000
NW	0.130	0.052	0.29	3.1	0.000
NNW	0.094	0.071	0.43	4.7	0.000
TOTAL:					1.992

THE WEIGHTED GUST STRENGTH FACTOR IS 4.1

GROUND POSITION 33

Table 6.3.33

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.292	0.106	0.78	4.6	0.000
NNE	0.360	0.125	0.91	4.4	0.001
NE	0.413	0.111	0.92	4.6	0.002
ENE	0.423	0.130	0.93	3.9	0.007
E	0.385	0.106	0.81	4.1	0.001
ESE	0.286	0.124	0.80	4.1	0.000
SE	0.237	0.123	0.79	4.5	0.000
SSE	0.468	0.122	1.06	4.8	0.070
S	0.471	0.122	1.04	4.7	0.150
SSW	0.535	0.103	0.98	4.3	0.433
SW	0.590	0.100	1.03	4.4	0.563
WSW	0.608	0.106	0.97	3.4	0.376
W	0.556	0.096	0.92	3.8	0.154
WNW	0.555	0.113	0.97	3.6	0.246
NW	0.193	0.091	0.59	4.3	0.000
NNW	0.152	0.082	0.50	4.3	0.000
TOTAL:					2.004

THE WEIGHTED GUST STRENGTH FACTOR IS 4.2

GROUND POSITION 34

Table 6.3.34

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.055	0.036	0.30	6.8	0.000
NNE	0.065	0.042	0.30	5.6	0.000
NE	0.062	0.035	0.42	10.3	0.000
ENE	0.276	0.113	0.66	3.4	0.007
E	0.196	0.095	0.54	3.7	0.000
ESE	0.204	0.072	0.50	4.2	0.001
SE	0.173	0.085	0.55	4.5	0.000
SSE	0.290	0.109	0.69	3.7	0.044
S	0.547	0.151	1.01	3.1	1.930
SSW	0.121	0.092	0.75	6.9	0.000
SW	0.153	0.096	0.73	6.0	0.000
WSW	0.046	0.023	0.14	4.1	0.000
W	0.037	0.016	0.14	6.3	0.000
WNW	0.035	0.016	0.12	5.1	0.000
NW	0.038	0.027	0.17	4.9	0.000
NNW	0.048	0.033	0.24	5.8	0.000
TOTAL:					1.983

THE WEIGHTED GUST STRENGTH FACTOR IS 5.3

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********************   GROUND POSITION 35   *************************
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Table 6.3.35

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.076	0.046	0.26	4.1	0.000
NNE	0.065	0.042	0.29	5.2	0.000
NE	0.068	0.049	0.30	4.7	0.000
ENE	0.133	0.055	0.35	3.9	0.000
E	0.074	0.034	0.27	5.7	0.000
ESE	0.117	0.065	0.58	7.1	0.000
SE	0.254	0.123	0.78	4.3	0.048
SSE	0.325	0.163	0.84	3.2	0.353
S	0.196	0.109	0.71	4.7	0.014
SSW	0.184	0.106	0.67	4.6	0.007
SW	0.333	0.131	0.82	3.7	0.728
WSW	0.346	0.101	0.73	3.7	0.507
W	0.338	0.077	0.70	4.6	0.338
WNW	0.194	0.076	0.52	4.2	0.002
NW	0.102	0.056	0.33	4.1	0.000
NNW	0.144	0.068	0.35	3.0	0.000
TOTAL:					1.997

THE WEIGHTED GUST STRENGTH FACTOR IS 4.2

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********************   GROUND POSITION 36      *************************
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Table 6.3.36

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.092	0.045	0.25	3.6	0.000
NNE	0.079	0.046	0.27	3.9	0.000
NE	0.085	0.063	0.38	4.7	0.000
ENE	0.121	0.052	0.36	4.5	0.000
E	0.115	0.064	0.42	4.8	0.000
ESE	0.196	0.081	0.66	5.7	0.002
SE	0.277	0.116	0.75	4.1	0.038
SSE	0.354	0.148	0.90	3.7	0.298
S	0.300	0.149	0.96	4.4	0.216
SSW	0.225	0.112	0.92	6.2	0.021
SW	0.323	0.133	0.84	3.9	0.325
WSW	0.380	0.109	0.78	3.7	0.449
W	0.401	0.091	0.77	4.1	0.446
WNW	0.325	0.105	0.69	3.5	0.196
NW	0.115	0.067	0.41	4.4	0.000
NNW	0.170	0.054	0.38	3.9	0.000
TOTAL:					1.991

THE WEIGHTED GUST STRENGTH FACTOR IS 4.2

GROUND POSITION 37

Table 6.3.37

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.128	0.049	0.29	3.2	0.000
NNE	0.088	0.049	0.29	4.1	0.000
NE	0.087	0.061	0.39	4.9	0.000
ENE	0.143	0.060	0.39	4.1	0.000
E	0.134	0.076	0.53	5.2	0.000
ESE	0.253	0.081	0.64	4.7	0.020
SE	0.329	0.116	0.77	3.8	0.111
SSE	0.412	0.163	0.90	3.0	0.563
S	0.321	0.154	0.89	3.7	0.304
SSW	0.209	0.109	0.75	5.0	0.007
SW	0.301	0.138	0.91	4.4	0.183
WSW	0.406	0.130	0.88	3.6	0.580
W	0.359	0.094	0.76	4.3	0.223
WNW	0.201	0.090	0.62	4.6	0.000
NW	0.141	0.065	0.43	4.5	0.000
NNW	0.174	0.048	0.40	4.8	0.000
TOTAL:					1.991

THE WEIGHTED GUST STRENGTH FACTOR IS 4.3

GROUND POSITION 38

Table 6.3.38

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.098	0.049	0.28	3.8	0.000
NNE	0.079	0.051	0.27	3.7	0.000
NE	0.106	0.071	0.40	4.1	0.000
ENE	0.107	0.051	0.36	5.0	0.000
E	0.137	0.072	0.48	4.8	0.000
ESE	0.228	0.086	0.57	4.0	0.007
SE	0.277	0.097	0.69	4.3	0.032
SSE	0.385	0.142	0.89	3.6	0.405
S	0.359	0.176	1.00	3.6	0.531
SSW	0.191	0.102	0.76	5.6	0.001
SW	0.196	0.089	0.70	5.7	0.001
WSW	0.347	0.131	0.86	3.9	0.243
W	0.382	0.092	0.72	3.6	0.301
WNW	0.378	0.102	0.77	3.8	0.475
NW	0.195	0.078	0.55	4.6	0.000
NNW	0.119	0.050	0.33	4.3	0.000
TOTAL:					1.997

THE WEIGHTED GUST STRENGTH FACTOR IS 4.3

GROUND POSITION 39

Table 6.3.39

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.066	0.041	0.26	4.8	0.000
NNE	0.071	0.050	0.37	5.9	0.000
NE	0.107	0.079	0.45	4.4	0.000
ENE	0.117	0.057	0.39	4.7	0.000
E	0.146	0.072	0.46	4.4	0.000
ESE	0.262	0.087	0.59	3.7	0.014
SE	0.333	0.110	0.76	3.9	0.077
SSE	0.395	0.135	0.91	3.8	0.337
S	0.358	0.163	0.95	3.6	0.382
SSW	0.203	0.115	0.87	5.8	0.001
SW	0.230	0.105	0.72	4.7	0.005
WSW	0.375	0.129	0.81	3.4	0.267
W	0.434	0.099	0.79	3.6	0.431
WNW	0.403	0.109	0.79	3.6	0.480
NW	0.227	0.083	0.57	4.2	0.002
NNW	0.096	0.047	0.30	4.2	0.000
TOTAL:					1.998

THE WEIGHTED GUST STRENGTH FACTOR IS 4.3

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******************** GROUND POSITION 40   ************************
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Table 6.3.40

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.068	0.039	0.22	3.8	0.000
NNE	0.056	0.043	0.31	5.8	0.000
NE	0.136	0.090	0.47	3.7	0.000
ENE	0.137	0.073	0.40	3.6	0.000
E	0.104	0.057	0.44	5.9	0.000
ESE	0.255	0.075	0.55	3.9	0.037
SE	0.265	0.093	0.59	3.5	0.044
SSE	0.340	0.118	0.82	4.1	0.335
S	0.366	0.140	0.96	4.3	0.850
SSW	0.301	0.140	0.85	3.9	0.414
	0.182	0.110	0.76	5.5	0.001
	0.269	0.114	0.72	3.9	0.075
	0.333	0.083	0.69	4.3	0.224
[illegible]	0.057	0.028	0.28	7.9	0.000
[illegible]	0.222	0.076	0.46	3.1	0.016
[illegible]	0.047	0.029	0.27	7.6	0.000
					1.998

WEIGHTED GUST STRENGTH FACTOR IS 4.9

Table 6.4 - Directional Data - Configuration 3 (Proposed Building With Modifications to the Campus)
Re-test of Ground Positions 6-8, 11-13, 18-24, 27, 28, 31

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*********************   GROUND POSITION  6    *************************
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Table 6.4.1

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.217	0.106	0.69	4.5	0.002
NNE	0.191	0.105	0.60	3.9	0.000
NE	0.171	0.096	0.68	5.2	0.000
ENE	0.121	0.081	0.54	5.1	0.000
E	0.084	0.072	0.45	5.1	0.000
ESE	0.061	0.055	0.42	6.5	0.000
SE	0.125	0.075	0.67	7.2	0.000
SSE	0.091	0.068	0.54	6.6	0.000
S	0.094	0.071	0.42	4.7	0.000
SSW	0.286	0.125	0.81	4.2	0.174
SW	0.350	0.120	0.81	3.8	0.473
WSW	0.350	0.174	0.93	3.3	0.267
W	0.291	0.093	0.59	3.2	0.042
WNW	0.317	0.111	0.83	4.6	0.137
NW	0.376	0.122	0.87	4.0	0.871
NNW	0.270	0.098	0.66	4.0	0.032
TOTAL:					1.998

THE WEIGHTED GUST STRENGTH FACTOR IS 4.5

GROUND POSITION /

Table 6.4.2

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.266	0.127	0.83	4.4	0.001
NNE	0.230	0.113	0.69	4.0	0.000
NE	0.556	0.102	0.96	3.9	0.128
ENE	0.546	0.087	0.90	4.0	0.148
E	0.562	0.096	0.88	3.3	0.134
ESE	0.603	0.120	0.99	3.2	0.438
SE	0.637	0.106	1.08	4.1	0.610
SSE	0.507	0.098	0.85	3.4	0.439
S	0.270	0.117	0.66	3.3	0.005
SSW	0.278	0.110	0.75	4.3	0.009
SW	0.307	0.106	0.71	3.8	0.017
WSW	0.309	0.135	0.79	3.5	0.010
W	0.261	0.095	0.64	4.1	0.000
WNW	0.291	0.107	0.77	4.4	0.002
NW	0.338	0.100	0.76	4.2	0.044
NNW	0.324	0.099	0.74	4.2	0.011
TOTAL:					1.996

THE WEIGHTED GUST STRENGTH FACTOR IS 4.0

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******************** GROUND POSITION 8 ************************
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Table 6.4.3

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.167	0.123	0.68	4.2	0.000
NNE	0.245	0.110	0.65	3.7	0.000
NE	0.418	0.093	0.76	3.7	0.023
ENE	0.488	0.080	0.77	3.6	0.094
E	0.509	0.079	0.81	3.8	0.088
ESE	0.589	0.108	0.97	3.5	0.424
SE	0.492	0.111	0.90	3.7	0.243
SSE	0.438	0.121	0.92	4.0	0.223
S	0.233	0.117	0.67	3.7	0.001
SSW	0.334	0.089	0.81	5.4	0.081
SW	0.271	0.075	0.66	5.2	0.004
WSW	0.260	0.084	0.63	4.4	0.001
W	0.358	0.122	0.74	3.1	0.028
WNW	0.272	0.116	0.63	3.1	0.001
NW	0.472	0.096	0.79	3.3	0.773
NNW	0.324	0.116	0.67	3.0	0.013
TOTAL:					1.996

THE WEIGHTED GUST STRENGTH FACTOR IS 3.8

GROUND POSITION 11

Table 6.4.4

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.192	0.131	0.69	3.8	0.000
NNE	0.196	0.113	0.64	3.9	0.000
NE	0.329	0.091	0.66	3.6	0.000
ENE	0.311	0.095	0.65	3.5	0.001
E	0.231	0.083	0.57	4.1	0.000
ESE	0.237	0.077	0.66	5.4	0.000
SE	0.274	0.072	0.55	3.8	0.000
SSE	0.226	0.073	0.53	4.2	0.000
S	0.121	0.069	0.37	3.6	0.000
SSW	0.096	0.083	0.48	4.7	0.000
SW	0.141	0.106	0.73	5.6	0.000
WSW	0.091	0.112	0.67	5.2	0.000
W	0.470	0.142	1.03	3.9	0.080
WNW	0.608	0.122	1.10	4.1	0.726
NW	0.586	0.113	1.03	3.9	1.069
NNW	0.456	0.116	0.91	3.9	0.121
TOTAL:					1.997

THE WEIGHTED GUST STRENGTH FACTOR IS 4.2

GROUND POSITION 12

Table 6.4.5

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.247	0.129	0.70	3.5	0.000
NNE	0.251	0.111	0.65	3.5	0.000
NE	0.425	0.101	0.80	3.7	0.026
ENE	0.474	0.092	0.87	4.3	0.081
E	0.507	0.097	0.91	4.1	0.086
ESE	0.592	0.101	0.94	3.4	0.433
SE	0.584	0.095	0.91	3.5	0.482
SSE	0.510	0.082	0.83	3.9	0.482
S	0.177	0.099	0.57	4.0	0.000
SSW	0.260	0.119	0.69	3.6	0.004
SW	0.379	0.152	0.78	2.7	0.156
WSW	0.092	0.093	0.60	5.4	0.000
W	0.242	0.070	0.62	5.4	0.000
WNW	0.331	0.068	0.64	4.6	0.015
NW	0.383	0.075	0.72	4.5	0.179
NNW	0.359	0.097	0.77	4.2	0.051
TOTAL:					1.997

THE WEIGHTED GUST STRENGTH FACTOR IS 4.1

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********************   GROUND POSITION 13   ************************
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Table 6.4.6

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.173	0.094	0.71	5.7	0.000
NNE	0.248	0.111	0.76	4.6	0.002
NE	0.164	0.100	0.60	4.4	0.000
ENE	0.055	0.047	0.38	7.0	0.000
E	0.058	0.043	0.32	6.0	0.000
ESE	0.114	0.090	0.64	5.8	0.000
SE	0.163	0.102	0.90	7.2	0.000
SSE	0.190	0.105	0.58	3.7	0.000
S	0.063	0.063	0.46	6.3	0.000
SSW	0.352	0.127	0.78	3.3	0.430
SW	0.409	0.114	0.83	3.7	0.730
WSW	0.428	0.148	0.90	3.2	0.526
W	0.285	0.110	0.66	3.4	0.016
WNW	0.307	0.116	0.75	3.9	0.052
NW	0.332	0.121	0.73	3.3	0.236
NNW	0.252	0.102	0.75	4.9	0.004
TOTAL:					1.997

THE WEIGHTED GUST STRENGTH FACTOR IS 4.5

GROUND POSITION 18

Table 6.4.7

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.229	0.123	0.70	4.0	0.000
NNE	0.369	0.150	0.94	3.8	0.034
NE	0.527	0.164	1.12	3.6	0.153
ENE	0.396	0.168	0.97	3.4	0.045
E	0.367	0.151	0.99	4.1	0.016
ESE	0.320	0.125	0.88	4.5	0.030
SE	0.335	0.103	0.75	4.0	0.038
SSE	0.423	0.104	0.86	4.2	0.279
S	0.333	0.128	0.86	4.1	0.115
SSW	0.226	0.096	0.66	4.5	0.001
SW	0.248	0.091	0.59	3.7	0.003
WSW	0.241	0.105	0.64	3.8	0.001
W	0.293	0.146	0.95	4.5	0.006
WNW	0.406	0.128	0.87	3.6	0.245
NW	0.448	0.118	0.94	4.1	0.871
NNW	0.373	0.119	0.93	4.7	0.161
TOTAL:					1.999

THE WEIGHTED GUST STRENGTH FACTOR IS 4.1

GROUND POSITION 19

Table 6.4.8

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.128	0.104	0.69	5.4	0.000
NNE	0.154	0.093	0.62	5.0	0.000
NE	0.278	0.106	0.71	4.1	0.010
ENE	0.278	0.128	0.75	3.7	0.021
E	0.175	0.082	0.48	3.7	0.000
ESE	0.103	0.077	0.48	4.9	0.000
SE	0.101	0.074	0.58	6.5	0.000
SSE	0.143	0.102	0.66	5.1	0.000
S	0.228	0.113	0.75	4.6	0.033
SSW	0.207	0.085	0.59	4.5	0.013
SW	0.189	0.078	0.57	4.9	0.002
WSW	0.170	0.088	0.57	4.5	0.000
W	0.229	0.124	0.71	3.9	0.006
WNW	0.342	0.121	0.87	4.3	0.391
NW	0.388	0.112	0.86	4.2	1.395
NNW	0.286	0.111	0.71	3.8	0.124
TOTAL:					1.995

THE WEIGHTED GUST STRENGTH FACTOR IS 4.5

GROUND POSITION 20

Table 6.4.9

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.082	0.067	0.47	5.8	0.000
NNE	0.076	0.053	0.38	5.7	0.000
NE	0.111	0.064	0.48	5.7	0.000
ENE	0.125	0.072	0.55	5.8	0.000
E	0.105	0.060	0.49	6.4	0.000
ESE	0.081	0.048	0.31	4.8	0.000
SE	0.060	0.036	0.27	5.7	0.000
SSE	0.059	0.036	0.26	5.5	0.000
S	0.090	0.066	0.51	6.3	0.000
SSW	0.168	0.092	0.49	3.5	0.005
SW	0.134	0.076	0.48	4.6	0.000
WSW	0.146	0.078	0.48	4.2	0.000
W	0.226	0.136	0.69	3.4	0.026
WNW	0.343	0.123	0.91	4.6	0.882
NW	0.319	0.115	0.80	4.2	1.076
NNW	0.175	0.094	0.59	4.4	0.001
TOTAL:					1.991

THE WEIGHTED GUST STRENGTH FACTOR IS 4.8

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********************   GROUND POSITION 21   *************************
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Table 6.4.10

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.210	0.104	0.63	4.0	0.023
NNE	0.416	0.098	0.80	3.9	0.585
NE	0.452	0.094	0.78	3.5	0.415
ENE	0.364	0.077	0.73	4.7	0.212
E	0.301	0.097	0.58	2.9	0.068
ESE	0.197	0.090	0.52	3.6	0.016
SE	0.171	0.088	0.54	4.2	0.003
SSE	0.177	0.102	0.62	4.4	0.006
S	0.127	0.082	0.54	5.0	0.000
SSW	0.144	0.088	0.49	3.9	0.001
SW	0.193	0.118	0.67	4.0	0.024
WSW	0.250	0.112	0.60	3.1	0.134
W	0.229	0.105	0.75	4.9	0.038
WNW	0.267	0.122	0.76	4.0	0.222
NW	0.246	0.115	0.74	4.3	0.245
NNW	0.168	0.091	0.60	4.8	0.001
TOTAL:					1.992

THE WEIGHTED GUST STRENGTH FACTOR IS 4.2

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********************   GROUND POSITION 22    ************************
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Table 6.4.11

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.290	0.121	0.70	3.4	0.038
NNE	0.432	0.086	0.81	4.4	0.215
NE	0.509	0.083	0.81	3.6	0.233
ENE	0.423	0.062	0.69	4.3	0.125
E	0.332	0.080	0.58	3.1	0.021
ESE	0.261	0.082	0.53	3.3	0.017
SE	0.209	0.077	0.53	4.1	0.001
SSE	0.266	0.115	0.66	3.4	0.024
S	0.112	0.069	0.51	5.7	0.000
SSW	0.240	0.105	0.63	3.7	0.022
SW	0.223	0.094	0.58	3.8	0.004
WSW	0.293	0.086	0.63	3.9	0.054
W	0.360	0.115	0.89	4.6	0.164
WNW	0.427	0.111	0.86	3.9	0.747
NW	0.337	0.120	0.80	3.9	0.328
NNW	0.201	0.095	0.64	4.6	0.000
TOTAL:					1.992

THE WEIGHTED GUST STRENGTH FACTOR IS 4.0

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********************   GROUND POSITION 23     ************************
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Table 6.4.12

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.113	0.058	0.40	5.0	0.000
NNE	0.133	0.069	0.46	4.8	0.000
NE	0.185	0.078	0.53	4.4	0.000
ENE	0.217	0.084	0.60	4.6	0.000
E	0.259	0.119	0.73	4.0	0.001
ESE	0.414	0.091	0.79	4.2	0.178
SE	0.401	0.094	0.95	5.8	0.162
SSE	0.387	0.087	0.78	4.5	0.221
S	0.161	0.140	0.70	3.8	0.000
SSW	0.049	0.052	0.34	5.5	0.000
SW	0.092	0.065	0.44	5.3	0.000
WSW	0.078	0.059	0.40	5.5	0.000
W	0.174	0.116	0.67	4.3	0.000
WNW	0.373	0.100	0.78	4.1	0.189
NW	0.457	0.097	0.79	3.4	1.241
NNW	0.253	0.115	0.68	3.7	0.002
TOTAL:					1.994

THE WEIGHTED GUST STRENGTH FACTOR IS 4.5

GROUND POSITION 24

Table 6.4.13

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.256	0.127	0.70	3.5	0.080
NNE	0.327	0.102	0.75	4.1	0.145
NE	0.379	0.084	0.71	4.0	0.157
ENE	0.378	0.070	0.64	3.7	0.186
E	0.356	0.084	0.66	3.6	0.115
ESE	0.348	0.094	0.73	4.1	0.282
SE	0.275	0.106	0.62	3.3	0.097
SSE	0.265	0.104	0.64	3.6	0.123
S	0.076	0.061	0.39	5.1	0.000
SSW	0.065	0.054	0.37	5.7	0.000
SW	0.173	0.098	0.54	3.7	0.002
WSW	0.147	0.096	0.53	4.0	0.000
W	0.156	0.104	0.56	3.8	0.000
WNW	0.258	0.102	0.58	3.1	0.092
NW	0.304	0.085	0.65	4.1	0.646
NNW	0.246	0.092	0.67	4.6	0.072
TOTAL:					1.997

THE WEIGHTED GUST STRENGTH FACTOR IS 4.1

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*******************   ***********************
******************* GROUND POSITION 27   ***********************
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Table 6.4.14

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.357	0.130	0.97	4.8	0.147
NNE	0.452	0.147	1.14	4.7	0.212
NE	0.342	0.146	0.99	4.4	0.016
ENE	0.241	0.096	0.59	3.6	0.001
E	0.251	0.097	0.63	3.9	0.001
ESE	0.354	0.099	0.74	3.9	0.096
SE	0.461	0.080	0.74	3.6	0.356
SSE	0.560	0.130	0.94	2.9	1.151
S	0.106	0.090	0.66	6.1	0.000
SSW	0.116	0.087	0.48	4.2	0.000
SW	0.253	0.075	0.51	3.4	0.013
WSW	0.228	0.082	0.47	2.9	0.002
W	0.084	0.071	0.48	5.5	0.000
WNW	0.072	0.053	0.49	7.8	0.000
NW	0.104	0.061	0.50	6.5	0.000
NNW	0.159	0.102	0.56	3.9	0.000
TOTAL:					1.994

THE WEIGHTED GUST STRENGTH FACTOR IS   4.8

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GROUND POSITION 28

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Table 6.4.15

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.362	0.139	0.93	4.1	0.247
NNE	0.364	0.132	0.98	4.6	0.087
NE	0.293	0.118	0.92	5.3	0.007
ENE	0.206	0.080	0.55	4.3	0.000
E	0.194	0.096	0.66	4.9	0.000
ESE	0.203	0.107	0.62	3.9	0.002
SE	0.346	0.093	0.69	3.7	0.122
SSE	0.589	0.106	0.98	3.7	1.529
S	0.128	0.112	0.82	6.1	0.000
SSW	0.051	0.047	0.33	5.8	0.000
SW	0.045	0.043	0.28	5.6	0.000
WSW	0.053	0.055	0.34	5.1	0.000
W	0.057	0.050	0.29	4.7	0.000
WNW	0.032	0.033	0.22	5.6	0.000
NW	0.062	0.043	0.23	4.0	0.000
NNW	0.070	0.061	0.40	5.4	0.000
TOTAL:					1.993

THE WEIGHTED GUST STRENGTH FACTOR IS 4.9

GROUND POSITION 31

Table 6.4.16

WIND DIR	VAVE/ VGRAD	VRMS/ VGRAD	VPEAK/ VGRAD	GUST FACTOR G	CONT PROB PERCENT
N	0.244	0.091	0.62	4.2	0.003
NNE	0.366	0.100	0.80	4.4	0.068
NE	0.382	0.080	0.73	4.4	0.043
ENE	0.362	0.079	0.79	5.4	0.048
E	0.229	0.100	0.67	4.4	0.000
ESE	0.185	0.098	0.60	4.2	0.000
SE	0.247	0.117	0.84	5.1	0.006
SSE	0.486	0.097	0.95	4.8	0.787
S	0.450	0.235	1.10	2.8	1.039
SSW	0.081	0.085	0.94	10.1	0.000
SW	0.065	0.051	0.35	5.5	0.000
WSW	0.029	0.030	0.27	8.1	0.000
W	0.042	0.042	0.26	5.3	0.000
WNW	0.040	0.037	0.22	4.9	0.000
NW	0.051	0.037	0.26	5.5	0.000
NNW	0.048	0.040	0.33	7.1	0.000
TOTAL:					1.995

THE WEIGHTED GUST STRENGTH FACTOR IS 5.7

Table 6.5 Stations and Wind Directions with Gustiness Factors Greater Than Five - for Configuration 1

Station	Wind Direction	$\frac{V_{ave}}{V_{gr.}}$	$\frac{V_{rms}}{V_{gr}}$	$\frac{V_{pk}}{V_{g.}}$	Gust Factor g_θ	Gustiness Factor g_{g_θ}
2	NNW	0.34	0.12	1.14	6.6	7.5
5	N	0.13	0.12	0.86	6.2	5.3
5	NE	0.12	0.08	0.74	7.5	5.5
9	SW	0.57	0.12	1.13	4.8	5.4
11	W	0.54	0.13	1.14	4.6	5.3
14	NNE	0.41	0.15	1.11	4.7	5.2
18	E	0.23	0.14	1.05	6.0	6.3
25	E	0.16	0.08	0.73	6.9	5.1
26	SE	0.46	0.12	1.12	5.5	6.2
30	NE	0.40	0.10	0.97	5.4	5.3
31	NNE	0.35	0.11	0.93	5.4	5.0
31	ESE	0.20	0.10	0.84	6.4	5.4
32	SSW	0.60	0.10	1.07	4.7	5.0
32	SW	0.59	0.11	1.10	4.6	5.1
33	WNW	0.43	0.12	1.04	5.2	5.4
37	WSW	0.50	0.11	1.03	5.0	5.2
38	ESE	0.53	0.12	0.98	5.5	5.4
39	ENE	0.16	0.08	0.73	7.1	5.2

THE AVERAGE OF THE GUST FACTORS IS 4.4

THE AVERAGE OF THE WEIGHTED GUST FACTORS IS 4.4

THE AVERAGE OF THE GUST PRODUCTS IS 3.1

Table 6.6 Stations and Wind Directions with Gustiness Factors Greater Than Five - for Configuration 2

Station	Wind Direction	$\frac{V_{ave}}{V_{gr.}}$	$\frac{V_{rms}}{V_{gr}}$	$\frac{V_{pk}}{V_{g.}}$	Gust Factor g_θ	Gustiness Factor g_{g_θ}
3	NNE	0.11	0.08	0.78	8.7	6.8
3	SW	0.11	0.05	0.60	9.7	5.8
3	NNW	0.27	0.06	0.73	11.3	8.3
6	SW	0.31	0.12	0.98	5.5	5.3
9	SSE	0.16	0.07	0.75	7.8	5.8
13	SW	0.44	0.11	1.01	5.4	5.5
14	NNE	0.42	0.16	1.20	4.9	5.9
18	NNE	0.37	0.14	1.06	5.0	5.3
25	E	0.23	0.12	0.90	5.6	5.0
30	SW	0.18	0.09	0.77	6.9	5.3
31	SSW	0.22	0.10	0.84	6.2	5.2
33	SSE	0.47	0.12	1.06	4.8	5.1
34	SSW	0.12	0.09	0.75	6.9	5.1
36	SSW	0.22	0.11	0.92	6.2	5.7
39	SSW	0.20	0.12	0.87	5.8	5.1

THE AVERAGE OF THE GUST FACTORS IS 4.3

THE AVERAGE OF THE WEIGHTED GUST FACTORS IS 4.4

THE AVERAGE OF THE GUST PRODUCTS IS 2.9

Table 6.7 Stations and Wind Directions with Gustiness Factors Greater Than Five - for Configuration 3

Station	Wind Direction	$\frac{V_{ave}}{V_{gr.}}$	$\frac{V_{rms}}{V_{gr}}$	$\frac{V_{pk}}{V_{g.}}$	Gust Factor g_{θ}	Gustiness Factor $g_{g_{\theta}}$
5	SE	0.16	0.10	0.90	7.2	6.4
23	SE	0.40	0.09	0.95	5.8	5.5
27	NNE	0.45	0.15	1.14	4.7	5.3
28	S	0.13	0.11	0.82	6.1	5.0
31	SSW	0.08	0.08	0.94	10.1	9.4

THE AVERAGE OF THE GUST FACTORS IS 4.4

THE AVERAGE OF THE WEIGHTED GUST FACTORS IS 4.4

THE AVERAGE OF THE GUST PRODUCTS IS 2.9

Table 9.1 - Measured Wind Velocities from Full Scale Tests

Sort No.	Station No.	$(V_{ave})_{fs}$	$(V_g)_{fs}$	$\left(\frac{V_{ave}}{V_g}\right)_{fs}$	$\left(\frac{V_{rms}}{V_g}\right)_{fs}$
1	4-A	17.15	24.14	0.710	0.222
2	12	16.88	27.72	0.609	0.132
3	17	16.79	43.05	0.390	0.095
4	17-A	16.65	36.27	0.459	0.116
5	18	16.11	50.36	0.320	0.109
6	11	14.48	47.55	0.307	0.063
7	18-A	14.29	35.08	0.407	0.116
8	2	13.80	23.99	0.575	0.129
9	22	11.15	33.02	0.338	0.174
10	2-A	11.14	37.22	0.299	0.177
11	5-A	10.69	19.45	0.550	0.188
12	7	10.26	34.22	0.300	0.095
13	14	9.65	38.55	0.250	0.076
14	13	9.47	30.97	0.306	0.113
15	19-A	9.47	34.21	0.277	0.169
16	23	8.95	45.99	0.195	0.083
17	1	7.94	49.06	0.162	0.060
18	6	7.91	30.26	0.261	0.112
19	19	7.37	46.47	0.159	0.081
20	8	7.27	24.31	0.299	0.098
21	15	6.73	25.94	0.259	0.123
22	16	6.41	25.94	0.247	0.099
23	5	6.22	30.26	0.206	0.094
24	25	5.80	31.81	0.182	0.088
25	21	5.41	31.71	0.171	0.067
26	16-A	5.19	28.46	0.182	0.089
27	15-A	4.80	29.03	0.165	0.100
28	20-A	4.77	36.03	0.132	0.070
29	21-A	4.69	39.62	0.118	0.060
30	10	4.68	14.59	0.321	0.161
31	24	4.60	46.66	0.099	0.075
32	3-A	3.68	35.50	0.110	0.061
33	20	3.66	30.63	0.119	0.071
34	9	3.58	18.37	0.195	0.127

Table 9.2 - Comparison of Full Scale to Wind Tunnel Data

Sort No.	Station No.	$\left(\frac{V_{ave}}{V_g}\right)_{fs}$	$\left(\frac{V_{rms}}{V_g}\right)_{fs}$	$\left(\frac{V_{ave}}{V_g}\right)_{wt}$	$\left(\frac{V_{rms}}{V_g}\right)_{wt}$	$\frac{\left(\frac{V_{ave}}{V_g}\right)_{fs}}{\left(\frac{V_{ave}}{V_g}\right)_{wt}}$	$\frac{\left(\frac{V_{rms}}{V_g}\right)_{fs}}{\left(\frac{V_{rms}}{V_g}\right)_{wt}}$
1	4-A	0.710	0.222	0.296	0.112	2.399	1.982
2	12	0.609	0.132	0.323	0.072	1.885	1.833
3	17	0.390	0.095	0.440	0.122	0.886	0.779
4	17-A	0.459	0.116	0.442	0.121	1.038	0.959
5	18	0.320	0.109	0.191	0.083	1.675	1.313
6	11	0.307	0.063	0.600	0.110	0.512	0.573
7	18-A	0.407	0.116	0.246	0.100	1.654	1.160
8	2	0.575	0.129	0.301	0.136	1.910	0.949
9	22	0.339	0.174	0.443	0.113	0.763	1.540
10	2-A	0.299	0.177	0.309	0.135	0.968	1.311
11	5-A	0.550	0.188	0.321	0.109	1.713	1.725
12	7	0.300	0.095	0.373	0.113	0.804	0.841
13	14	0.250	0.076	0.318	0.113	0.786	0.673
14	13	0.306	0.113	0.232	0.100	1.319	1.130
15	19-A	0.277	0.169	0.178	0.079	1.556	2.139
16	23	0.195	0.083	0.320	0.109	0.609	0.761
17	21	0.162	0.060	0.244	0.098	0.664	0.612
18	6	0.261	0.112	0.415	0.118	0.629	0.949
19	19	0.159	0.081	0.165	0.090	0.964	0.900
20	8	0.299	0.098	0.176	0.104	1.699	0.942
21	15	0.259	0.123	0.275	0.111	0.942	1.108
22	16	0.247	0.099	0.215	0.106	1.149	0.934
23	5	0.206	0.094	0.294	0.102	0.701	0.922
24	25	0.182	0.088	0.315	0.099	0.578	0.889
25	21	0.171	0.067	0.438	0.112	0.390	0.598
26	16-A	0.182	0.089	0.219	0.108	0.831	0.824
27	15-A	0.165	0.100	0.238	0.113	0.693	0.885
28	20-A	0.132	0.070	0.072	0.042	1.833	1.667
29	21-A	0.118	0.060	0.188	0.092	0.628	0.652
30	10	0.321	0.161	0.601	0.114	0.534	1.412
31	24	0.099	0.075	0.295	0.120	0.336	0.625
32	3-A	0.110	0.061	0.060	0.037	1.833	1.649
33	20	0.119	0.071	0.311	0.108	0.383	0.657
34	9	0.195	0.127	0.281	0.142	0.694	0.894

(All data ratioed to gradient velocity)

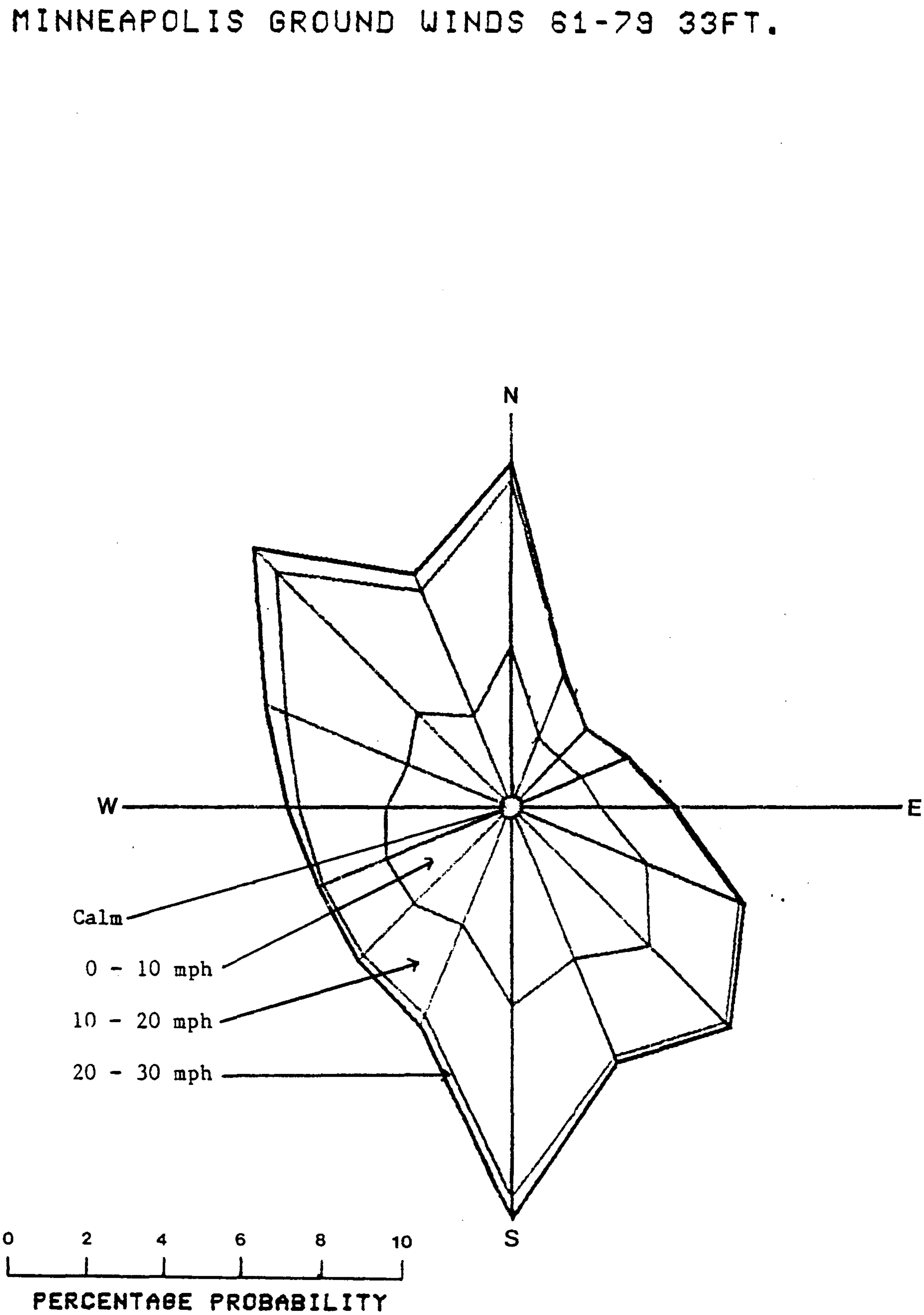


Figure 1. Surface Wind Rose for Minneapolis, MN

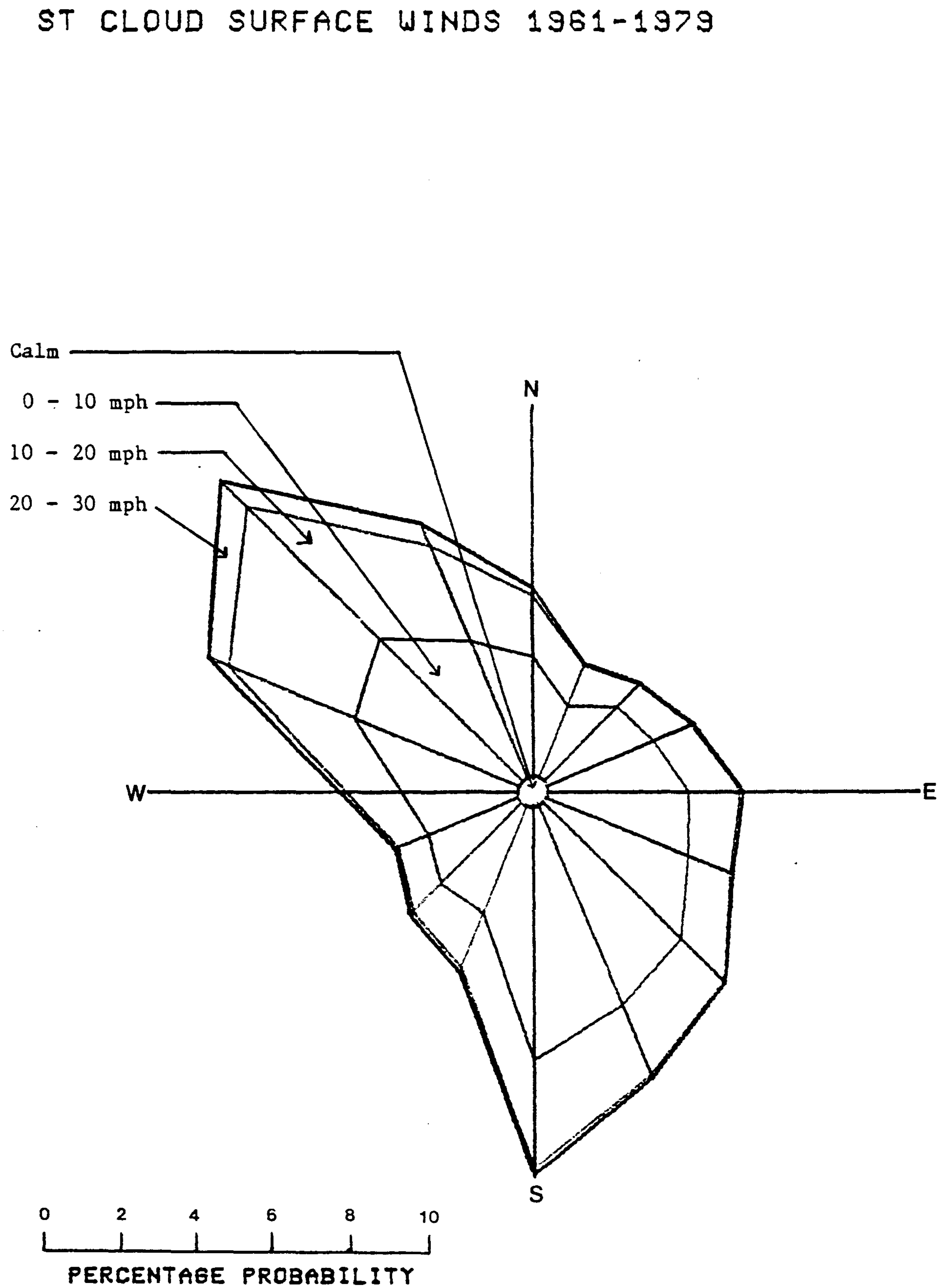


Figure 2. Surface Wind Rose for St. Cloud, MN

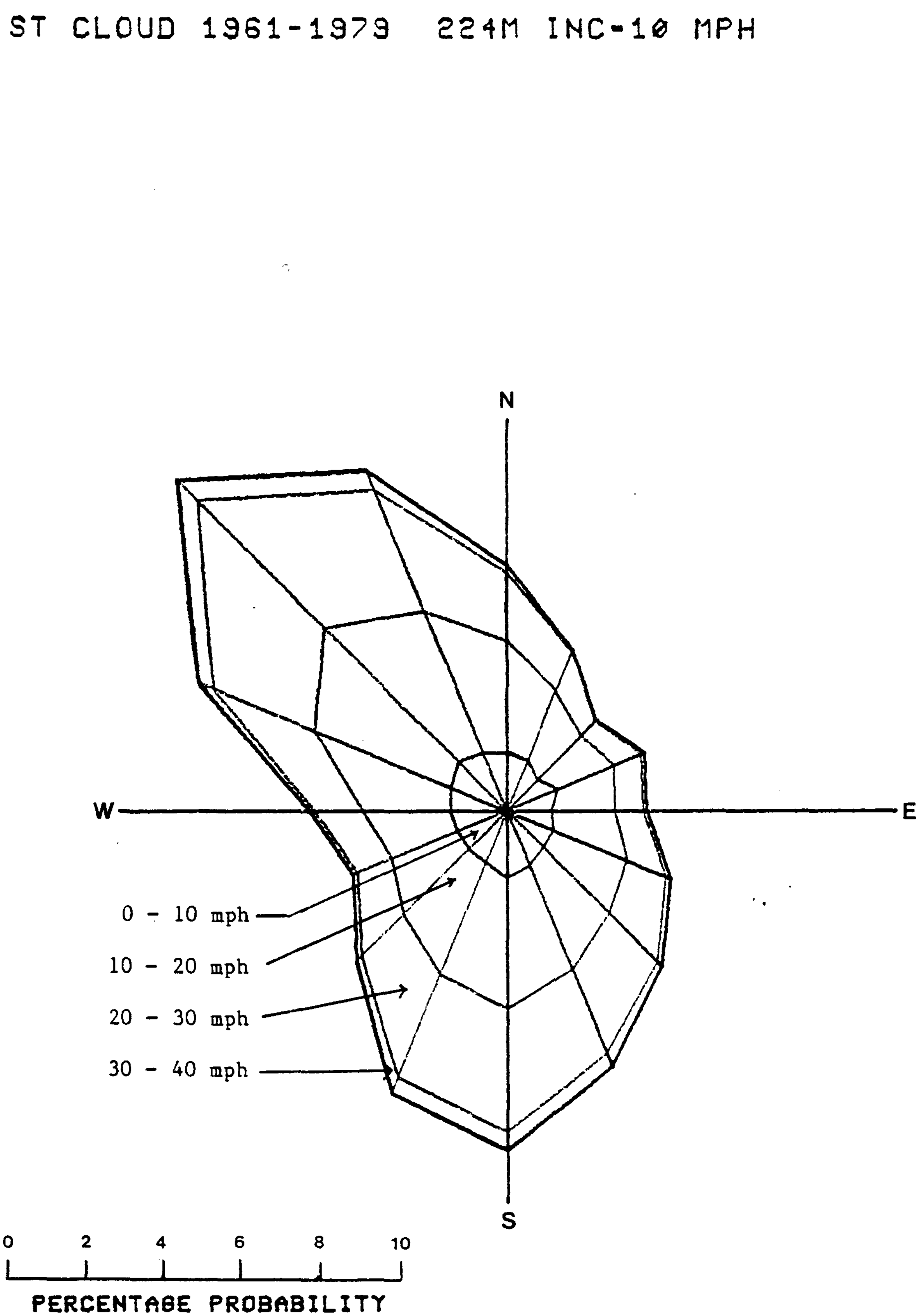


Figure 3. Winds Aloft Wind Rose for St. Cloud, MN (224 Meters)

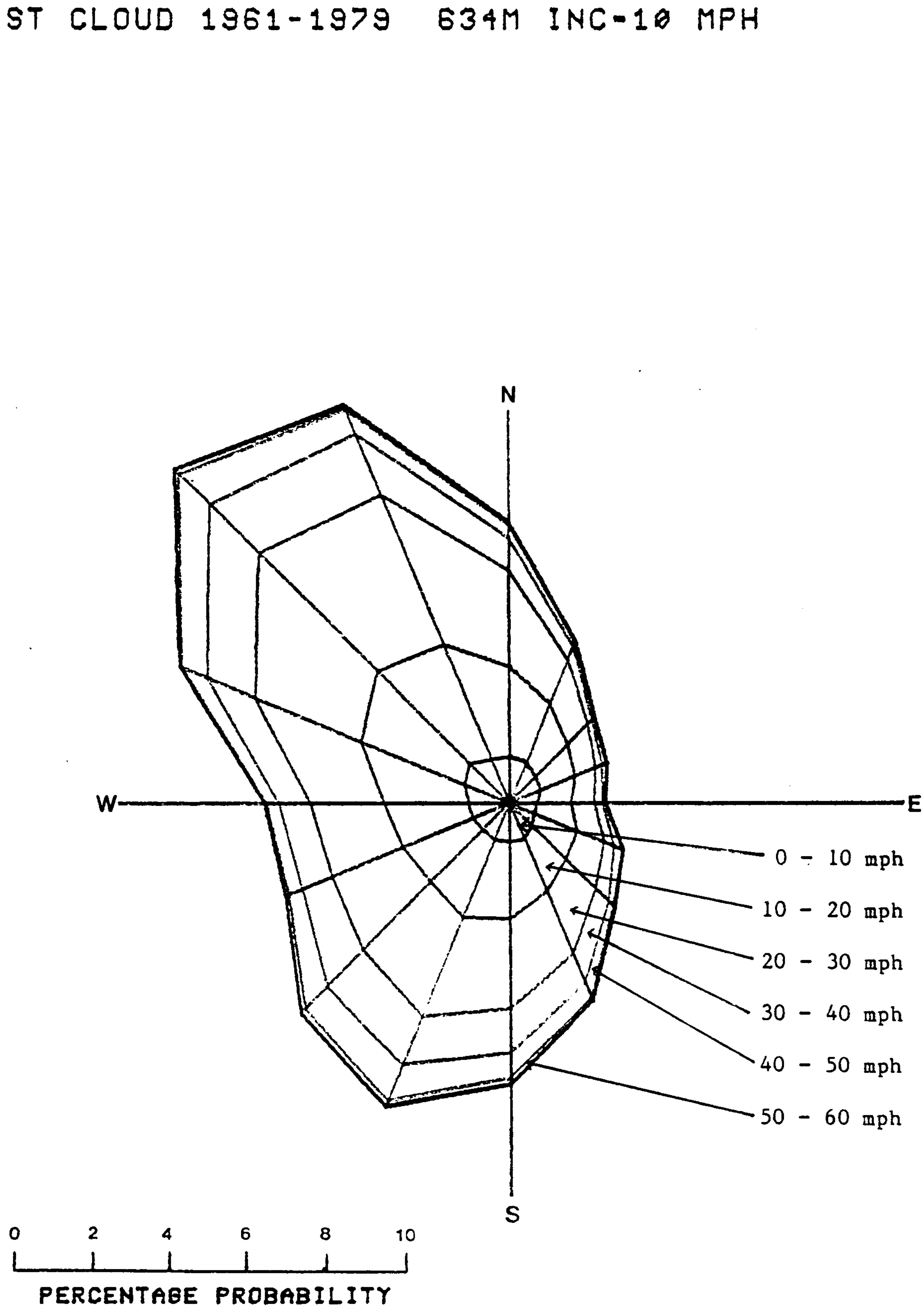


Figure 4. Winds Aloft Wind Rose for St. Cloud, MN (624 Meters)

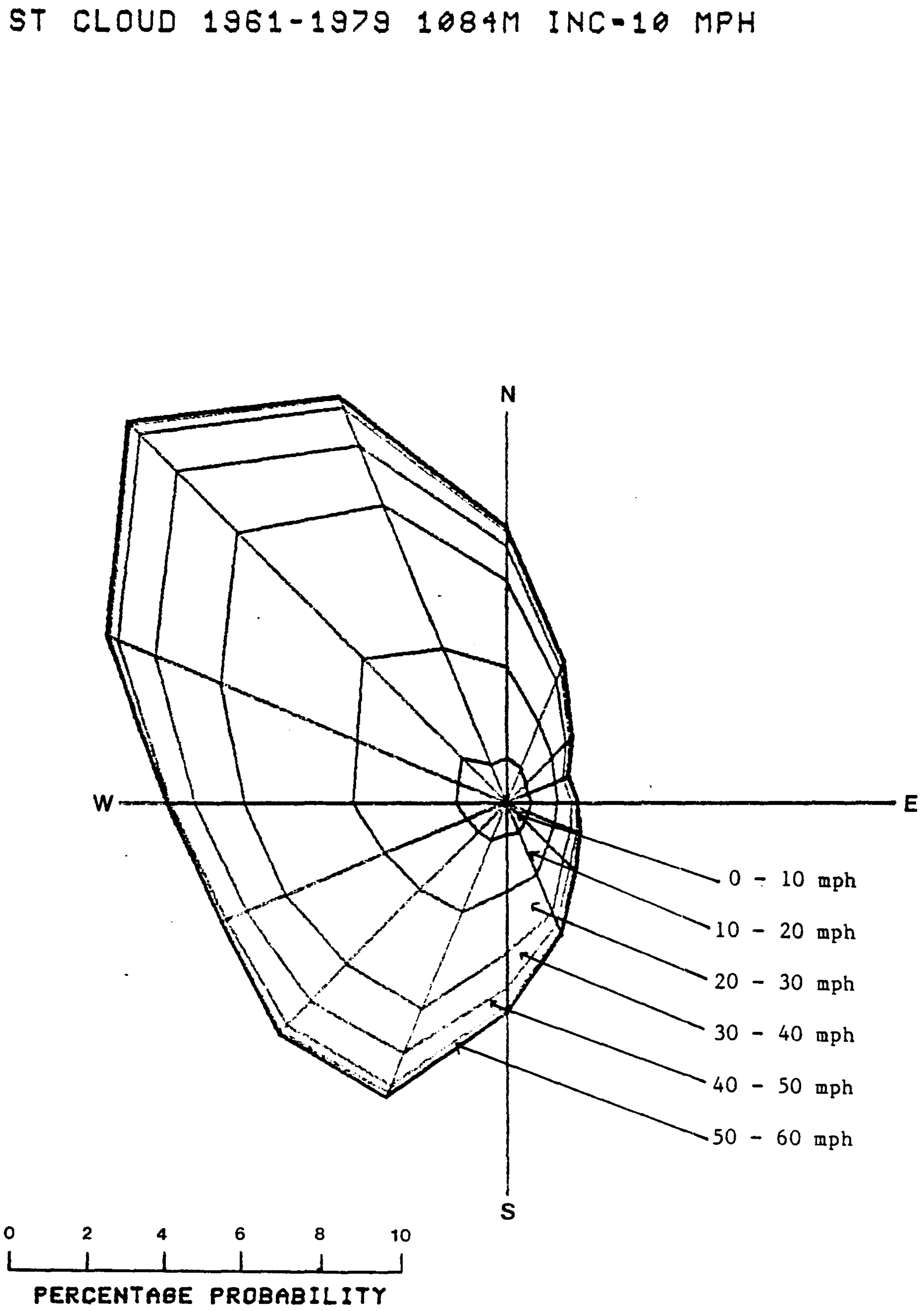


Figure 5. Winds Aloft Wind Rose for St. Cloud, MN (1084 Meters)

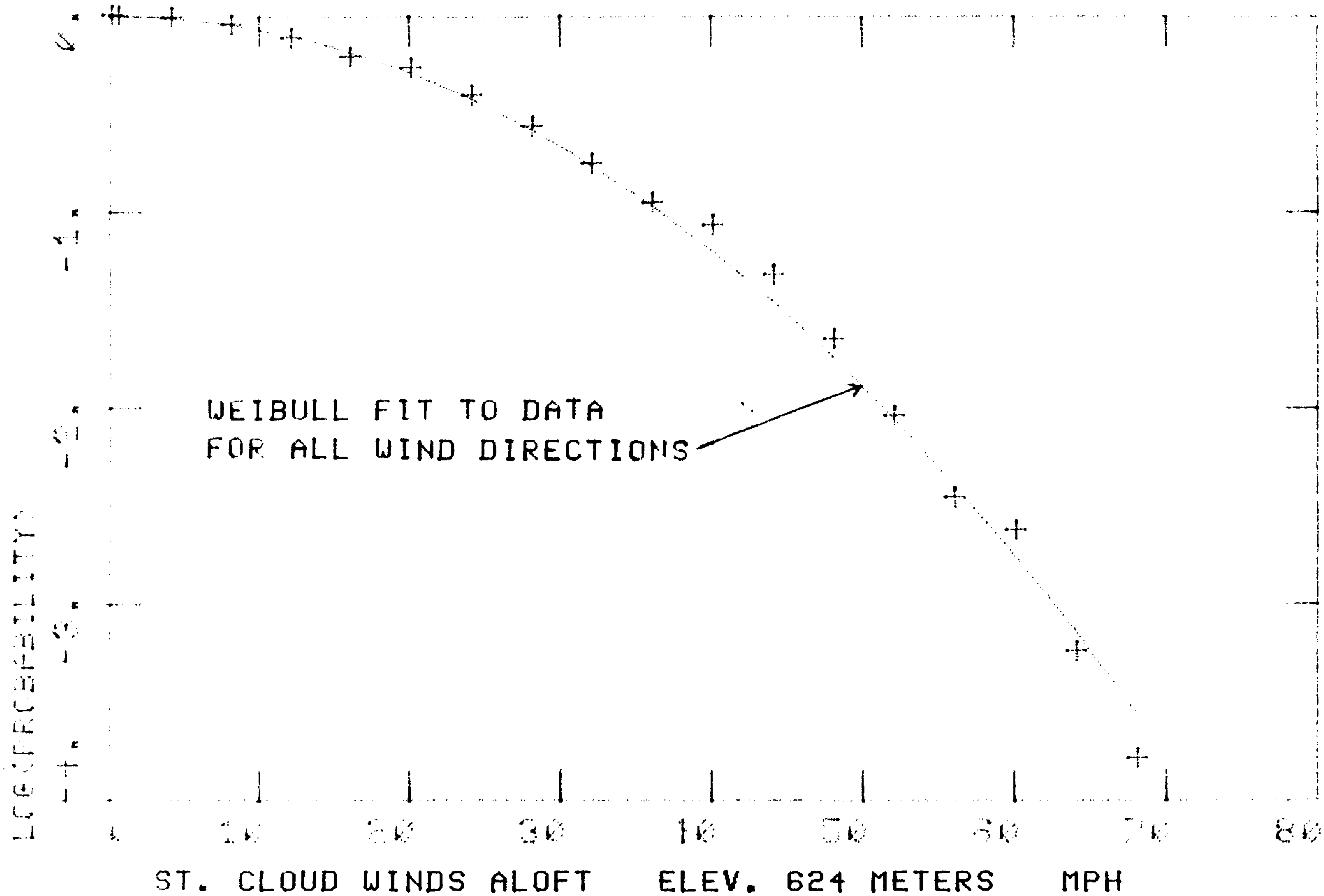


Figure 6. Weibull Fit to Winds Aloft Data at 624 Meters

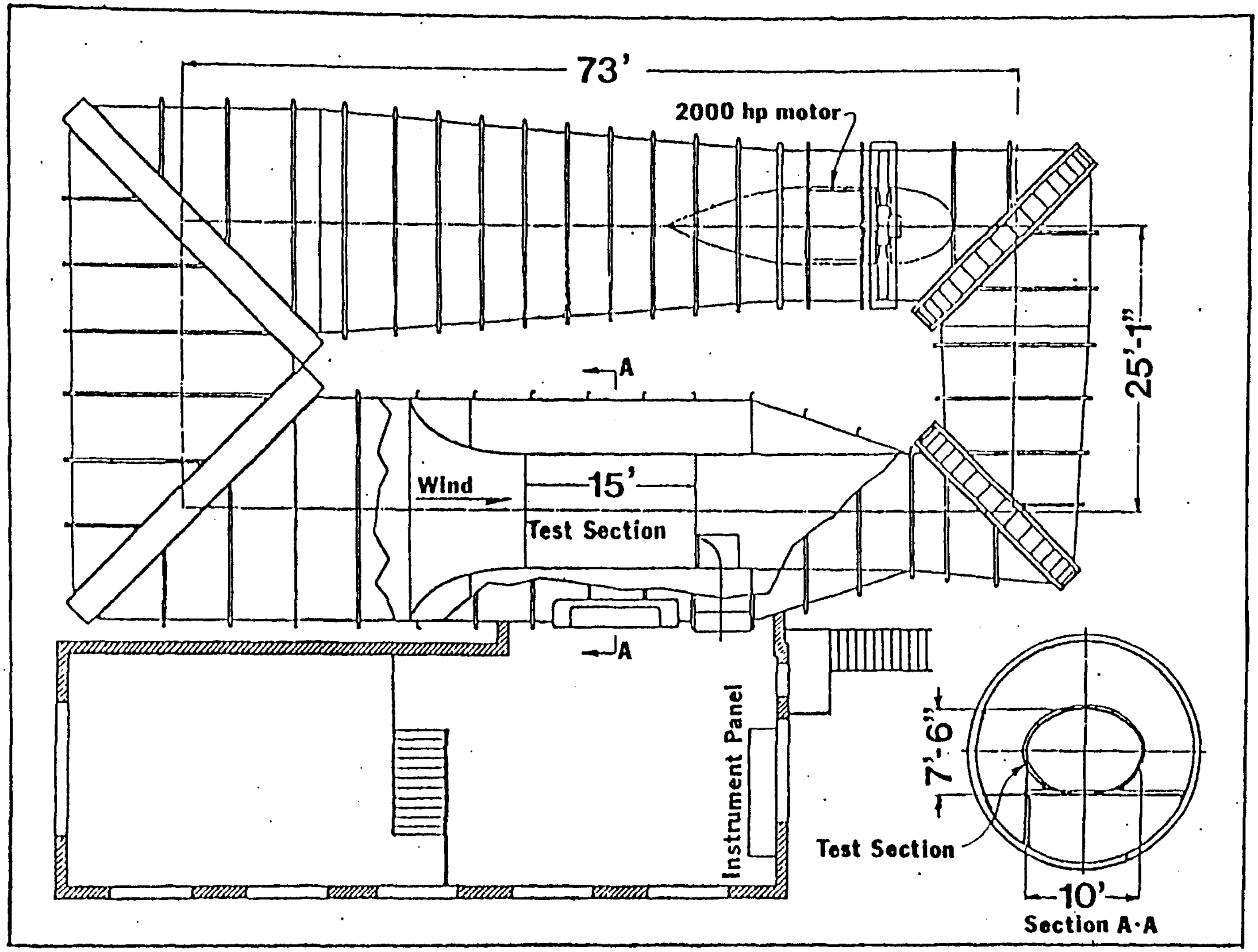


Figure 7. Schematic Diagram of Wright Brothers Wind Tunnel

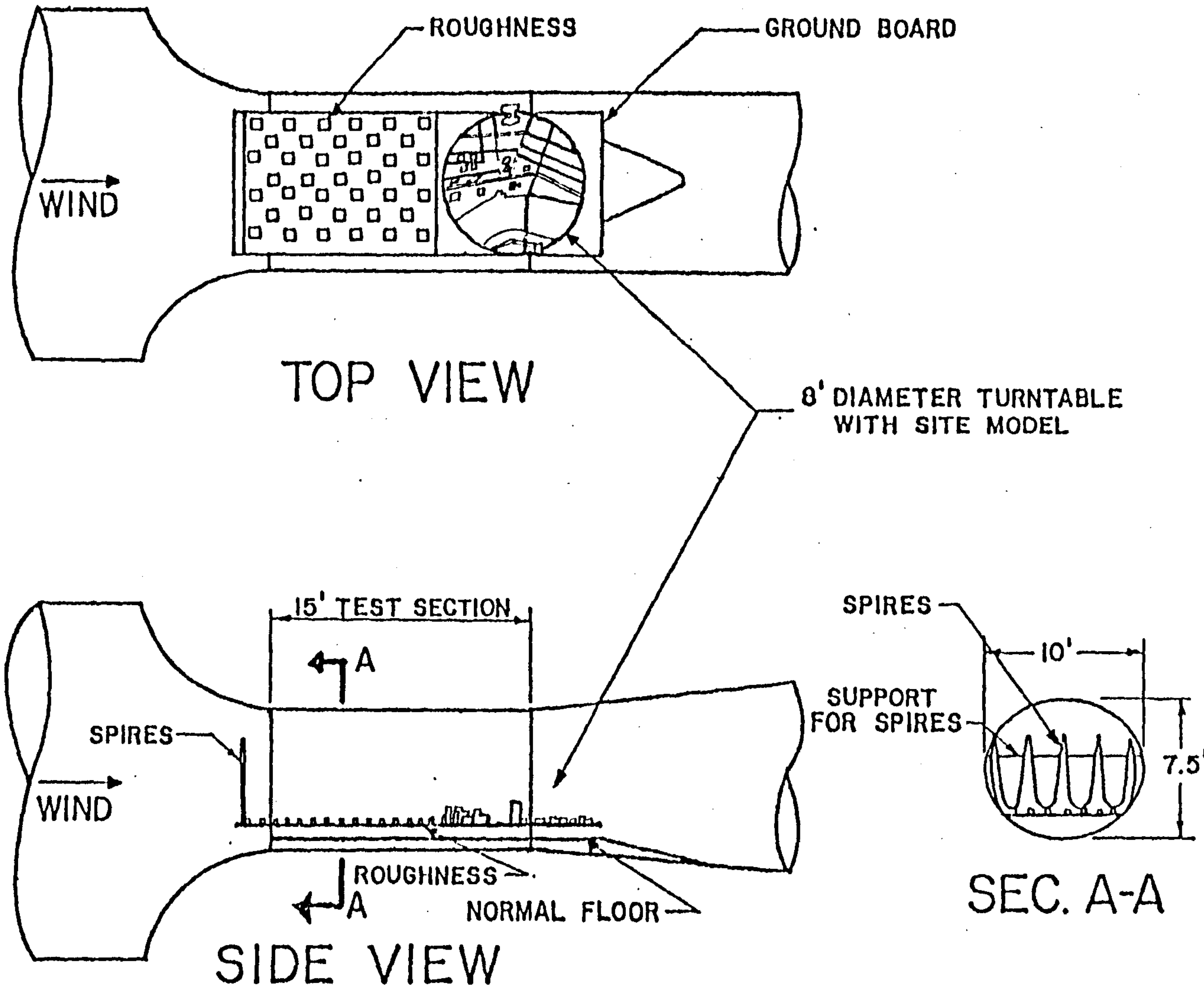
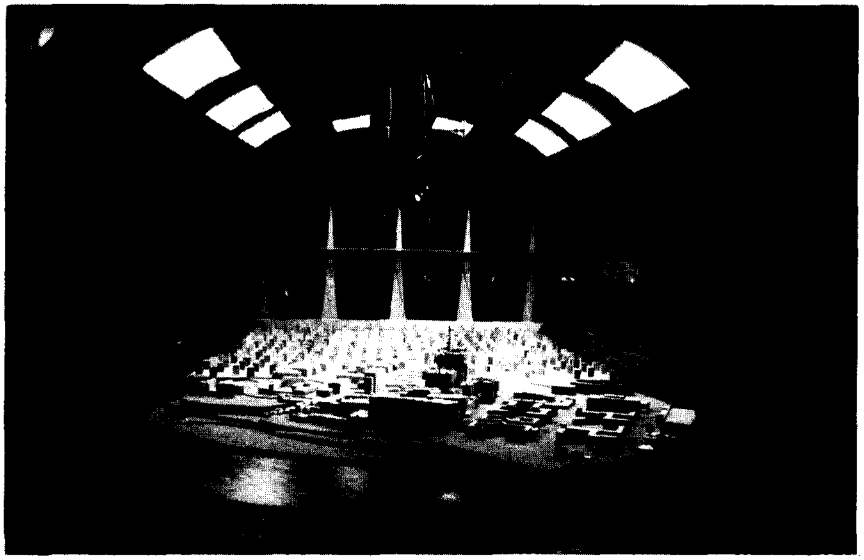


Figure 8. Schematic Diagram of Boundary Layer Simulation in the Wright Brothers Wind Tunnel



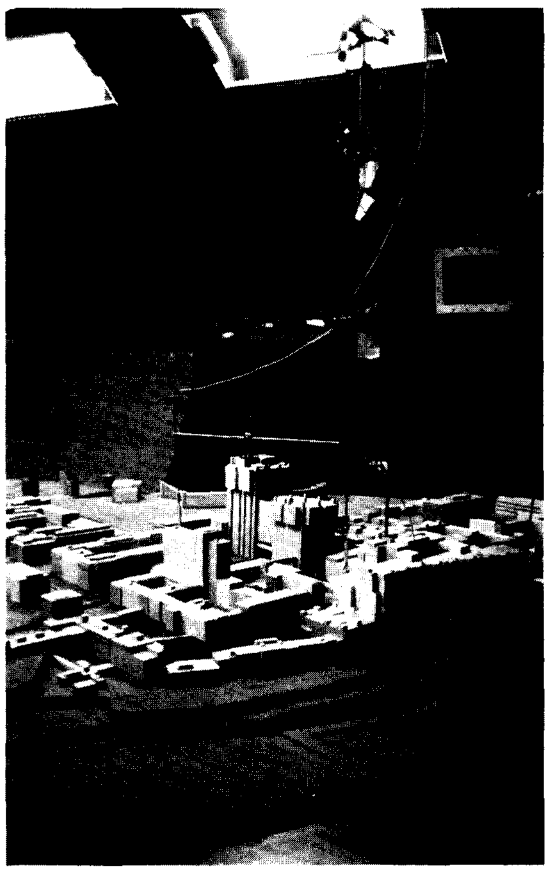
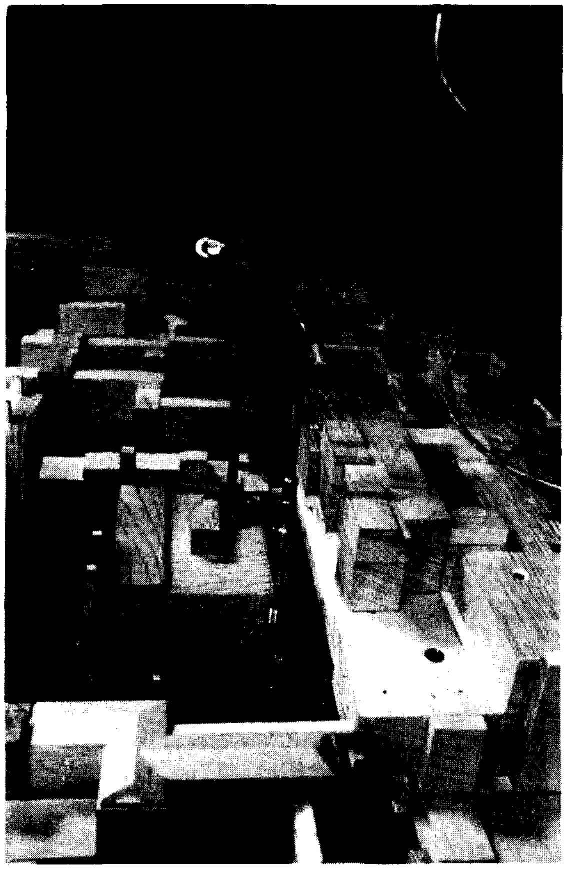


Figure 9. Views of Campus Model in Wind Tunnel Showing Proposed Health Sciences Center in Place



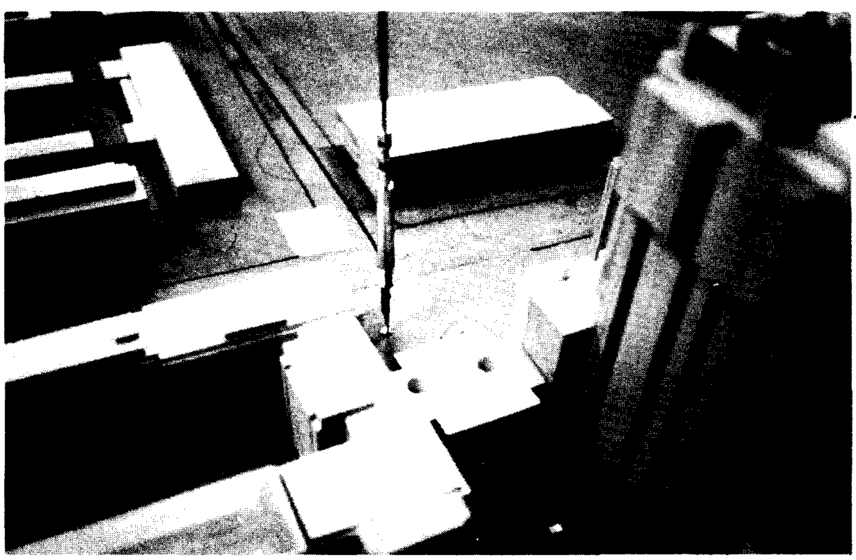


Figure 10. Close-up Views of Hot-Wire Anemometers Used in Test

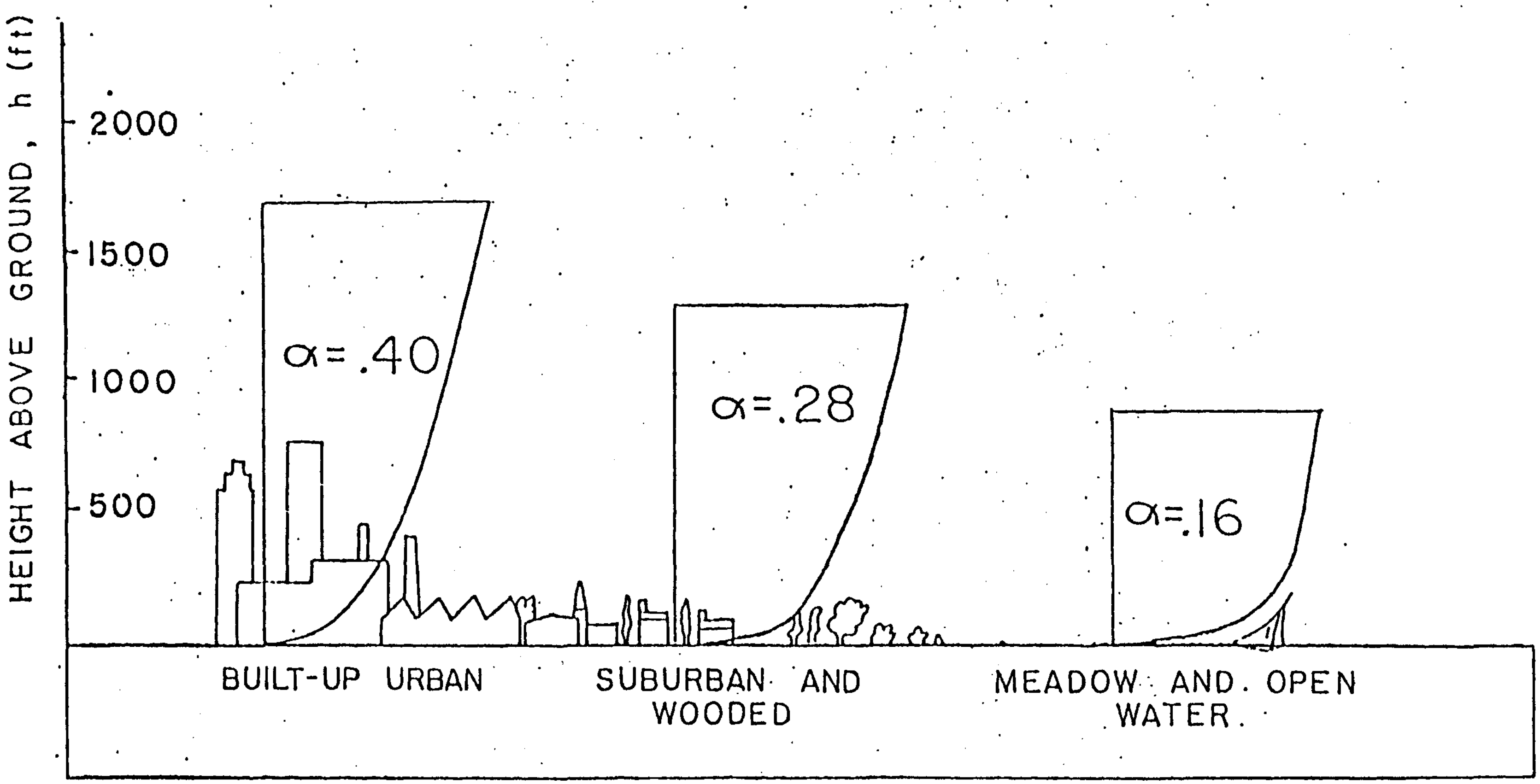


Figure 11. Typical Power Law Profiles for Various Terrains

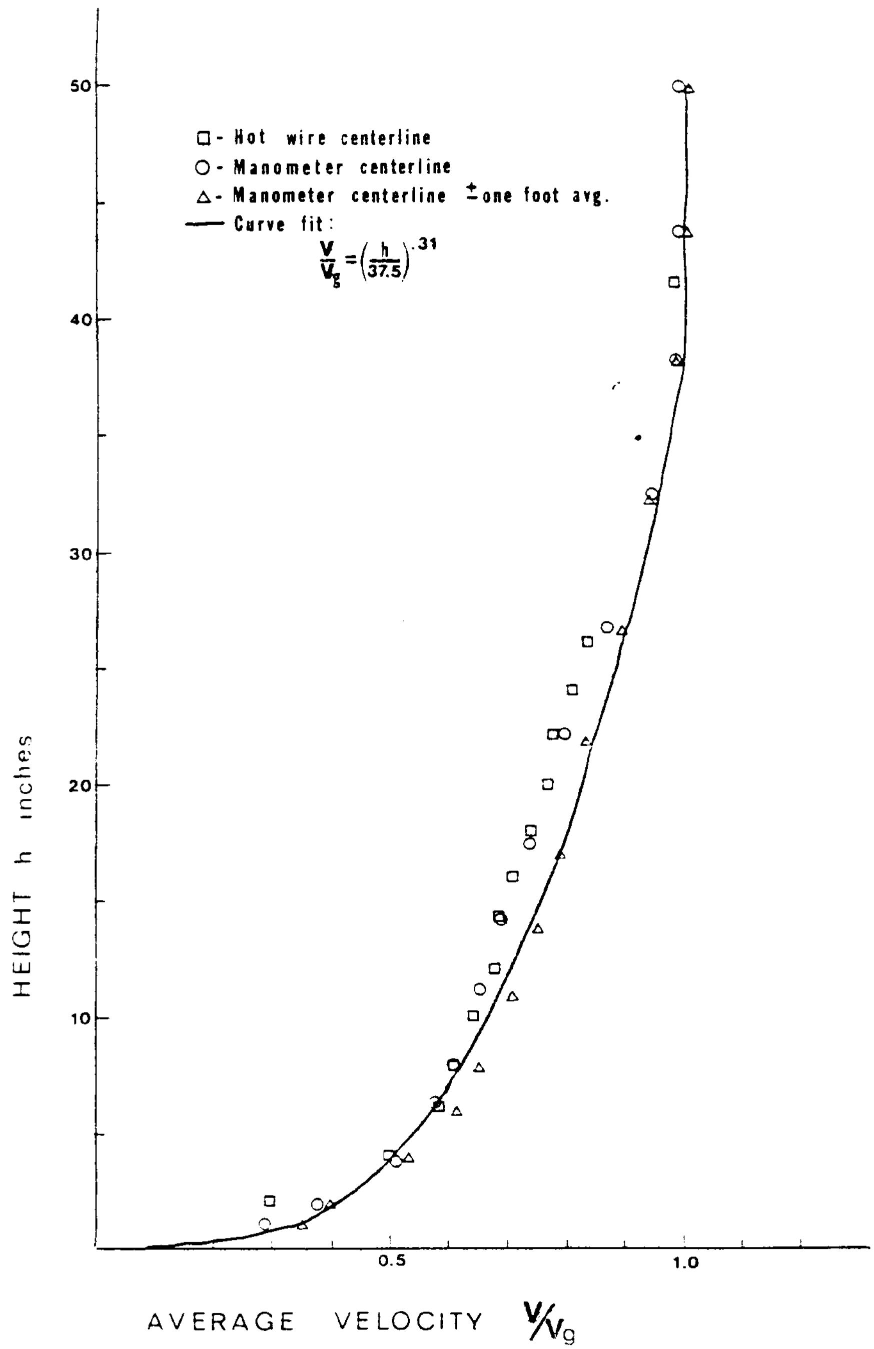


Figure 12. Velocity Gradient Simulation

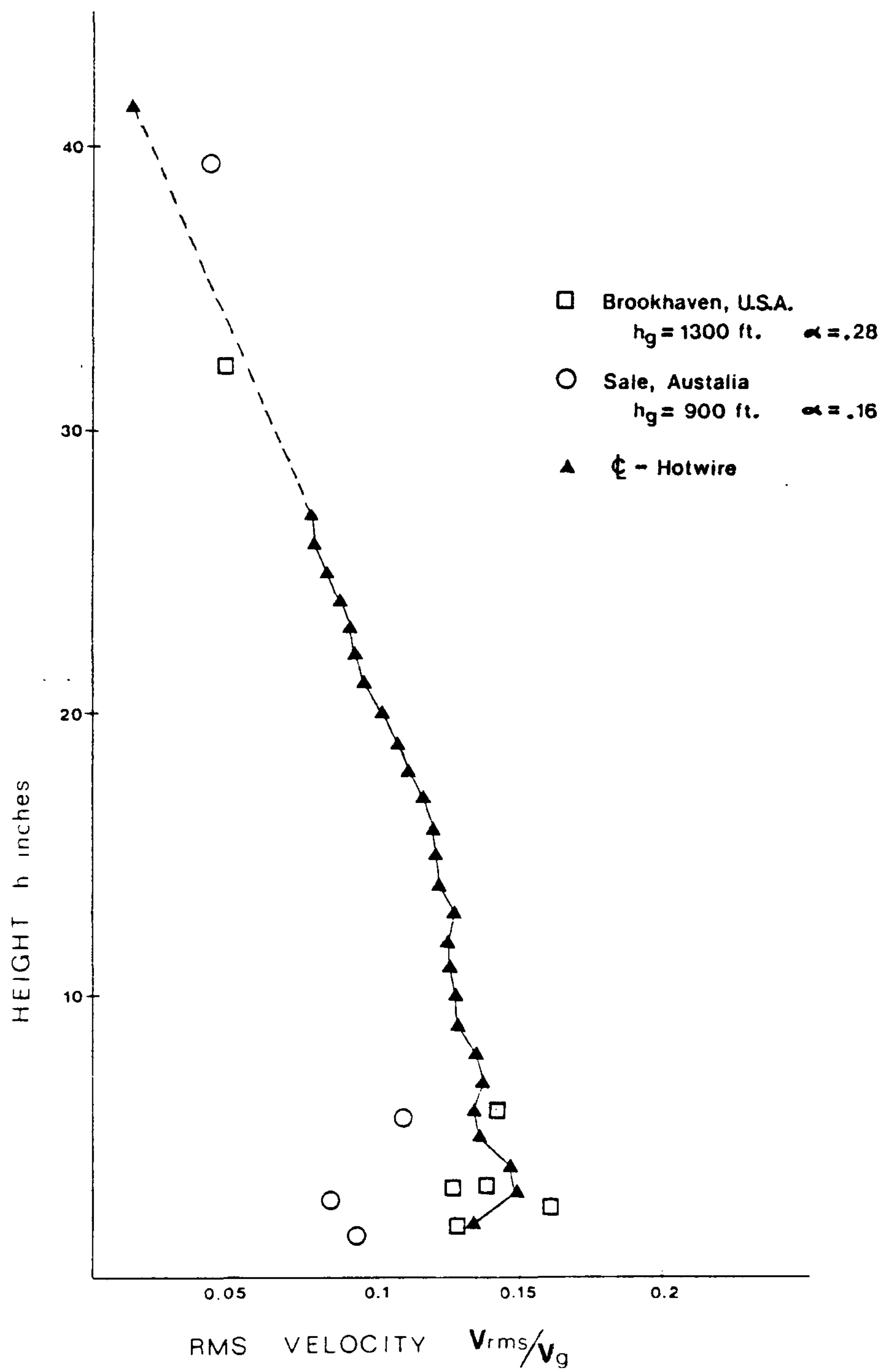


Figure 13. Simulation of Longitudinal Turbulence Intensity Variation with Height

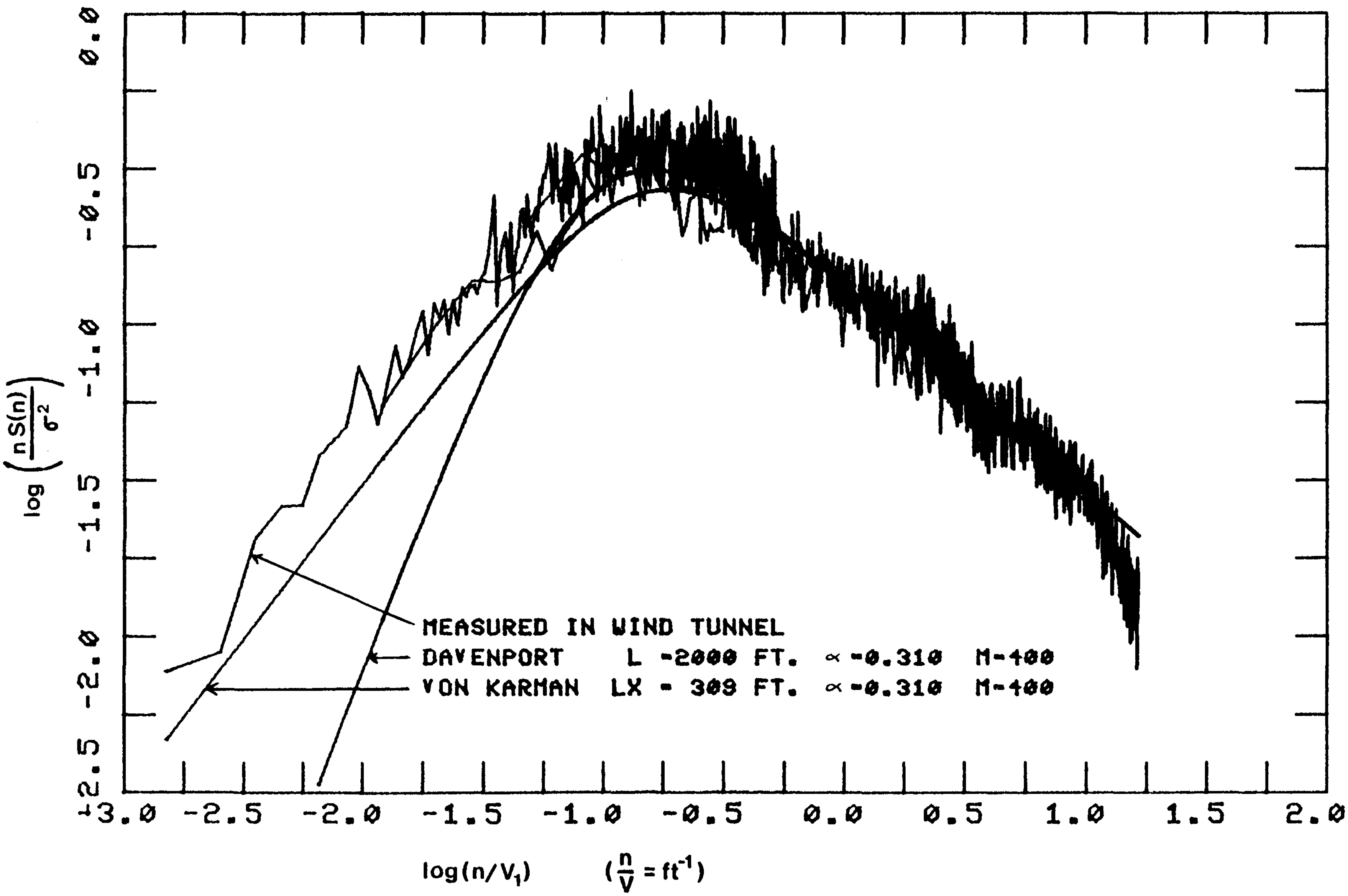


Figure 14. Power Spectrum of Longitudinal Velocity

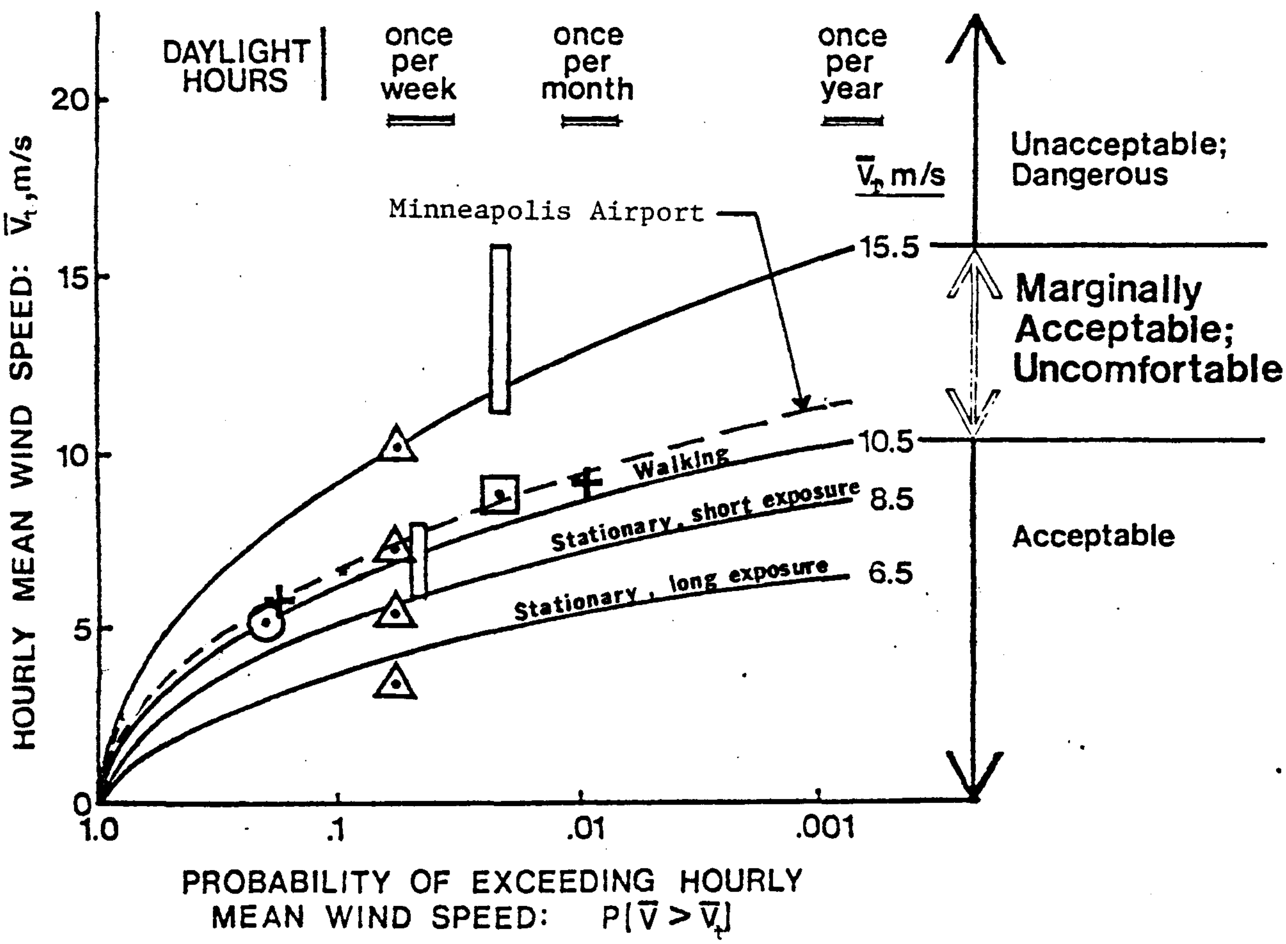
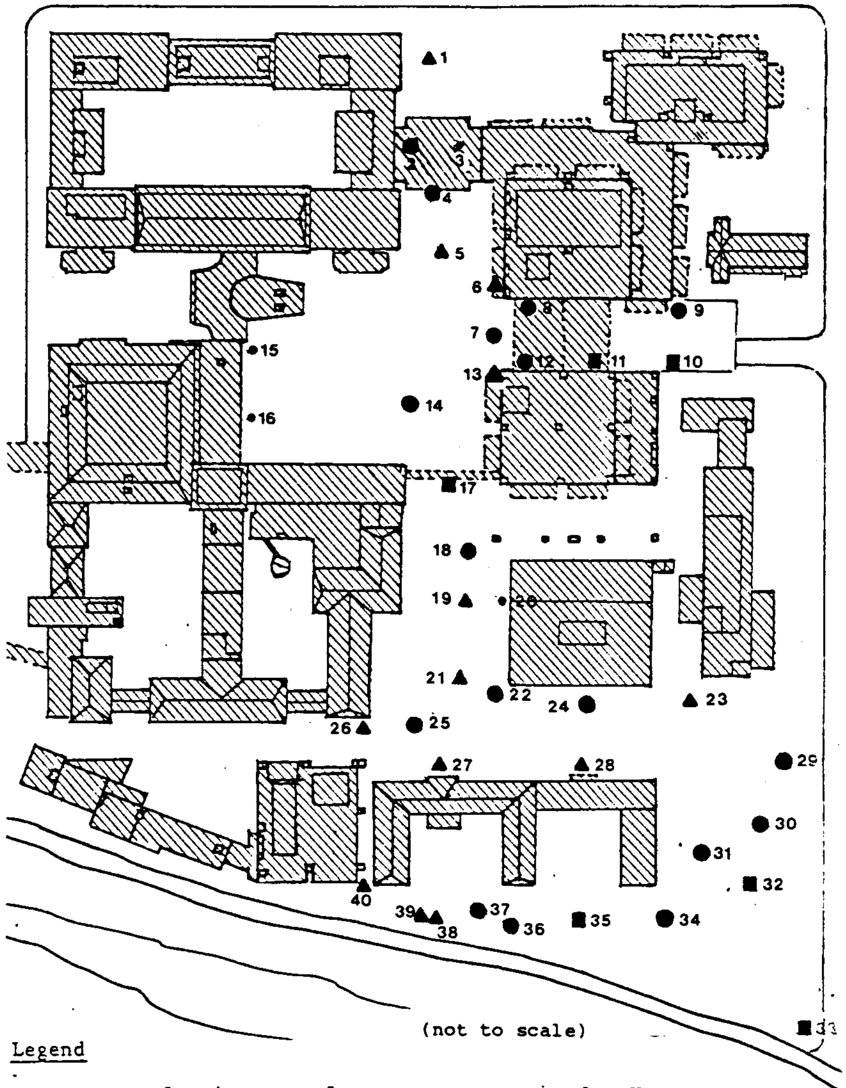


Figure 15(a) International Pedestrian Comfort Criteria

		SYMBOL
CONDITIONS AT LOGAN AIRPORT		- - - -
CRITERIA		
MELBOURNE [14]		———
DAVENPORT [3]		
Acceptable for:		
Walking fast	If P[$\bar{V}$ > 10] < 0.05	◬
Strolling	If P[$\bar{V}$ > 7.5] < 0.05	◬
Standing, Sitting, Short Exposure	If P[$\bar{V}$ > 5.5] < 0.05	◬
Standing, Sitting Long Exposure	If P[$\bar{V}$ > 3.5] < 0.05	◬
PENWARDEN AND WISE [16]		
Acceptable	If P[$\bar{V}$ > 5] < 0.2	⊙
LAWSON [10]		
Acceptable	If P[$\bar{V}$ > 6 to 8] < 0.04	▭
Unacceptable	If P[$\bar{V}$ > 11 to 14] < 0.02	▭
HUNT, POULTON & MUMFORD [9]		
Acceptable for Strolling	If P[$\bar{V}$ > 6] < 0.1	+
Acceptable for Walking	If P[$\bar{V}$ > 9] < 0.01	+
RADOVSKY & DURGIN [17]		
Acceptable	If P[$\bar{V}$ > 9] < 0.02	⊡

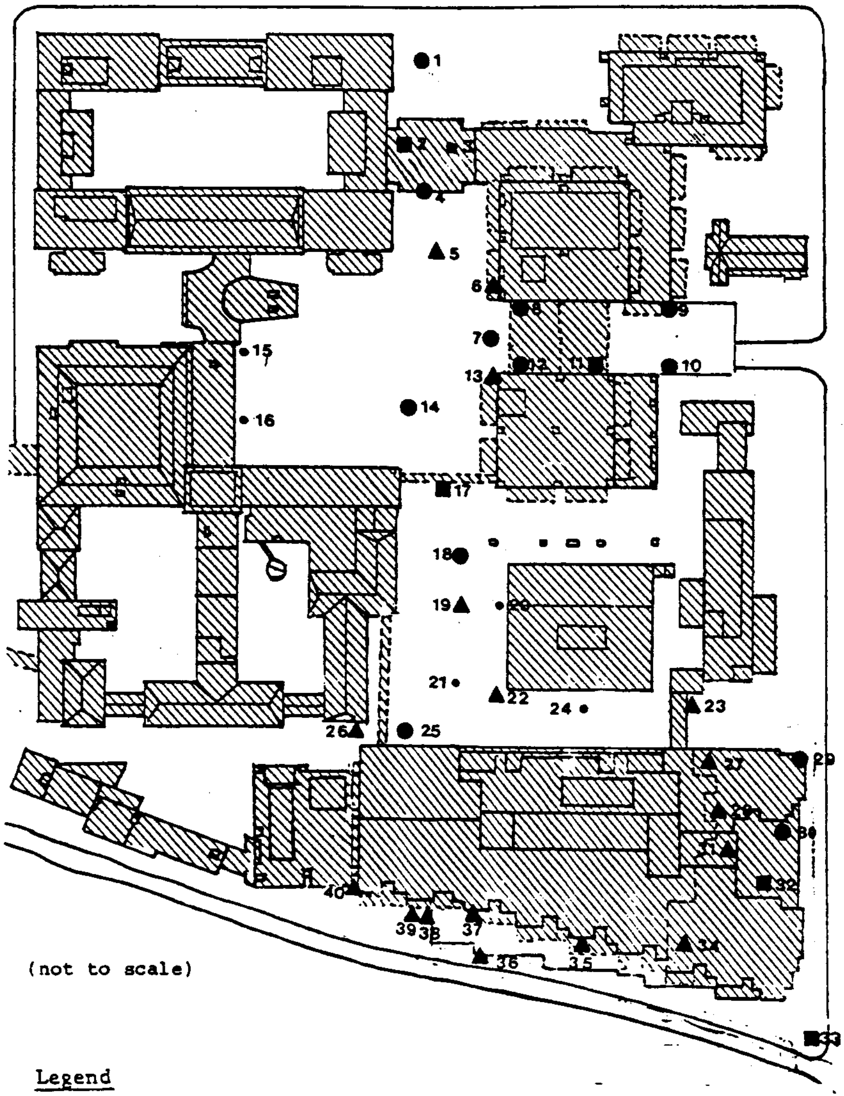
Figure 15(b) - Legend for Comfort Criteria Graph



Legend

No Mark	Stationary - Long exposure	$0 < V_{Ave} < 11.2$
▲	Stationary - Short exposure	$11.2 \leq V_{Ave} < 14.5$
●	Walking (acceptable)	$14.5 \leq V_{Ave} < 17.8$
■	Unacceptable	$17.8 \leq V_{Ave} < 25.6$

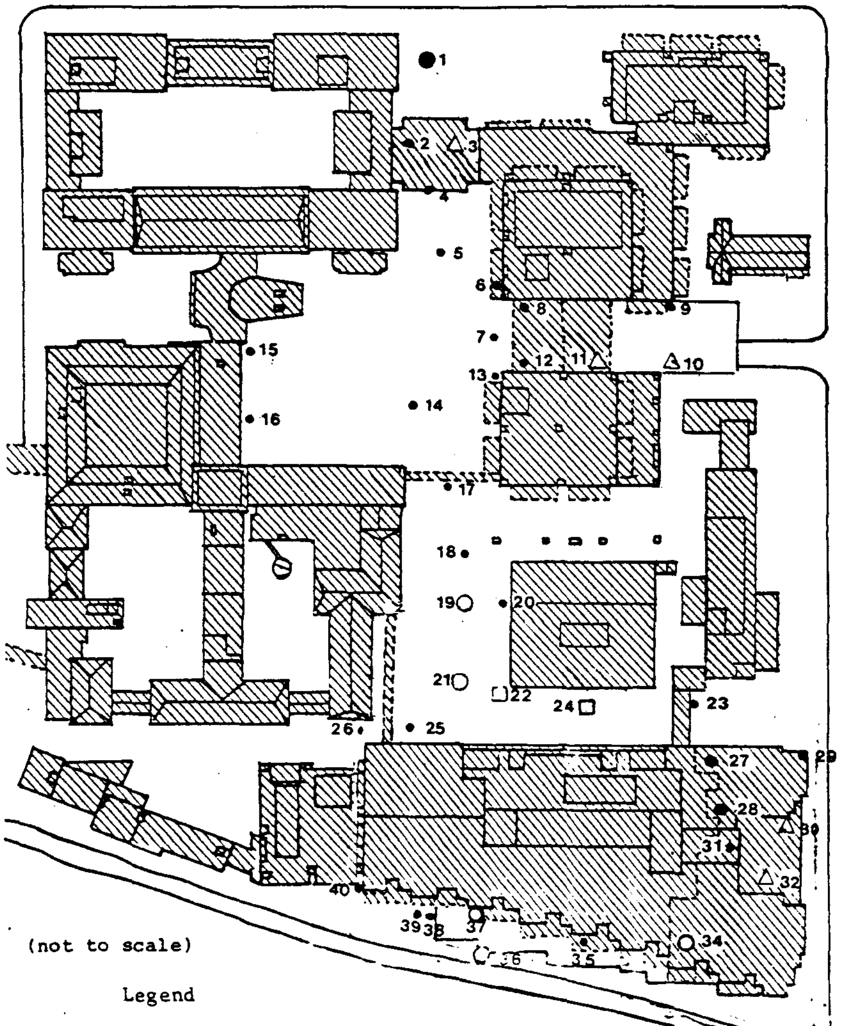
Figure 16. Map Plotting Tested 2% Exceedance Velocities Present Building (Configuration 1)



Legend

No Mark	Stationary - Long exposure	$0 < V_{Ave} < 11.2$
▲	Stationary - Short exposure	$11.2 \leq V_{Ave} < 14.5$
●	Walking (acceptable)	$14.5 \leq V_{Ave} < 17.8$
■	Unacceptable	$17.8 \leq V_{Ave} < 25.6$

Figure 17. Map Plotting Tested 2% Exceedance Velocities Proposed Building (Configuration 2)



Legend

□	decrease in velocity more than 4 mph
○	" " " between 2 mph and 4 mph
△	" " " " 1 mph and 2 mph
•	change " " less than 1 mph
▲	increase in velocity between 1 mph and 2 mph
●	" " " " 2 mph and 4 mph
■	" " " more than 4 mph

Figure 18. Change in 2% Exceedance Velocities – Configuration 1 vs. Configuration 2

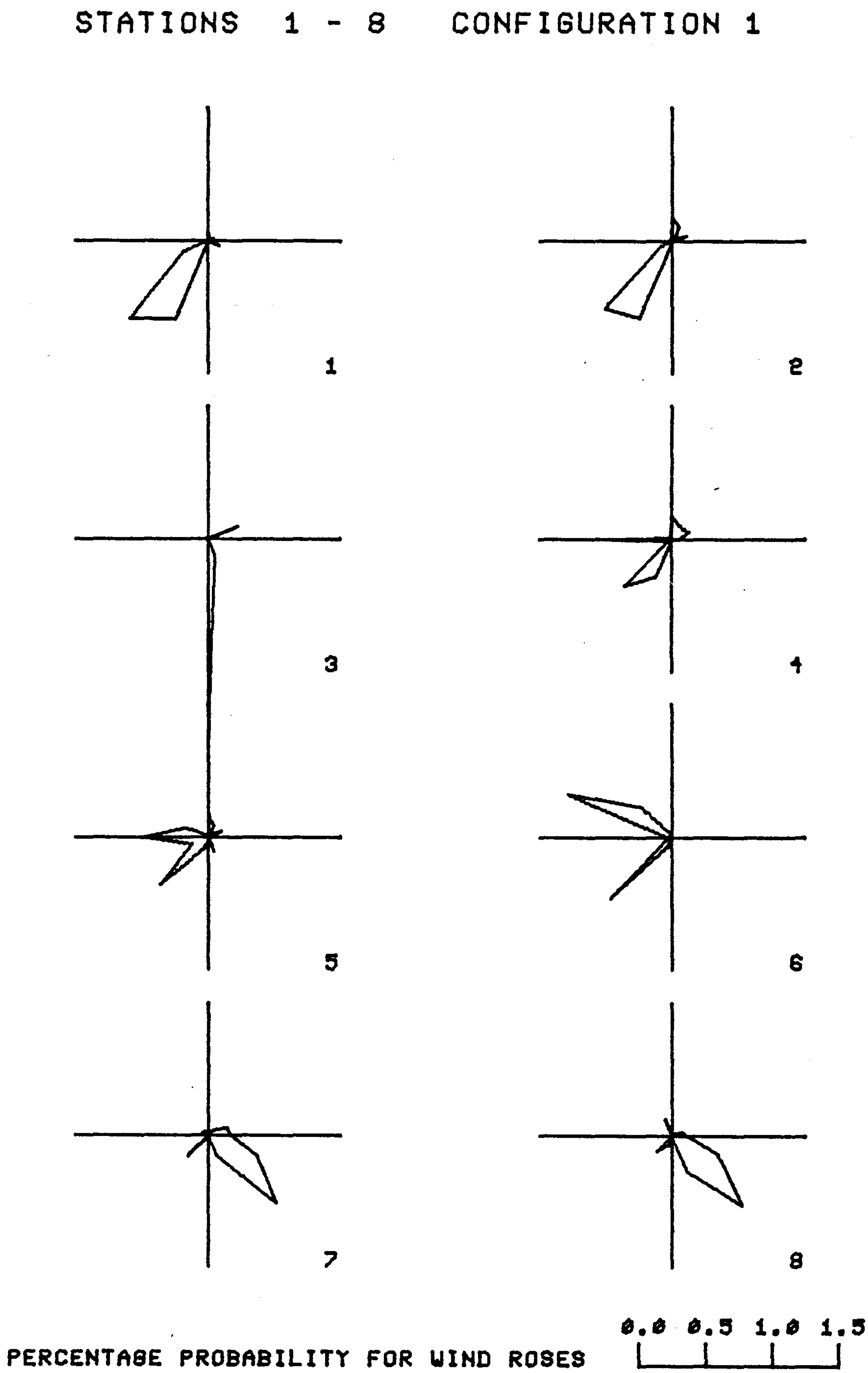


Figure 19. Contributing Probabilities for Ground Wind Stations 1 - 8 Configuration 1

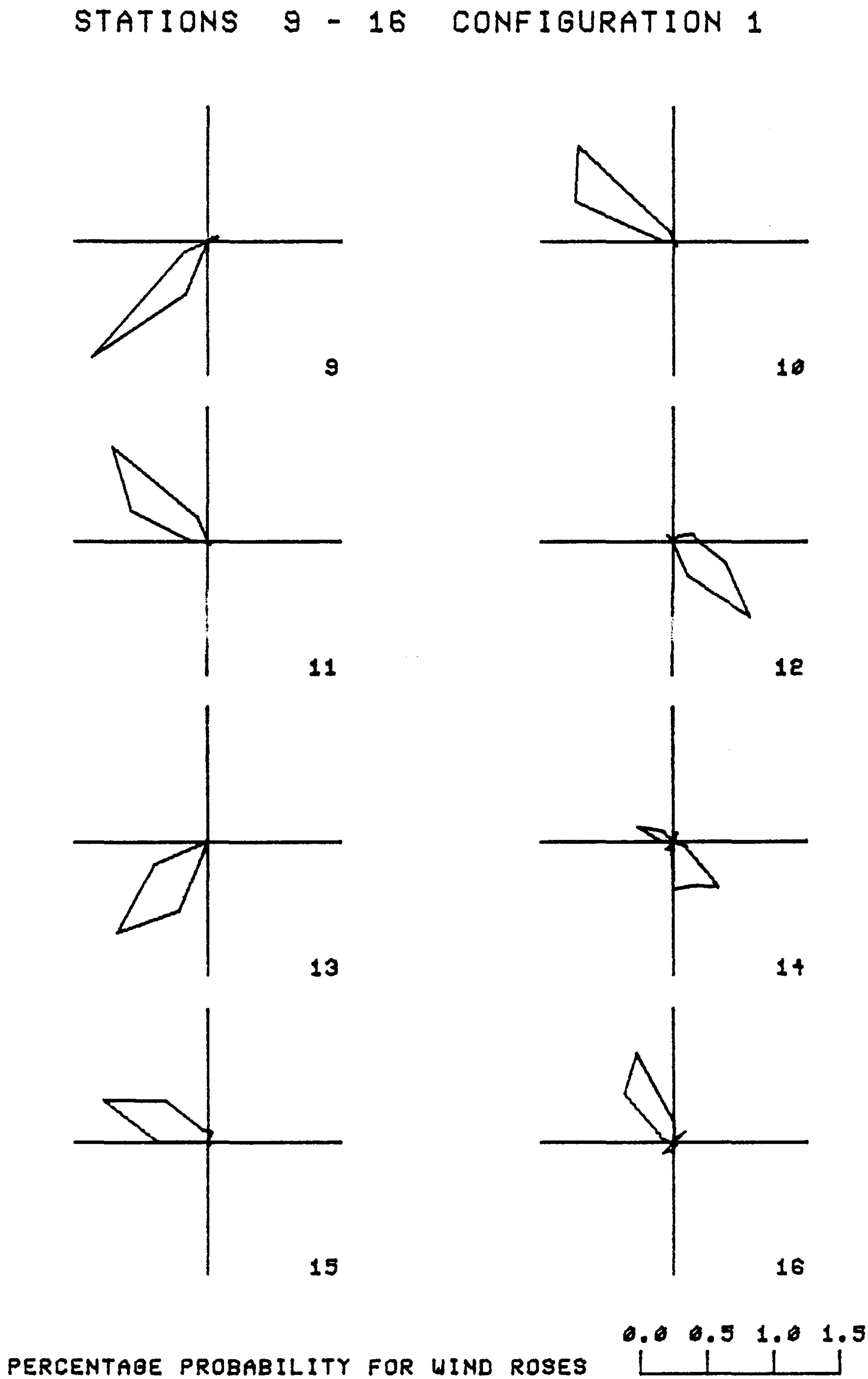


Figure 20. Contributing Probabilities for Ground Wind Stations 9 - 16 Configuration 1

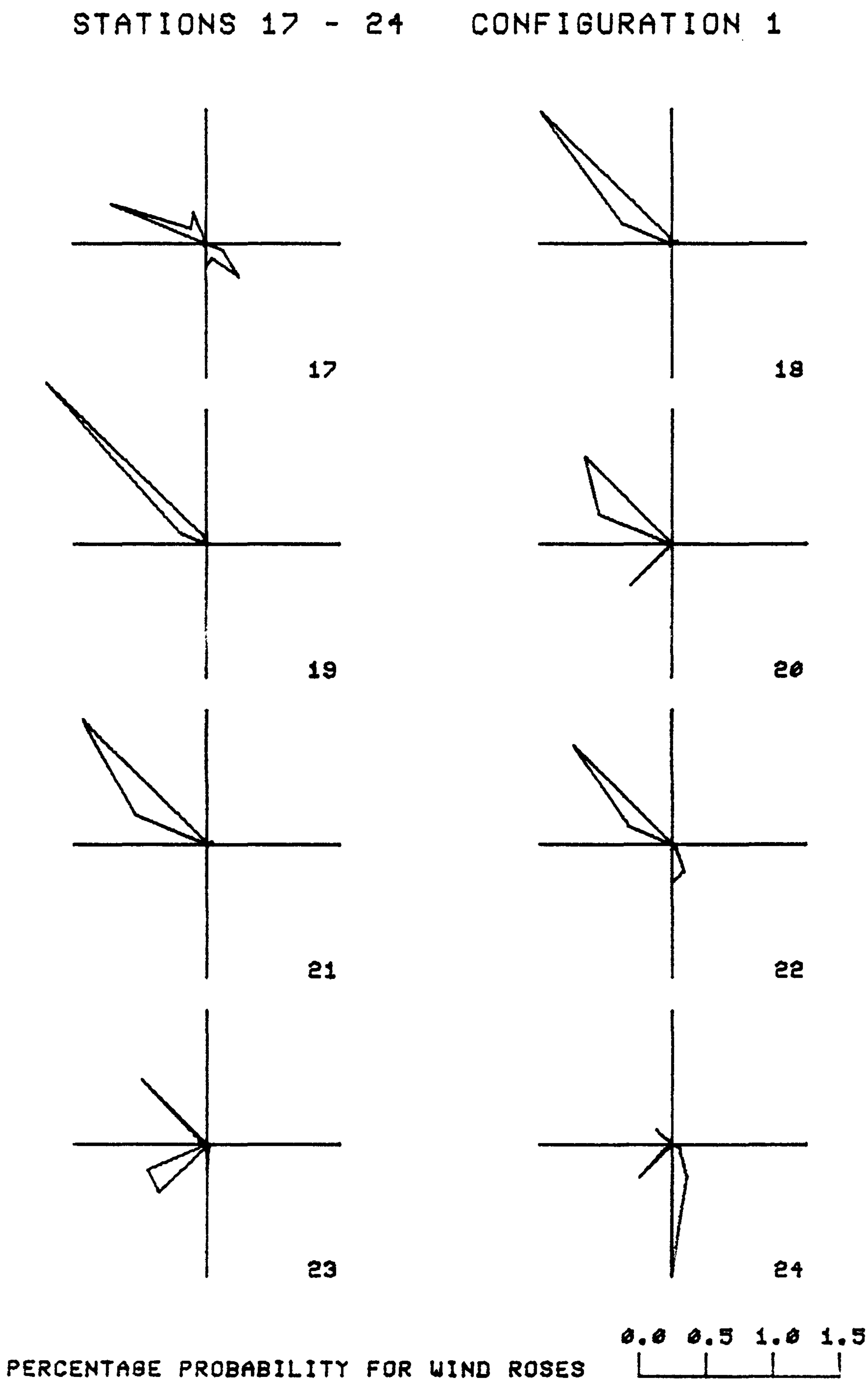


Figure 21. Contributing Probabilities for Ground Wind Stations 17 - 24 Configuration 1

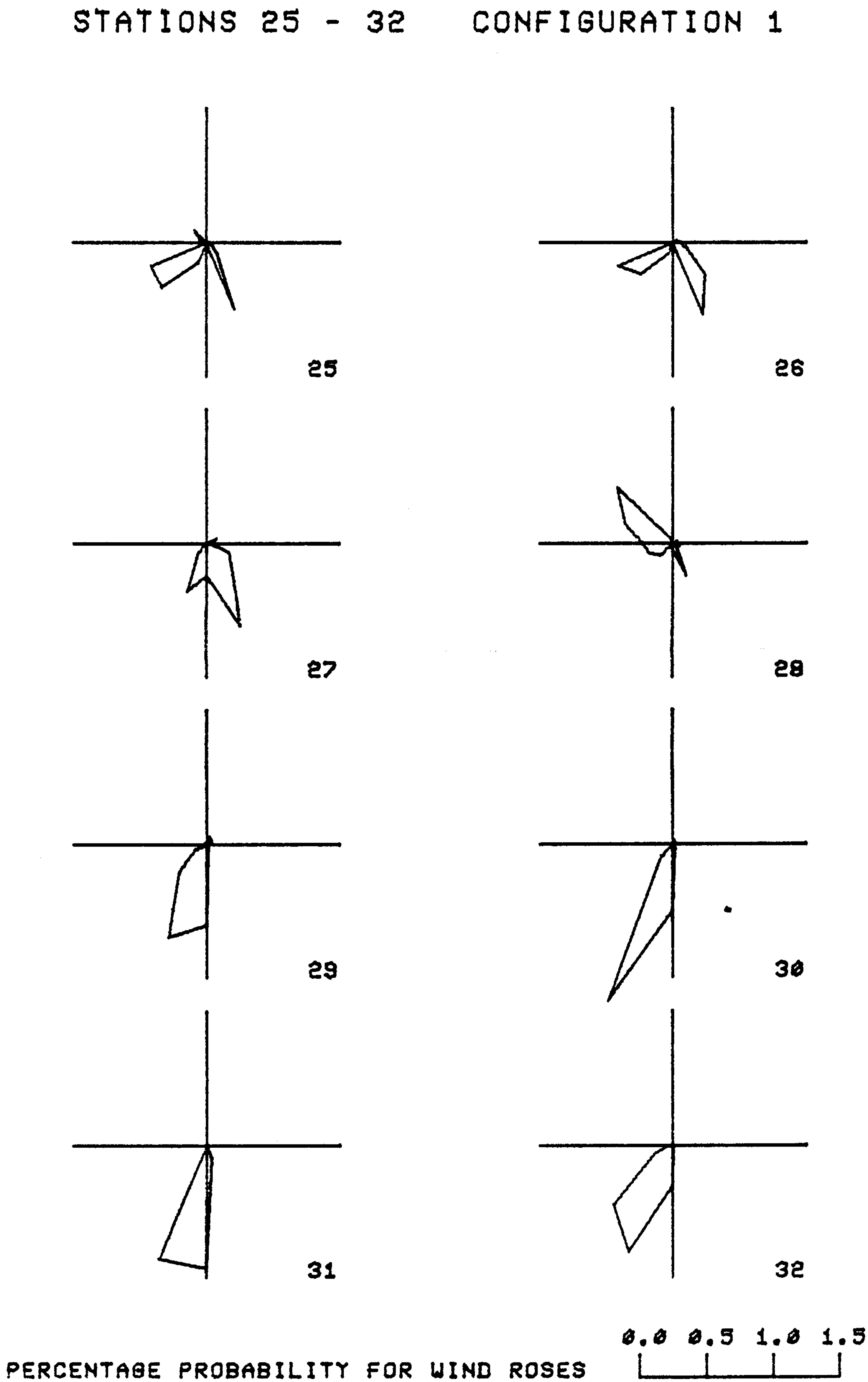


Figure 22. Contributing Probabilities for Ground Wind Stations 25 - 32 Configuration 1

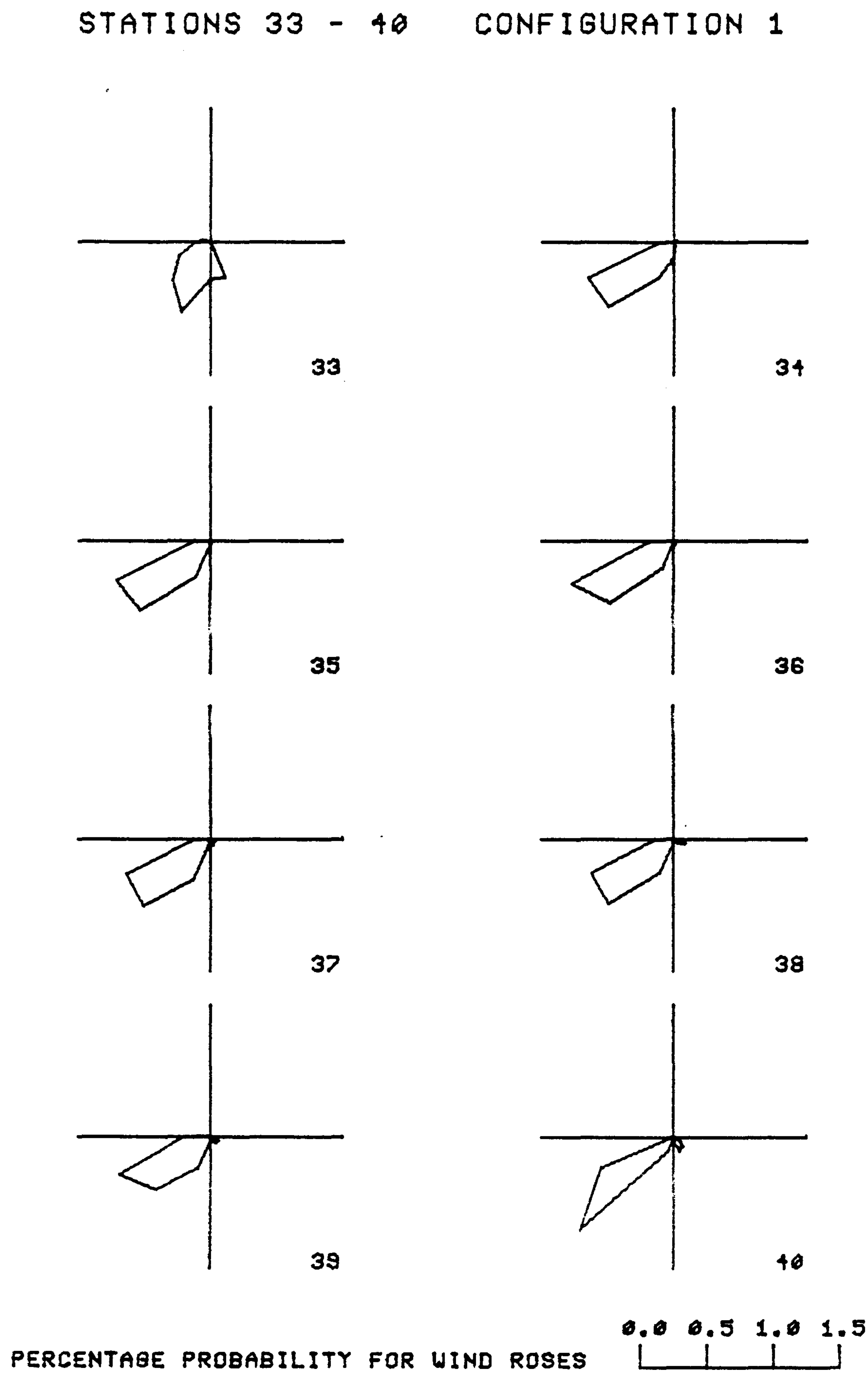


Figure 23. Contributing Probabilities for Ground Wind Stations 33 - 40 Configuration 1

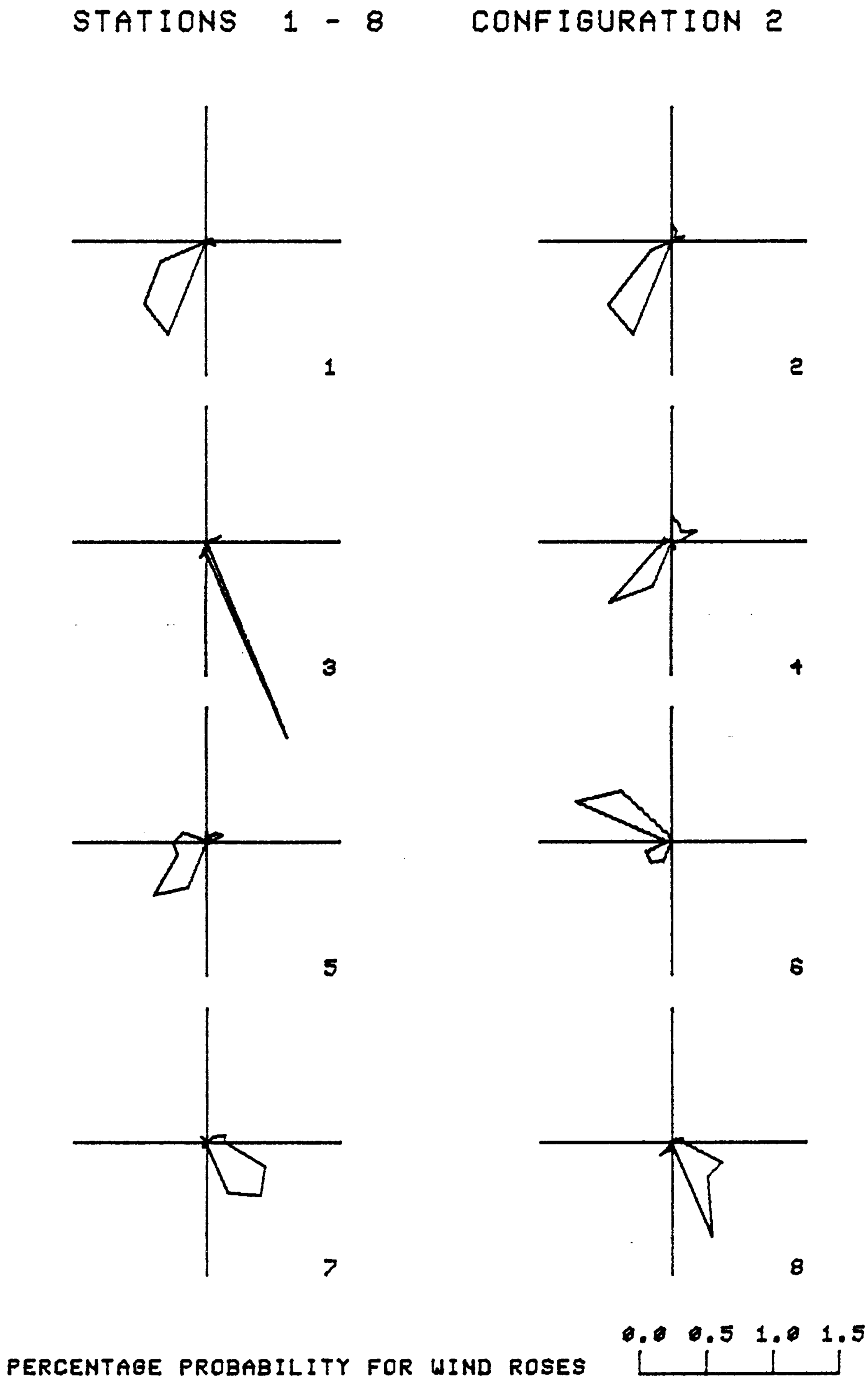


Figure 24. Contributing Probabilities for Ground Wind Stations 1 - 8 Configuration 2

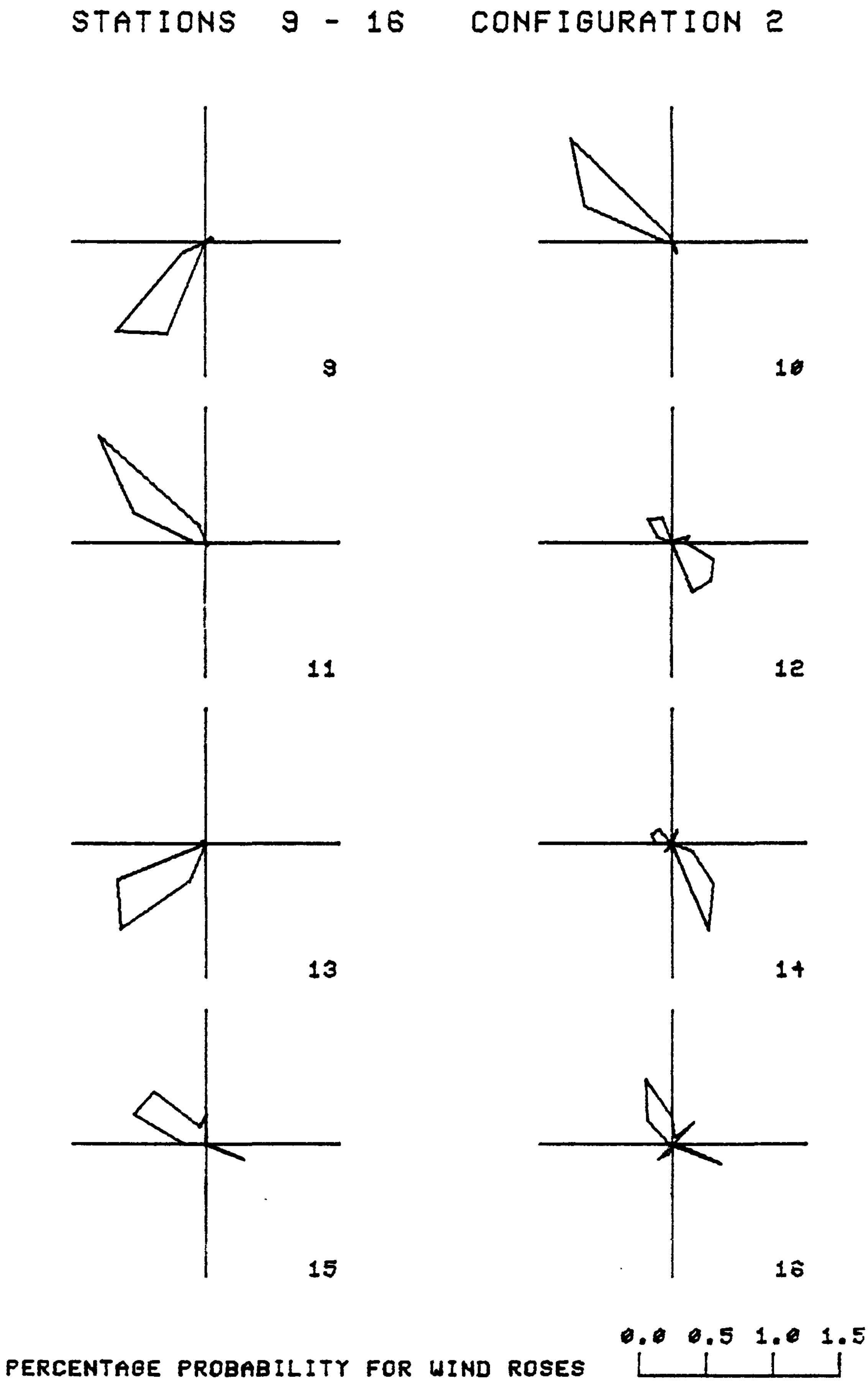


Figure 25. Contributing Probabilities for Ground Wind Stations 9 - 16 Configuration 2

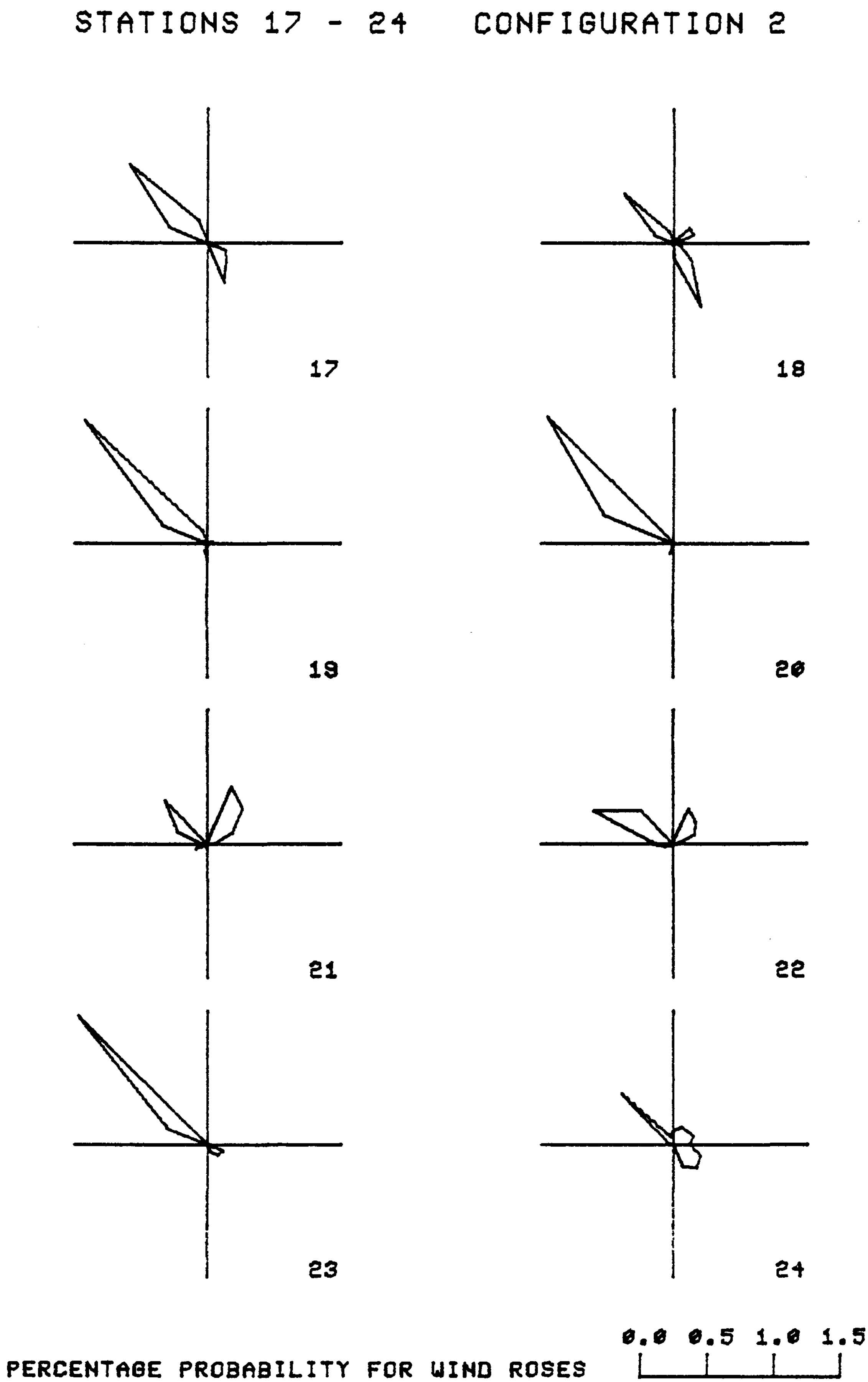


Figure 26. Contributing Probabilities for Ground Wind Stations 17 - 24 Configuration 2

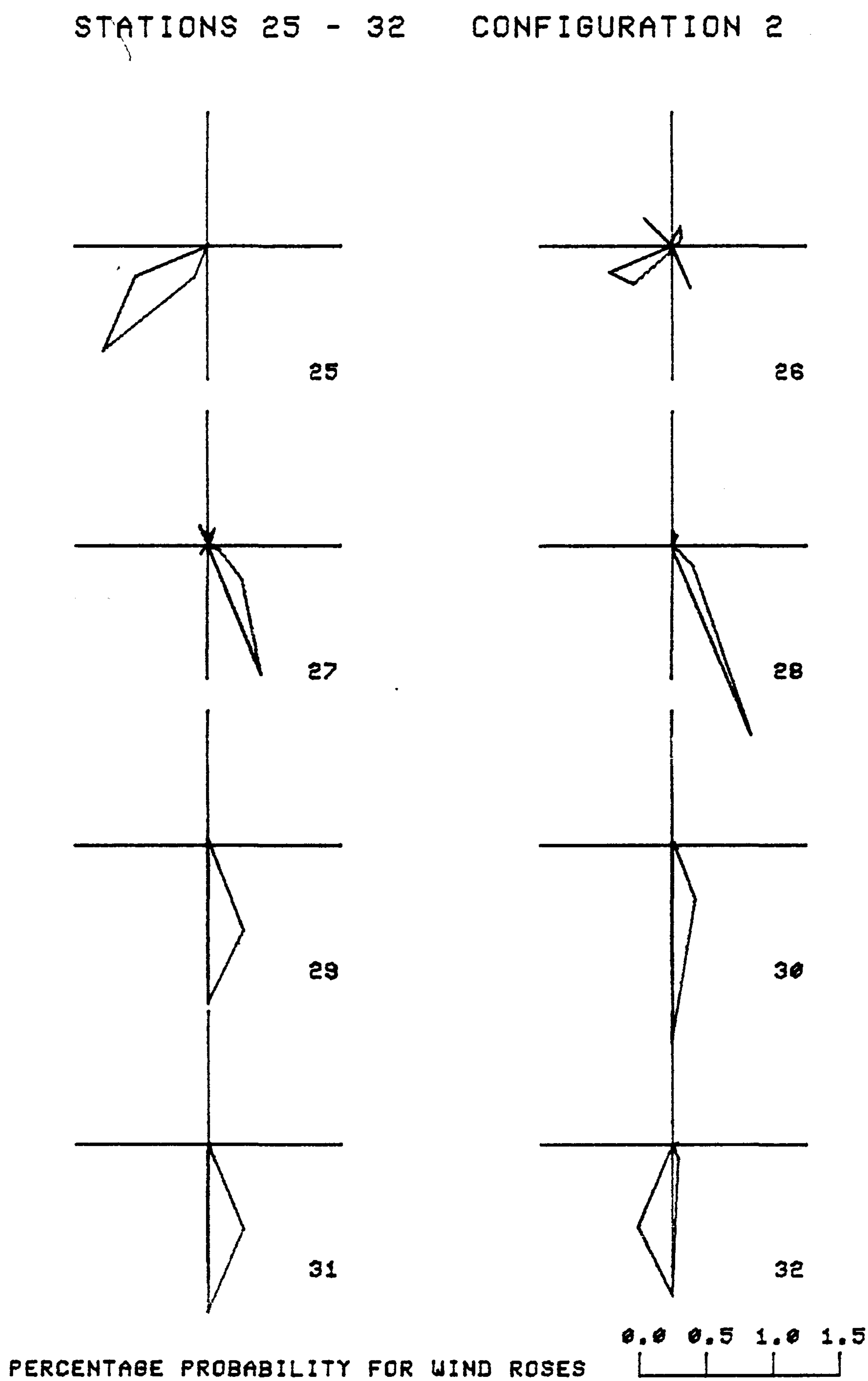


Figure 27. Contributing Probabilities for Ground Wind Stations 25 - 32 Configuration 2

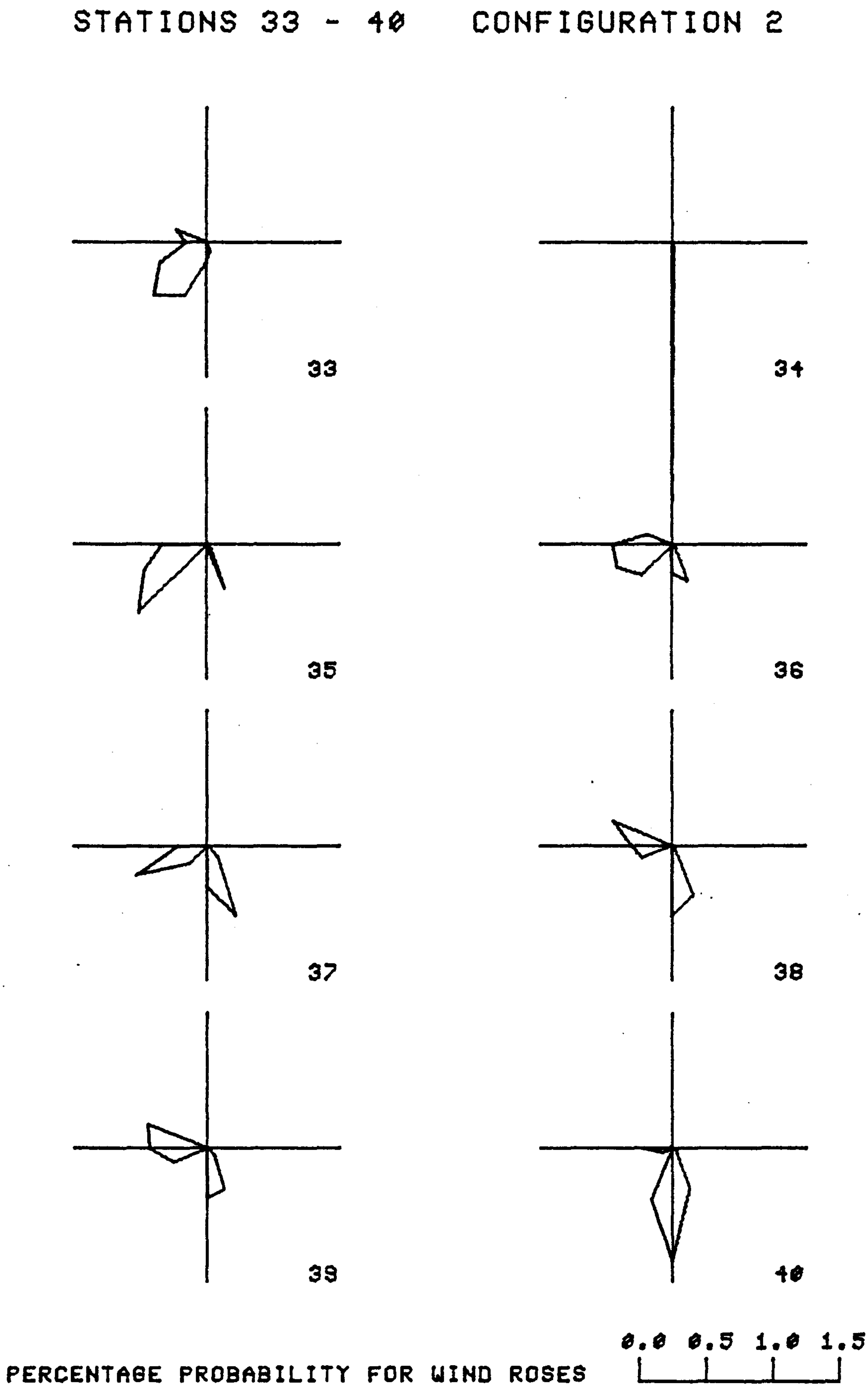
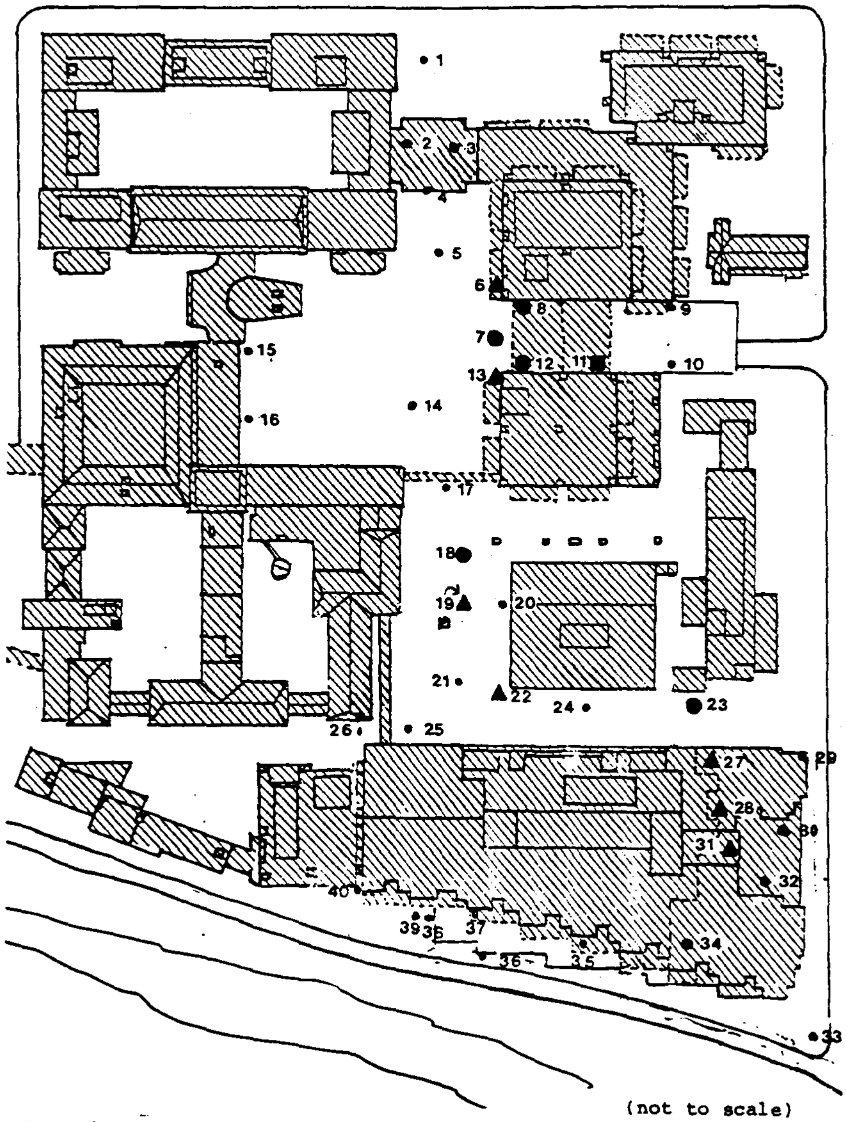


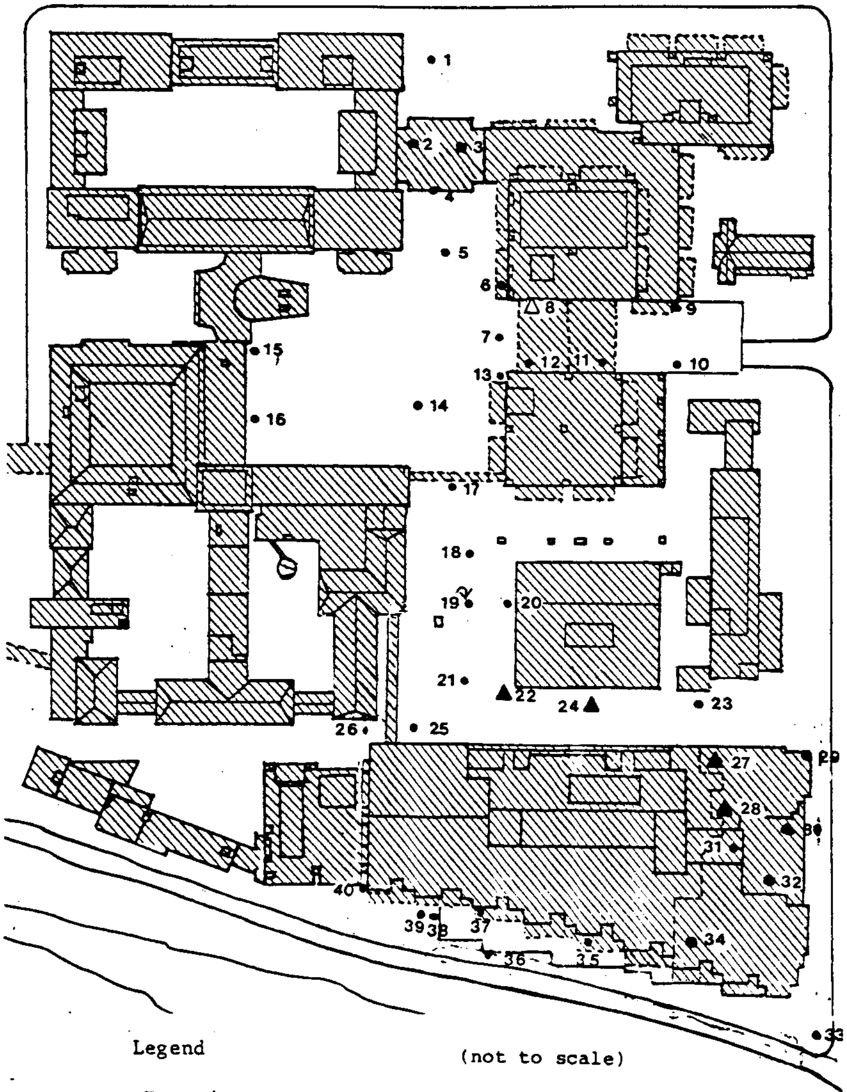
Figure 28. Contributing Probabilities for Ground Wind Stations 33 - 40 Configuration 2



Legend

No Mark	Stationary - Long exposure	$0 < V_{Ave} < 11.2$
▲	Stationary - Short exposure	$11.2 \leq V_{Ave} < 14.5$
●	Walking (acceptable)	$14.5 \leq V_{Ave} < 17.8$
■	Unacceptable	$17.8 \leq V_{Ave} < 25.6$

Figure 29. Map Plotting Tested 2% Exceedance Velocities Configuration 3



Legend (not to scale)

□	decrease in velocity more than 4 mph	
○	" " "	between 2 mph and 4 mph
△	" " " "	1 mph and 2 mph
•	change " "	less than 1 mph
▲	increase in velocity between 1 mph and 2 mph	
●	" " " "	2 mph and 4 mph
■	" " "	more than 4 mph

Figure 30. Change in 2% Exceedance Velocities Configuration 2 vs. Configuration 3

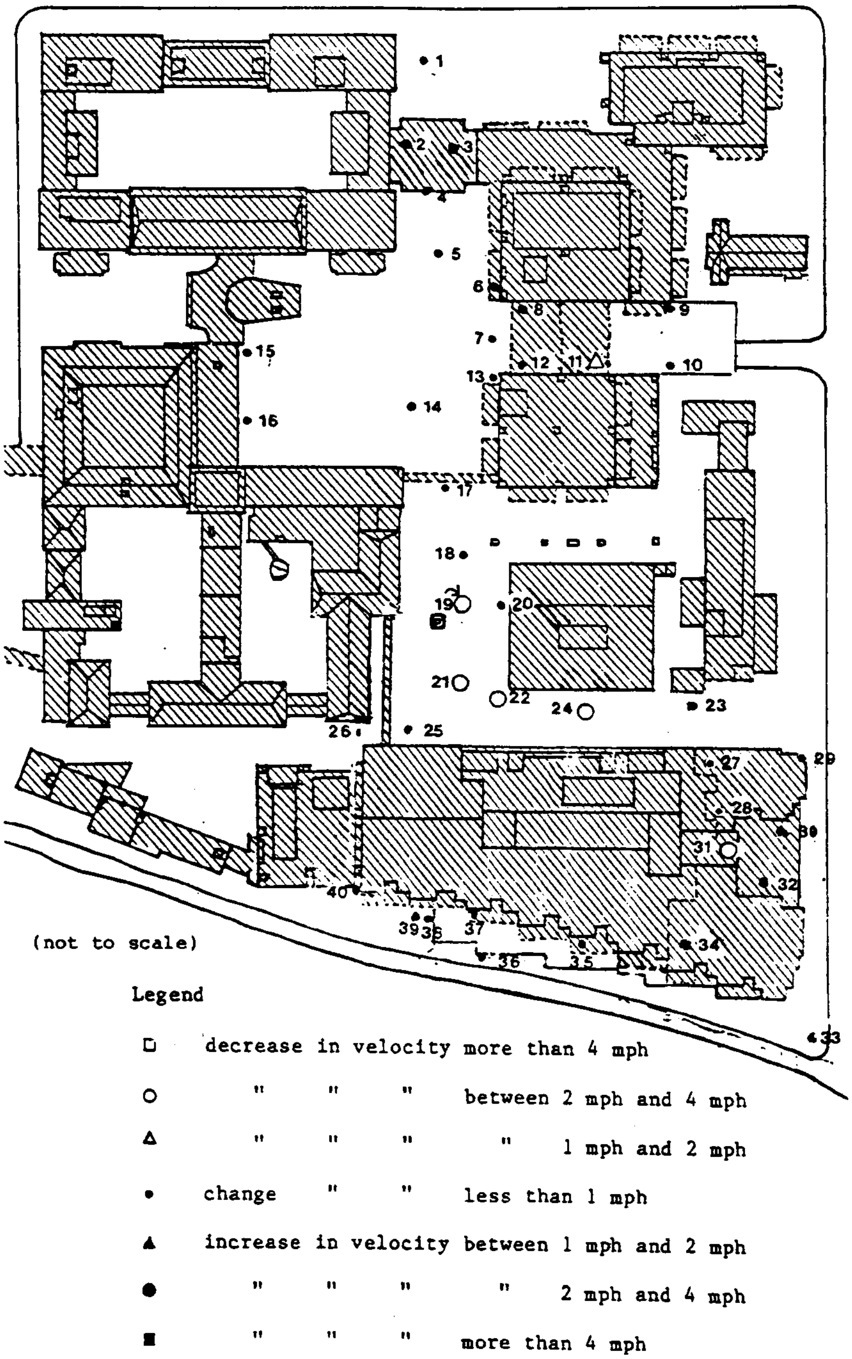


Figure 31. Change in 2% Exceedance Velocities
Configuration 1 vs. Configuration 3

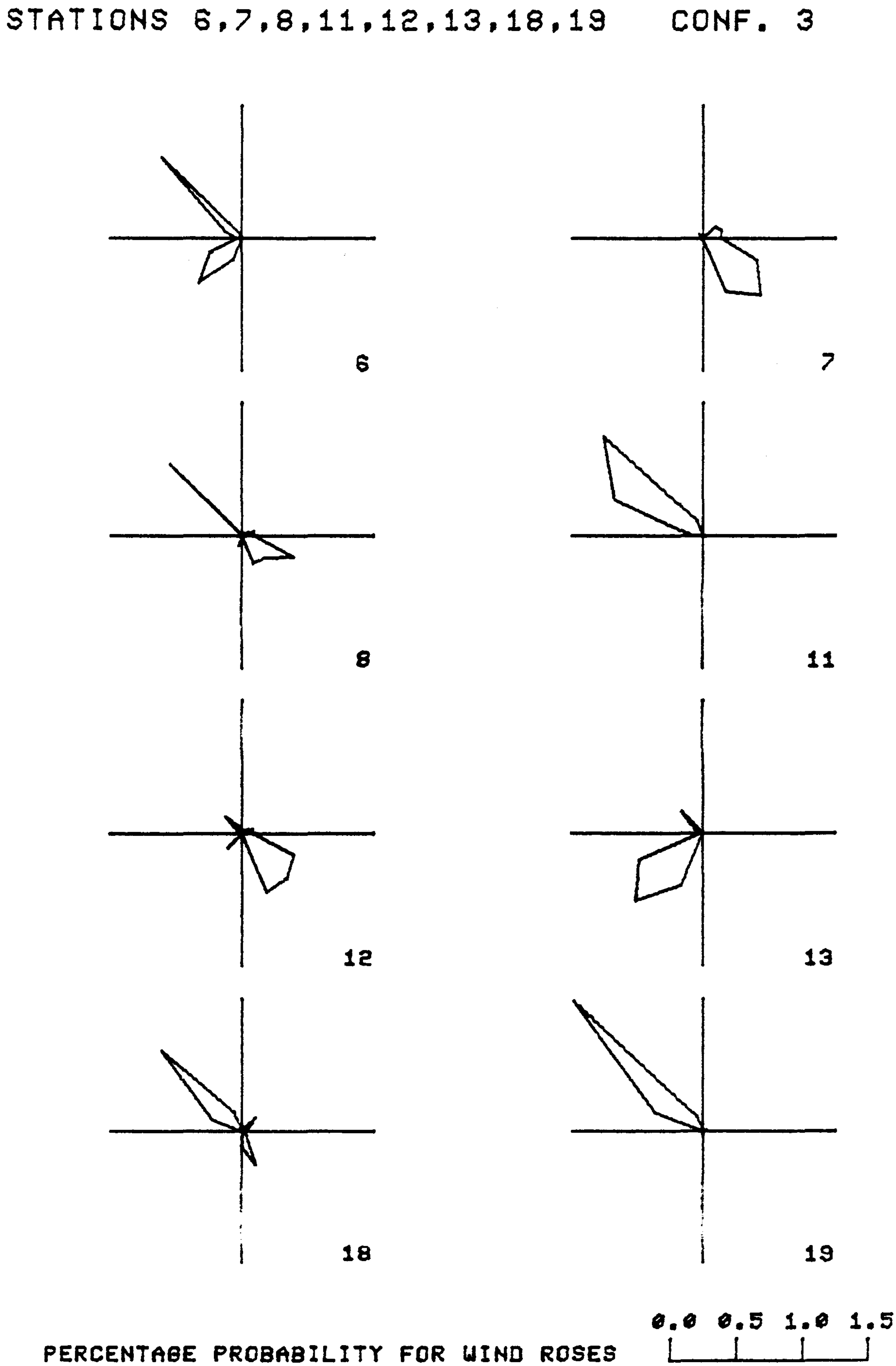


Figure 32. Contributing Probabilities for Ground Wind Stations 6,7,8,11,12,13,18,19 - Configuration 3

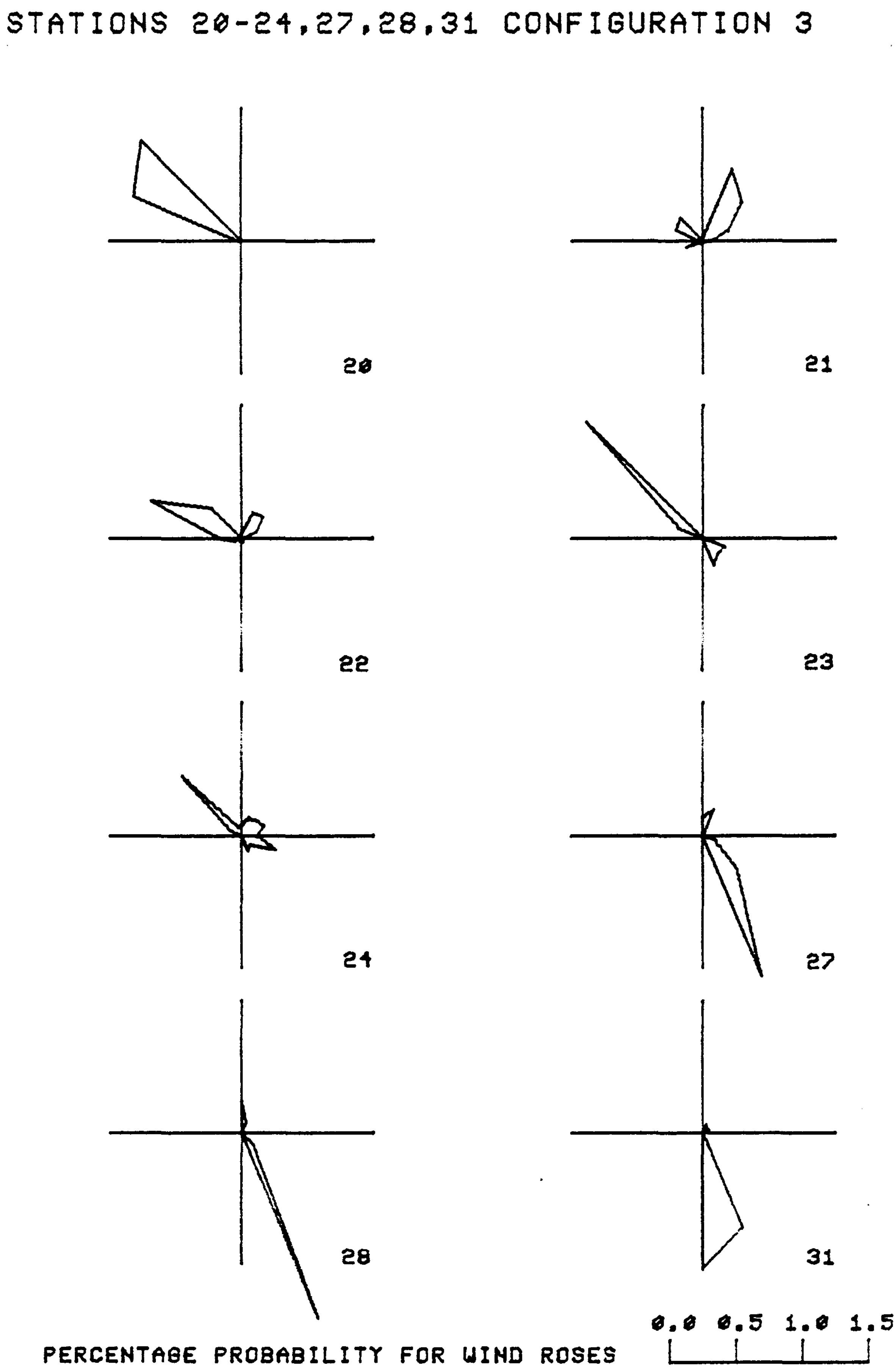


Figure 33. Contributing Probabilities for Ground Wind Stations 20-24,27,28,31 - Configuration 3

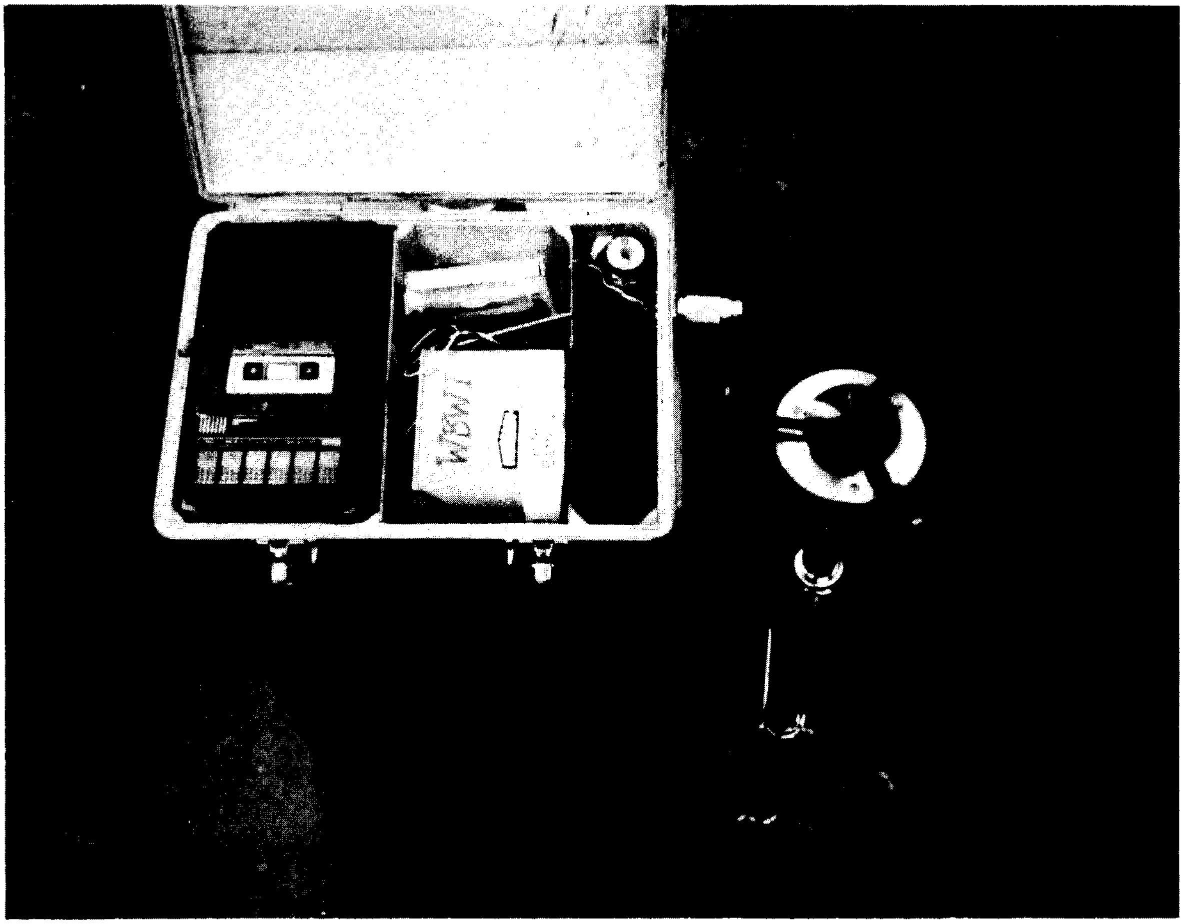


Figure 34. Portable Anemometer and Recorder

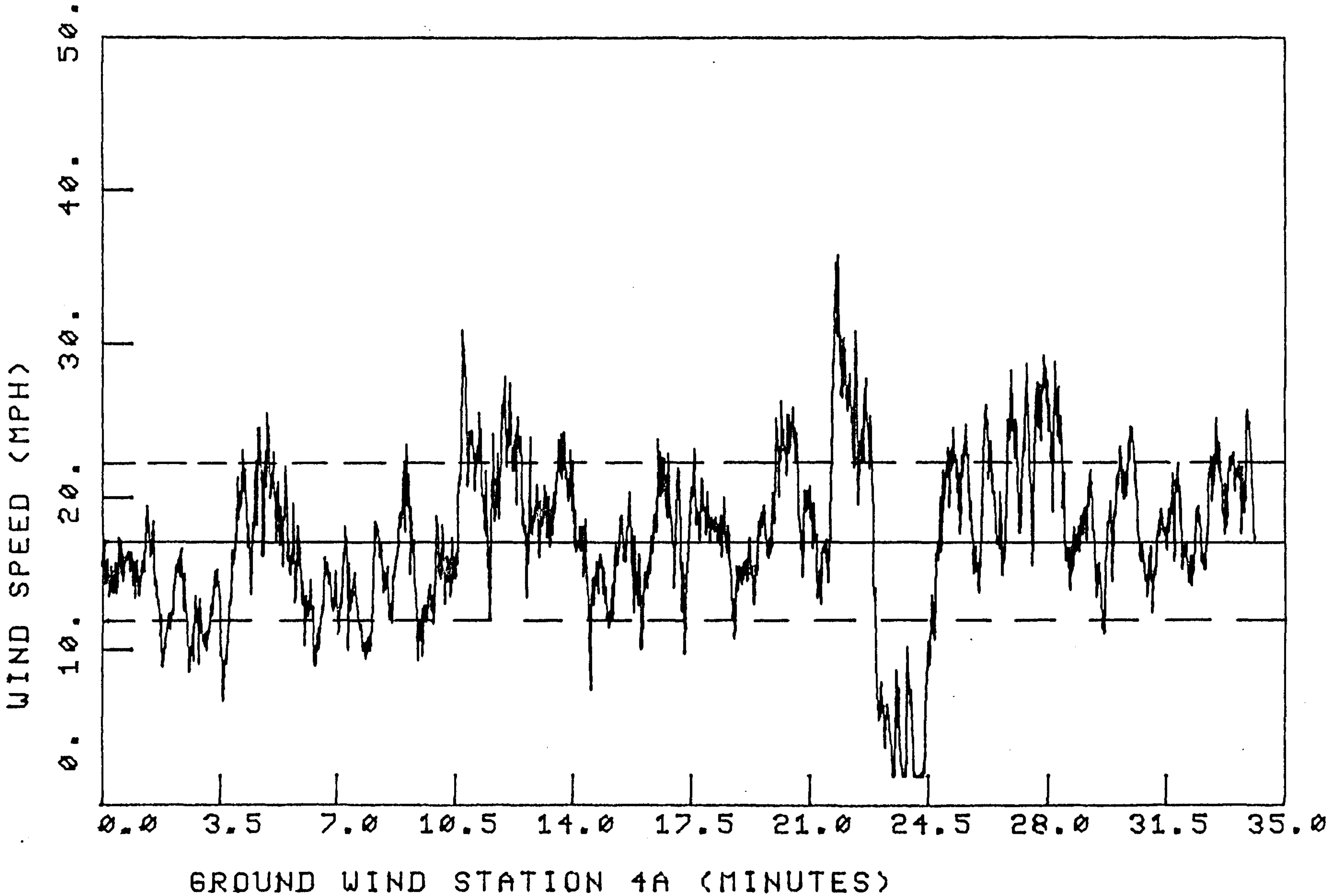


Figure 35. Full Scale Data - Ground Station 4A

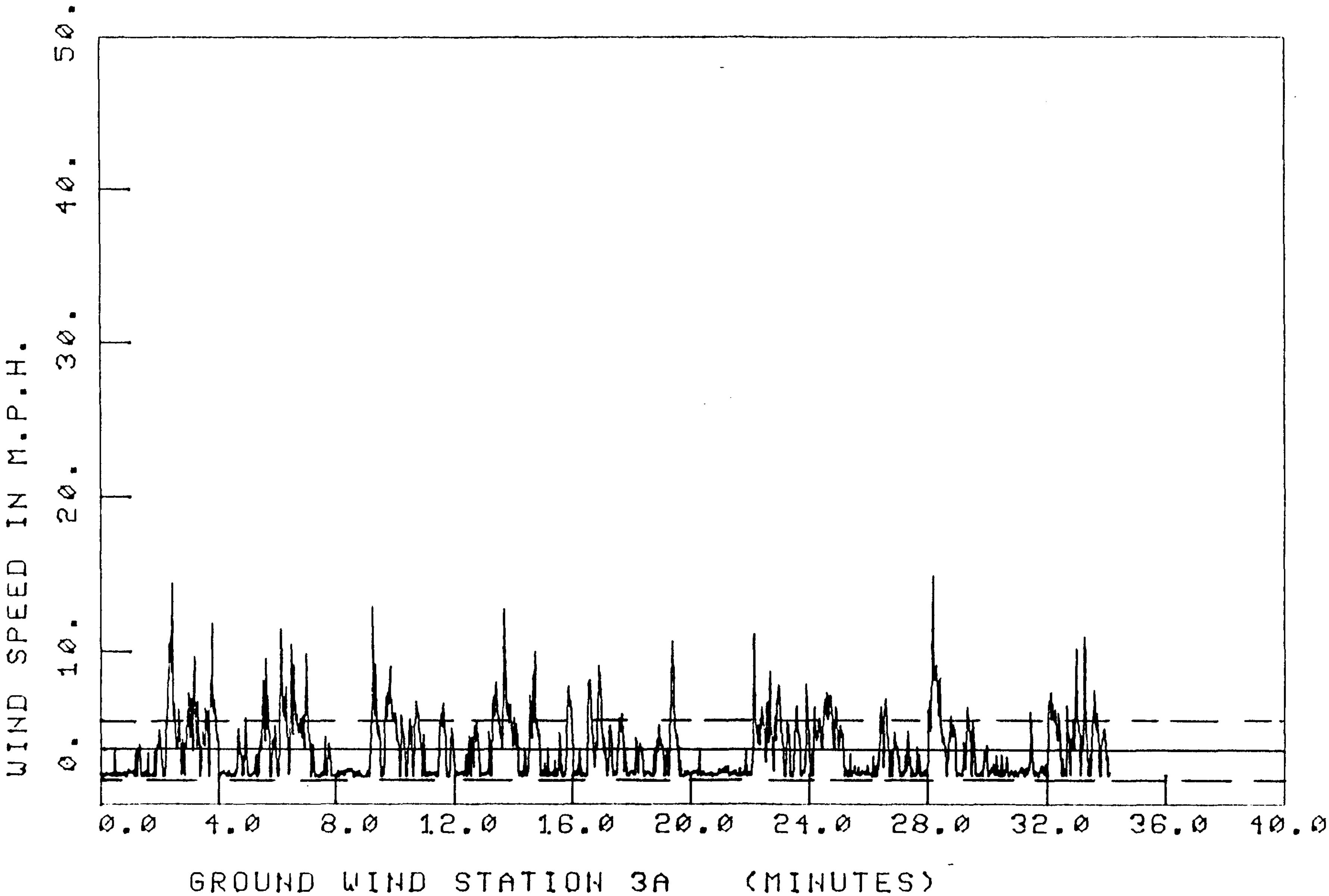


Figure 36. Full Scale Data - Ground Station 3A

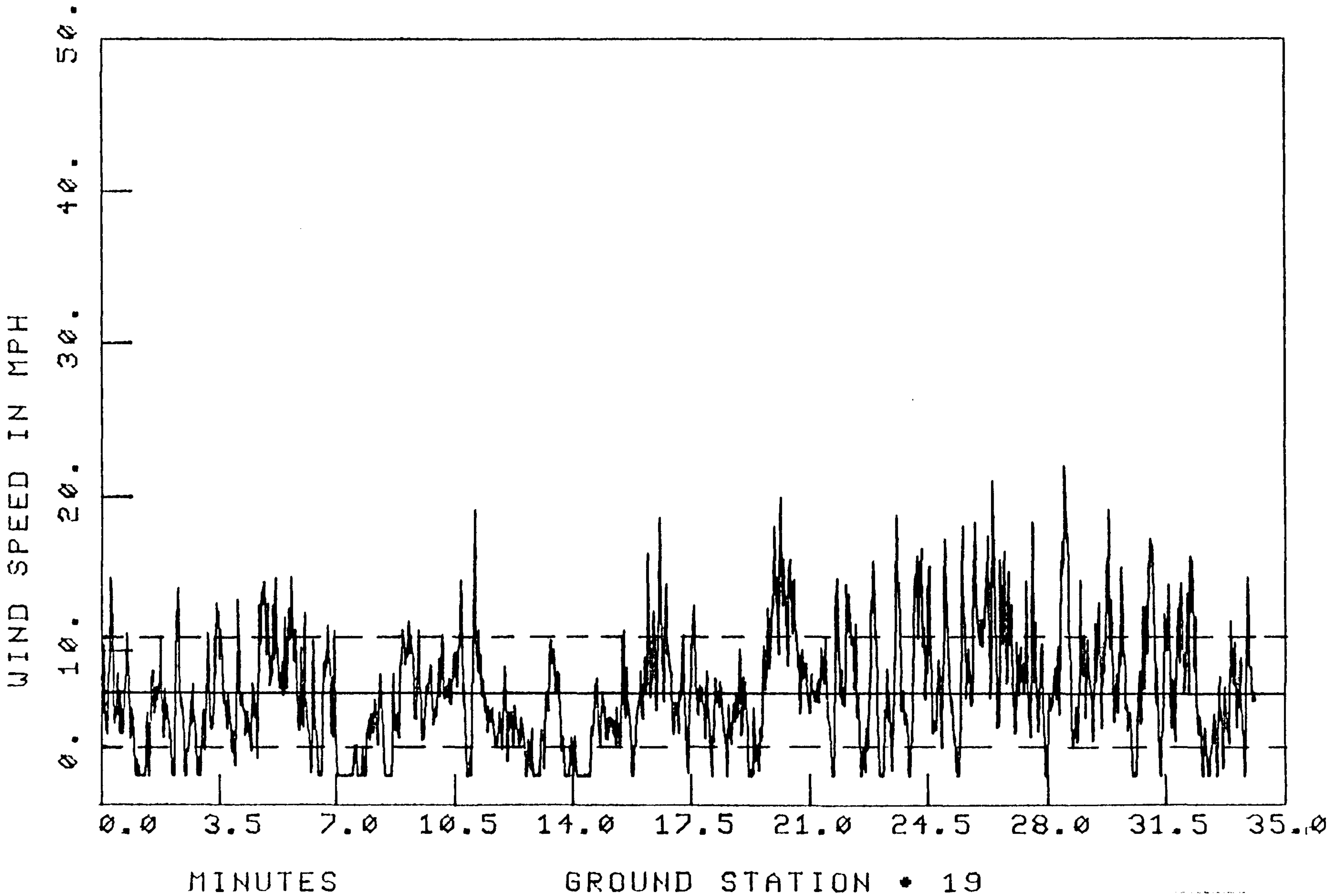


Figure 37. Full Scale Data - Ground Station 19

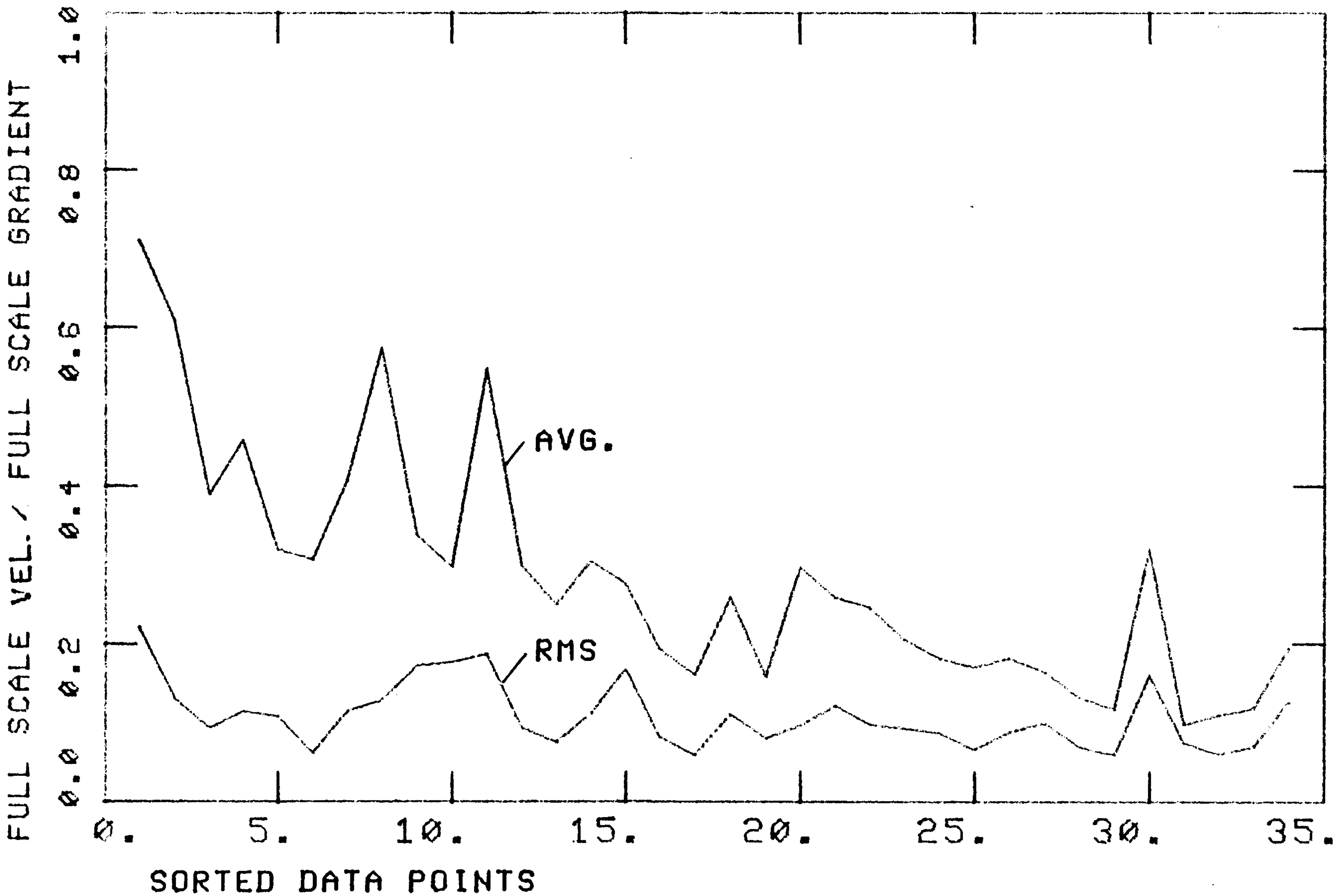


Figure 38. Ratio of Full Scale Ground Velocities to Full Scale Gradient Velocities

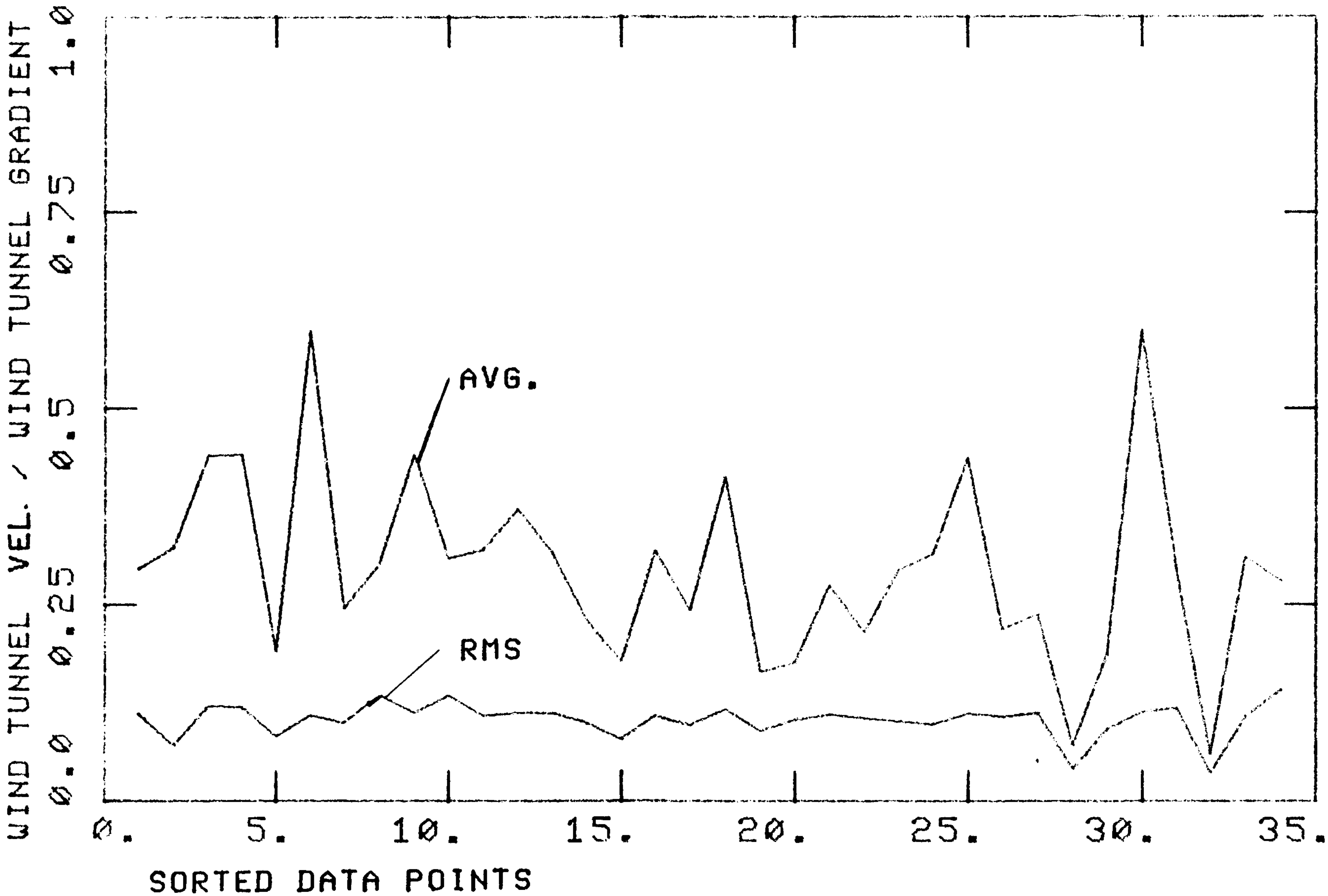


Figure 39. Ratio of Wind Tunnel Velocities to Wind Tunnel Gradient Velocity

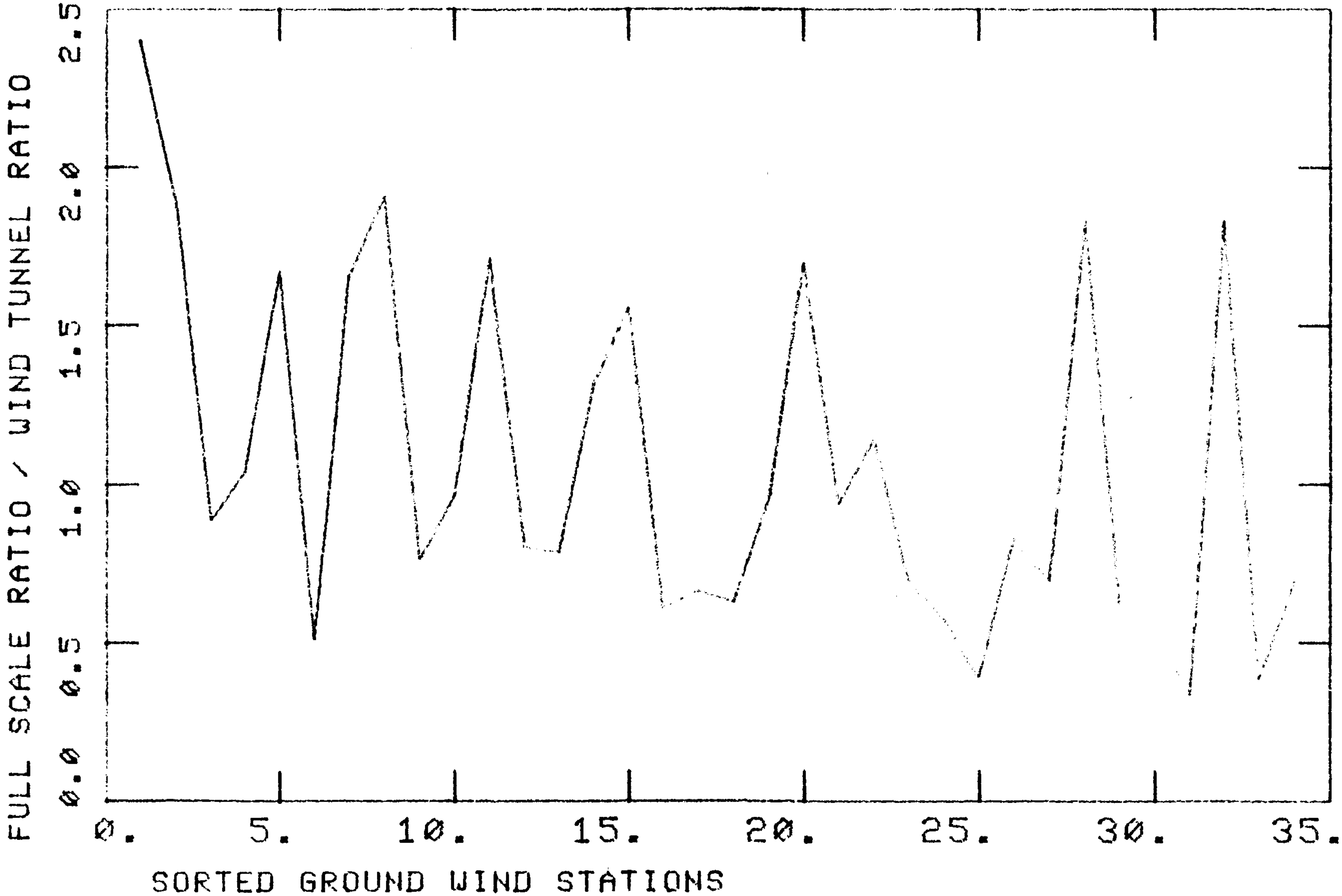


Figure 40. Ratio of Full Scale to Wind Tunnel Coefficients for Average Velocities

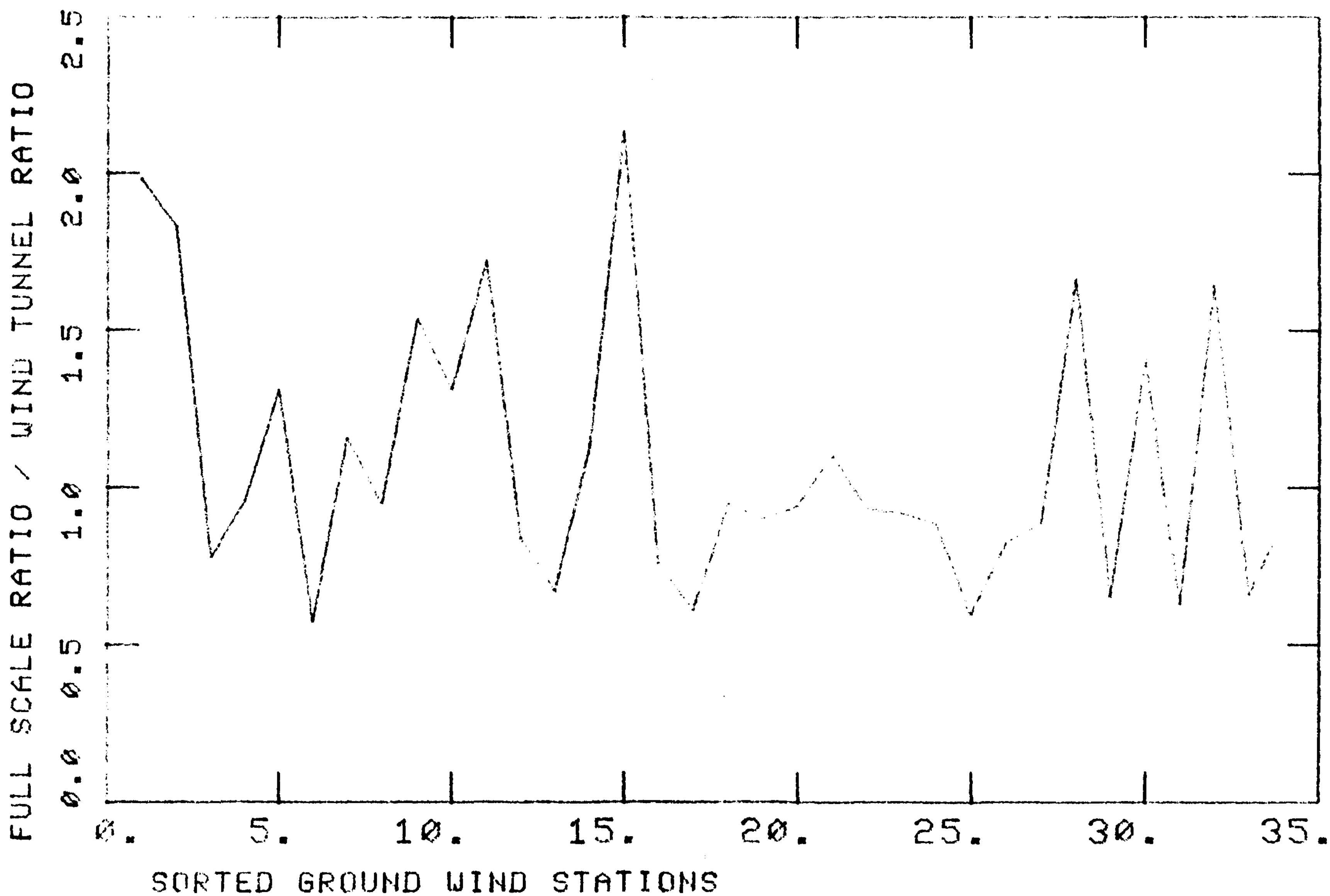


Figure 41. Ratio of Full Scale to Wind Tunnel Coefficients for RMS Velocities

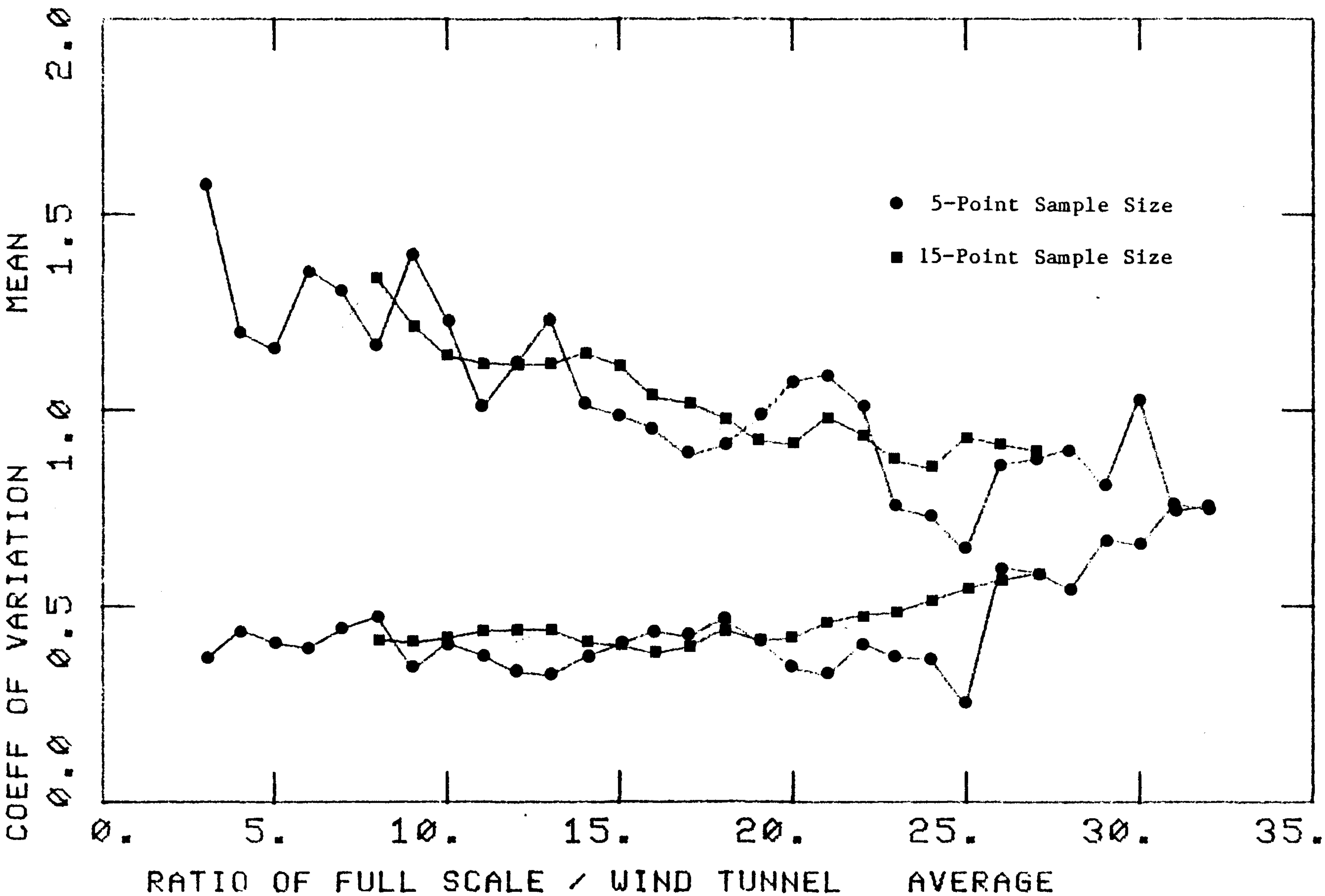


Figure 42. Mean and Coefficient of Variation for Average Velocity Ratios

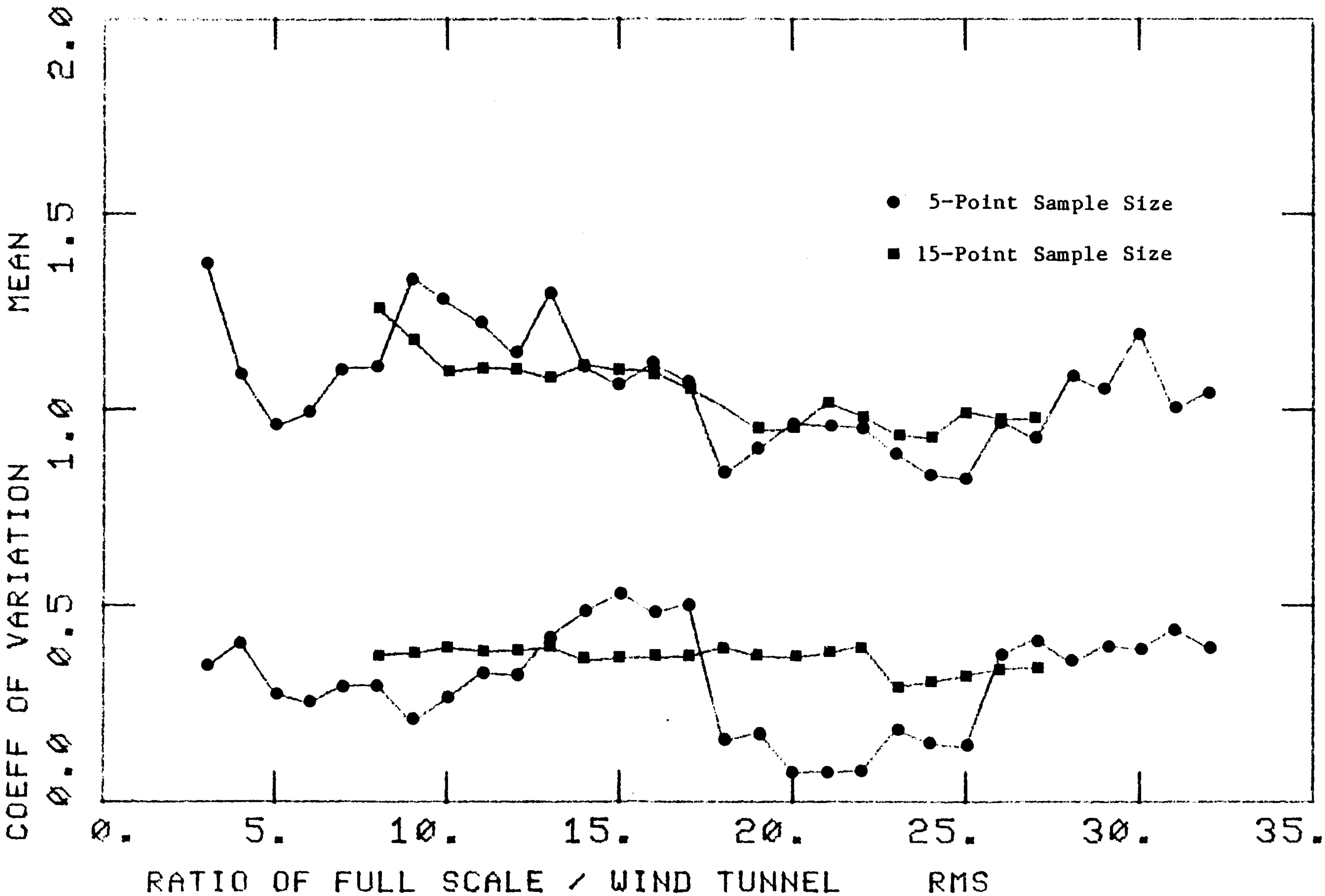


Figure 43. Mean and Coefficient of Variation for RMS Velocity Ratios