Candidate Wind Turbine Generator Site Annual Data Summary for January 1980 Through December 1980

**W. F. Sandusky
D. S. Renné**

April 1981

**Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830**

**Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute**

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PACIFIC NORTHWEST LABORATORY
operated by
BATTELLE
for the
UNITED STATES DEPARTMENT OF ENERGY
Under Contract DE-AC06-76RLO 1830

Printed in the United States of America
Available from
National Technical Information Service
United States Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22151

Price: Printed Copy \$ _____*; Microfiche \$3.00

*Pages	NTIS Selling Price
001-025	\$4.00
026-050	\$4.50
051-075	\$5.25
076-100	\$6.00
101-125	\$6.50
126-150	\$7.25
151-175	\$8.00
176-200	\$9.00
201-225	\$9.25
226-250	\$9.50
251-275	\$10.75
276-300	\$11.00

CANDIDATE WIND TURBINE GENERATOR SITE
ANNUAL DATA SUMMARY
FOR
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PACIFIC NORTHWEST LABORATORY
Richland, Washington 99352

SUMMARY

Summarized hourly meteorological data for fourteen candidate and wind turbine generator sites are presented in this report. These data are collected for the Department of Energy for the purpose of evaluating the wind energy potential at these sites and are used to assist in selection of potential sites for installation and testing of large wind turbines in electric utility systems. For each site, data are given in eight tables and one figure. Use of information from these tables, with information about specific wind turbines, should allow the user to estimate the potential for wind energy production at each site.

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INTRODUCTION

In the spring of 1976 the Department of Energy (then known as the Energy Research and Development Administration) selected 17 candidate sites, each proposed by interested electric service organizations, to receive meteorological measuring equipment for the purpose of evaluating the wind energy potential at these sites. The Department of Energy's Wind Energy Systems Division uses this meteorological information to assist in selection of potential sites for installation and field testing of large wind turbines in electric utility systems. Meteorological measurements at these sites began in late 1976 and early 1977, and in 1980 data collection programs were operable at 14 of the original sites.

This report presents summarized hourly meteorological data based on 2-min data at the candidate and wind turbine generator installation sites listed in Table 1. The data cover the period from January, 1980, through December, 1980. The data were collected from sensors at two or three levels on a meteorological tower. Selection of the levels was determined by site characteristics (and in one case, tower height). The data are recorded digitally at the site on a data cassette recording system with an instantaneous sample of data recorded every two minutes.

The three sites of the original 17 for which data are not reported are Kaena Point, Hawaii; Augspurger Mountain, Washington and Ludington, Michigan. The collection program and data analysis for the Kaena Point site was directed by the Department of Meteorology at the University of Hawaii. Data collection continued at the site until November, 1979. Pacific Northwest Laboratory received summarized data in a different format than reported herein and thus the Kaena Point data are not included. The collection program at Augspurger Mountain continued until the tower collapsed in January, 1978. The collection program at Ludington was terminated in November, 1979. Data for Ludington are presented in the 1979 Annual Report.^(a)

(a) Sandusky, W. F. and D. S. Renne. 1981. Candidate Wind Turbine Generator Site Annual Data Summary for January 1979 Through December 1979. PNL-3703, Pacific Northwest Laboratory, Richland, Washington.

The heights of the sensors at each site are given in Table 2. In that table and in later summary tables, the upper sensor is noted by the letter "A", the mid-level is noted by the letter "B" and the lower level is noted by the letter "C." Note that only four sites (Block Island, Rhode Island; Boone, North Carolina; Clayton, New Mexico; and Boardman, Oregon) have mid-level sensors.

In some cases, circumstances dictated the height of the sensor levels. The height of the sensor levels at Boone was increased to accommodate the MOD-1 turbine installed at the site. This turbine has a larger blade diameter and taller tower than the MOD-OA. At the Boardman site the levels reported are based on an ongoing monitoring program for the construction and operation of a nearby coal plant. The upper-level sensor at the Cold Bay, Alaska, site is at 21.8 m since an existing FAA beacon tower is used to support the sensors. Four sites have the lower sensors at 18.2 m above ground level to measure wind data above trees or buildings near the sites.

Table 3 provides an all-site summary of data recovery rates and wind speed characteristics for the calendar year 1980. Data under the column "Maximum" represent maximum hourly average values during the reporting period. Data under the column "Power" represents the available power for the reporting period.

Table 4 presents a summary of the mean annual wind speed obtained from each sensor level for the duration of this program to date. A 4-yr mean is also included.

The data for each site are presented in summary tables; the format of these tables is described in the next section. Information in the summary tables is provided on data recovery rates, available power, maximum values observed, annual mean values, diurnal mean values, frequency distribution of wind speed, wind speed persistence, and power law exponent as a function of wind direction. The information from the summary tables combined with information about specific wind turbines should allow the user to estimate the potential for wind energy production at each site.

TABLE 1. Site Identification and Location

Site	Identification Code	Date Collection Began	Latitude	Longitude	Elevation (meters)
Amarillo, TX	TX	03/01/77	35° 17'N	101° 45'W	1091
Block Island, RI	RI	12/11/76	41° 10'N	71° 34'W	14
Boardman, OR	OR	01/01/77	45° 41'N	119° 50'W	212
Boone, NC	NC	12/14/76	36° 15'N	81° 40'W	1347
Clayton, NM	NM	05/01/77	36° 26'N	103° 12'W	1536
Cold Bay, AK	AK	08/01/77	55° 12'N	162° 43'W	29
Culebra, PR	PR	03/01/77	18° 20'N	65° 18'W	80
Holyoke, MA	MA	12/16/76	42° 15'N	72° 38'W	372
Huron, SD	SD	12/10/76	44° 24'N	98° 08'W	396
Kingsley, NB	NB	12/05/76	41° 10'N	101° 39'W	1024
Montauk, NY	NY	12/30/76	41° 03'N	71° 53'W	2
Point Arena, CA	CA	01/07/77	38° 56'N	123° 43'W	21
Russell, KS	KS	12/02/76	38° 50'N	98° 51'W	564
San Geronio, CA	SG	12/03/76	33° 56'N	116° 34'N	329

TABLE 2. Sensor Heights

Site Location	C-Lower Level(a)	B-Middle Level(a)	A-Upper Level(a)
Amarillo, TX	9.1	(b)	45.7
Block Island, RI	9.1	30.0	45.7
Boardman, OR	9.1	39.6	70.1
Boone, NC	18.2	45.7	76.2
Clayton, NM	9.1	30.0	45.7
Cold Bay, AK	9.1	(b)	21.8
Culebra, PR	9.1	(b)	45.7
Holyoke, MA	18.2	(b)	45.7
Huron, SD	9.1	(b)	45.7
Kingsley Dam, NB	9.1	(b)	45.7
Montauk, NY	18.2	(b)	45.7
Point Arena, CA	9.1	(b)	45.7
Russell, KS	9.1	(b)	45.7
San Geronio, CA	9.1	(b)	45.7

(a) Meters above ground level.

(b) No data collected.

TABLE 3. Summary of Hourly Data for the Period
January 1980 Through December 1980

Site Code	Sensor Level (M)	% Sample Recovery	Wind Speed (M/S) Mean	Maximum	Available Power (Watts/M ²)
TX (C) (1)	9.1	88.8	6.4	23.6	261.2
RI (C)	9.1	90.8	5.3	14.9	151.6
OR (C)	9.1	57.9	3.4	19.7	97.7
NC (C)	18.2	65.3	6.3	27.1	338.3
NM (C)	9.1	89.3	5.2	19.6	147.0
AK (C)	9.1	73.7	6.5	20.2	344.0
PR (C)	9.1	90.8	5.9	15.8	178.5
MA (C)	18.2	79.6	4.6	19.0	110.6
SD (C)	9.1	77.0	4.6	20.6	124.0
NB (C)	9.1	98.1	4.7	21.6	108.6
NY (C) (2)	18.2	62.0	6.2	19.1	296.8
CA (C)	9.1	92.0	3.8	17.7	80.6
KS (C) (3)	9.1	82.0	5.0	17.6	142.7
SG (C)	9.1	89.9	6.3	18.9	335.9
<hr/>					
RI (B)	30.0	90.9	6.7	19.5	287.9
OR (B)	39.6	93.8	4.9	21.9	190.1
NC (B)	45.7	62.9	7.8	29.3	496.9
NM (B)	30.0	81.1	6.6	22.4	259.6
<hr/>					
TX (A) (1)	45.7	91.0	9.1	22.3	642.8
RI (A)	45.7	91.0	7.7	21.3	437.9
OR (A)	70.1	93.9	5.6	21.0	283.2
NC (A)	76.2	68.1	8.3	28.4	594.1
NM (A)	45.7	86.4	7.3	23.8	325.9
AK (A)	21.8	67.7	7.1	21.1	472.4
PR (A)	45.7	91.1	6.7	17.4	244.1
MA (A)	45.7	79.7	7.0	26.3	382.7
SD (A)	45.7	85.3	6.5	24.6	297.1
NB (A)	45.7	97.8	6.3	27.2	257.3
NY (A) (2)	45.7	62.1	7.2	20.7	425.8
CA (A)	45.7	94.3	6.0	20.0	264.0
KS (A) (3)	45.7	81.6	6.8	22.8	335.3
SG (A)	45.7	88.0	8.1	25.3	763.8

Note: A = Upper level
B = Mid-level
C = Lower level

1. Wind speed data for "TX" for the period July 1980-November 1980 was corrected per a calibration report.

2. Wind speed data for "NY" for the period October 1980-November 1980 was corrected per a calibration report.

3. Wind direction data for "KS" for the period April 24, 1980-September 23, 1980 was corrected per a calibration report.

TABLE 4. Mean Annual Wind Speeds
Based on Monthly Means

Site Code	Sensor Level (M)	$\bar{V}$ (M/S) 1977	$\bar{V}$ (M/S) 1978	$\bar{V}$ (M/S) 1979	$\bar{V}$ (M/S) 1980	$\bar{V}$ (M/S) 4-Yr Average
TX (C)	9.1	6.5	6.7	5.8	6.4	6.4
RI (C)	9.1	4.8	5.0	4.6	5.3	4.9
OR (C)	9.1	4.5	3.9	3.8	3.4	3.9
NC (C)	18.2	5.9	5.6	5.5	6.3	5.8
NM (C)	9.1	5.4	5.5	5.3	5.2	5.4
AK (C)	9.1	6.8	7.5	6.2	6.5	6.8
PR (C)	9.1	6.3	6.4	6.5	5.9	6.3
MA (C)	18.2	4.9	4.7	4.3	4.6	4.6
SD (C)	9.1	5.0	4.8	4.5	4.6	4.7
NB (C)	9.1	5.7	5.6	4.8	4.7	5.2
NY (C)	18.2	6.1	6.1	5.6	6.2	6.0
CA (C)	9.1	5.2	4.8	4.7	3.8	4.6
KS (C)	9.1	5.6	5.7	5.1	5.0	5.4
SG (C)	9.1	6.5	6.7	5.6	6.3	6.3
<hr/>						
RI (B)	30.0	N/A	N/A	5.7	6.7	6.2
OR (B)	39.6	5.9	4.8	4.8	4.9	5.1
NC (B)	45.7	8.0	7.7	7.0	7.8	7.6
NM (B)	30.0	N/A	7.3 ^(b)	6.7	6.6	6.9
<hr/>						
TX (A)	45.7	8.3	8.0	7.6	9.1	8.3
RI (A)	45.7	7.4	7.4	7.0	7.7	7.4
OR (A)	70.1	N/A	N/A ^(a)	5.4	5.6	5.5
NC (A)	76.2	N/A	7.0	7.8	8.3	7.7
NM (A)	45.7	7.4	7.4	7.3	7.3	7.4
AK (A)	21.8	9.6	8.3	7.1	7.1	8.0
PR (A)	45.7	6.9	7.1	7.4	6.7	7.0
MA (A)	45.7	7.2	7.1	6.5	7.0	7.0
SD (A)	45.7	6.7	6.6	6.5	6.5	6.6
NB (A)	45.7	6.8	7.0	6.2	6.3	6.6
NY (A)	45.7	7.2	7.4	6.7	7.2	6.5
CA (A)	45.7	6.7	6.8	6.4	6.0	6.5
KS (A)	45.7	7.5	7.5	7.0	6.8	7.2
SG (A)	45.7	7.9	8.1	7.2	8.1	7.8

(a) Data reporting began in July of 1978

(b) Data reporting began in March of 1978

N/A = Not available

SUMMARY TABLES

Summarized hourly data for each site are presented in eight tables and one figure. The hourly data are obtained by averaging the 2-min instantaneous data that are routinely collected at the site. A valid hourly value was calculated from at least 10 valid 2-min values acquired during the hour.

Discussion of data represented in each table and the method of calculation is given below. The notation "W/S" refers to wind speed, which is reported in meters per second. The notation "W/D" refers to wind direction, which is reported in degrees. Information on site elevation is reported in meters.

A value reported as -999.99 indicates missing data. At several sites no mid-level sensors exist. This condition is noted at the bottom of Table 1.3. The values for the mid-level wind speed in Table 1.3 under the column "Other Levels" are therefore indicated as missing, -999.99. If no mid-level sensors exist, the values reported for Level B in Tables 1.4, 1.5, and 1.6 are zero. Also, no information for Level B is provided in Tables 1.1 and 1.2.

TITLE AND FUNCTION

Table 1.1

Sensor Performance. Sensor performance identifies the percentage of time the recording system was operating and the percentage of time acceptable data were acquired by the meteorological sensors. The values given under the label "% On-Line" are obtained by dividing the total number of data scans collected by the total possible number of data scans. The values given under the label "% Recovered" are obtained by dividing the total number of acceptable data scans collected by the total possible number of data scans.

Table 1.2

Annual Means and Available Power. This table provides the mean wind speed, wind direction, and available power from the wind for each available sensor level during the reporting period. The value for wind direction indicates the direction from which the wind blows with 0° and 360° being north, 90° being east, 180° being south and 270° being west. Thus, a mean wind

direction of 220° indicates winds that blow primarily from the southwest. This represents the "resultant" wind direction at the site. The available wind power is given in units of watts per square meter. These values for each sensor level are computed by the following relationship:

$$P = \frac{1}{2n} \rho \sum_{i=1}^n V_i^3$$

where:

P = average power (watts/m²)

ρ = density of air at each sensor level (kg/m³)

V_i = the wind speed (in m/s) at the i th observation line

n = number of valid wind speed observations in the averaging period.

The air density was computed by adjusting the air density at sea level, 1.225 kg/m³, for the elevation of the site (in meters), assuming a standard atmosphere density profile and the height of the sensor above ground level (in meters). In all cases the air density was less than air density at sea level.

Table 1.3

Maximum Wind Speed. The highest calculated hourly value for each available sensor level is given along with date and time of occurrence. For this maximum hourly wind speed value, the mean hourly wind direction is given along with the hourly wind speeds that occurred at the other levels.

Table 1.4

Wind Speed and Direction Versus Time-of-Day. Mean hourly wind speed and direction values are reported for each hour of the day for the reporting period. Data reported for each hour represent the average of all hourly values calculated for that hour. Data are provided for each level of instrumentation. If the site has no sensor at the mid-level (B), the values for wind speed and wind direction are reported as 0.0.

Table 1.5

Frequency Distribution of Wind Speed. For each sensor level, the total number of observations and percentage of occurrences are given for a number of classes of wind speed. The first class, 0.0 to 0.5, represents winds from 0.0 up to and including 0.5 m/s. For the rest of the classes, except the last, the number under the "Count" column indicates the number of occurrences of hourly wind speeds greater than the lower limit and less than or equal to the upper limit. Thus, the class 0.5 to 1.0 indicates the condition $0.5 < \text{wind speed (m/s)} \leq 1.0$. The recovery rate, in percent, for each wind speed sensor is given at the bottom of the table. If no mid-level sensor is available, all values under Level B and the recovery rate for Level B will be 0 or 0.0.

Table 1.6

Cumulative Frequency Distribution of Wind Speed. Both the cumulative number of observations and percentage of cumulative frequency distribution of hourly wind speed values are given for various wind speed intervals. The value of 2.0 under the column "Wind Speed" represents wind speed occurrences up to and including 2.0 m/s. The corresponding number of cumulative hourly wind speed values is noted under the column "CFD" for each sensor level. If the site has no mid-level sensor, the values for Level B under the columns "CFD(ABS)" and "CFD(%)" will be 0 and 0.0, respectively.

Table 1.7

Wind Speed Persistence Frequency. Information presented in this table indicates the length of time the wind speed at the upper sensor level (A) occurs within a specified wind speed interval. For example, if in the "Hours" row of 2.0 and under the wind speed column of 4 to 5 m/s a value of 3 was reported, this indicates that during the reporting period there were three occurrences of wind speeds between 4 and 5 m/s that lasted for two hours.

Table 1.8

Power Law Exponent. A power law exponent, expressed as "ALPHA," between sensor levels is computed as indicated in the notes at the bottom of the table for each hour of data. These values are summed according to the wind direction occurring at the upper sensor level. After all data have been analyzed for the

reporting period, mean values of "ALPHA" are computed according to the total number of values of "ALPHA" summed for each directional sector. The purpose of this type of data representation is to investigate how the topographical features surrounding the site may influence general wind flow characteristics.

The value under the column ALPHA(A,B,C) represents a best fit of the values for ALPHA(A,B), ALPHA(B,C), and ALPHA(A,C). These values are only computed for sites with three levels of sensors. If the site has two levels of instrumentation, i.e., no Level B sensor, no best fit value will be calculated and information on ALPHA will be found under the column "ALPHA(A,C)."

The percentage of occurrence of wind direction for each sensor is also given in this table. That information is provided under the columns "%A," "%B," "%C" for the upper, mid-, and lower sensor levels, respectively.

Figure 1

Wind Rose for Lowest Sensor Level. A pictorial representation of the occurrence of wind speed interval as a function of wind direction is given. Each row of the symbol "0" in the pie-shaped directional sector represents 40 observations of wind speed in the range of 0 to 4 m/s. Each row of the symbol "Δ" in the pie-shaped directional sector represents 40 observations of wind speed in the range of 4 to 10 m/s. Each row of the symbol "+" represents 40 observations of wind speed in the range of 10 to 20 m/s.

AMARILLO, TEXAS

SITE ID: TX
 SITE LOCATION: AMARILLO, TX.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.1 SENSOR PERFORMANCE

TOTAL POSSIBLE SAMPLES: 8784

SENSOR	% ON-LINE	% RECOVERED
WS(A)	100.0	91.0
WD(A)	100.0	89.3
WS(C)	100.0	88.8
WD(C)	100.0	85.9

 1.2 ANNUAL MEANS AND STANDARD DEVIATIONS

	HEIGHT (METERS)	MEAN WS	MEAN WD	POWER WATTS/M**2
SITE DATA (A)	45.7	9.1	197.7	642.8
(C)	9.1	6.4	199.3	261.2

 1.3 MAXIMUM WIND SPEED

ELEVATION (METERS)	WIND SPEED	WIND DIR.	DATE	TIME	OTHER LEVELS
(A) 45.7	22.3	128.8	07/28/80	23:00	(B)-999.9 (C) 13.2
(C) 9.1	23.6	12.8	10/23/80	11:00	(A) 21.0 (B)-999.9

 NOTES:

1. SITE ELEVATION: 1091 METERS ABOVE SEA LEVEL.
2. SENSOR LEVEL B NOT AVAILABLE AT SITE TX.
3. SEE NOTE 1 ON PAGE 4.

SITE ID: TX
SITE LOCATION: AMARILLO, TX.
DATA : JANUARY 1980 THROUGH DECEMBER 1980

1.4 WIND SPEED AND DIRECTION VERSUS TIME-OF-DAY

TIME OF DAY	LEVEL A		LEVEL B		LEVEL C	
	WS	WD	WS	WD	WS	WD
00:00	10.1	168.7	0.0	0.0	6.5	170.0
01:00	9.8	180.6	0.0	0.0	6.3	180.8
02:00	9.7	192.3	0.0	0.0	6.2	192.7
03:00	9.6	200.7	0.0	0.0	6.2	203.8
04:00	9.4	211.7	0.0	0.0	6.0	214.6
05:00	9.3	223.5	0.0	0.0	6.0	224.5
06:00	9.1	231.0	0.0	0.0	5.9	229.9
07:00	8.9	237.4	0.0	0.0	5.9	237.9
08:00	8.6	243.4	0.0	0.0	6.2	246.3
09:00	8.4	246.1	0.0	0.0	6.5	254.1
10:00	8.4	248.5	0.0	0.0	6.8	256.6
11:00	8.4	241.7	0.0	0.0	6.9	249.4
12:00	8.3	232.0	0.0	0.0	6.9	239.8
13:00	8.3	219.2	0.0	0.0	6.9	225.8
14:00	8.3	210.0	0.0	0.0	6.9	217.5
15:00	8.2	203.1	0.0	0.0	6.8	208.3
16:00	8.4	188.8	0.0	0.0	6.7	192.4
17:00	8.6	176.6	0.0	0.0	6.6	180.3
18:00	8.9	163.0	0.0	0.0	6.5	167.7
19:00	9.1	156.2	0.0	0.0	6.4	162.1
20:00	9.3	154.1	0.0	0.0	6.2	160.1
21:00	9.8	155.4	0.0	0.0	6.4	161.2
22:00	10.1	157.1	0.0	0.0	6.4	161.4
23:00	10.1	161.4	0.0	0.0	6.4	163.2

NOTES:

1. SEE NOTE 1 ON PAGE 4.

SITE ID: TX
 SITE LOCATION: AMARILLO, TX.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.5 FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A COUNT	LEVEL B % COUNT	LEVEL C % COUNT	%
0.0- 0.5	9	0.1	0	0.1
0.5- 1.0	16	0.2	0	0.4
1.0- 1.5	47	0.6	0	1.3
1.5- 2.0	90	1.1	0	2.8
2.0- 2.5	122	1.5	0	3.9
2.5- 3.0	166	2.1	0	4.5
3.0- 3.5	191	2.4	0	4.9
3.5- 4.0	221	2.8	0	5.6
4.0- 4.5	251	3.1	0	6.4
4.5- 5.0	277	3.5	0	6.2
5.0- 5.5	274	3.4	0	6.6
5.5- 6.0	312	3.9	0	5.8
6.0- 6.5	324	4.1	0	6.9
6.5- 7.0	342	4.3	0	6.4
7.0- 7.5	350	4.4	0	5.9
7.5- 8.0	332	4.2	0	5.4
8.0- 8.5	339	4.2	0	4.3
8.5- 9.0	339	4.2	0	4.1
9.0- 9.5	330	4.1	0	3.2
9.5-10.0	371	4.6	0	2.9
10.0-11.0	752	9.4	0	4.5
11.0-12.0	687	8.6	0	3.0
12.0-13.0	552	6.9	0	1.7
13.0-14.0	426	5.3	0	1.1
14.0-15.0	307	3.8	0	0.7
15.0-16.0	222	2.8	0	0.5
16.0-17.0	145	1.8	0	0.3
17.0-18.0	86	1.1	0	0.2
18.0-19.0	54	0.7	0	0.1
19.0-20.0	26	0.3	0	0.1
20.0-21.0	23	0.3	0	0.1
>21.0	13	0.2	0	0.1

RECOVERY RATES
 LEVEL A LEVEL B LEVEL C
 91.0 0.0 88.8

NOTES:
 SEE NOTE 1 ON PAGE 4.

SITE ID: TX
 SITE LOCATION: AMARILLO, TX.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.6 CUMULATIVE FREQUENCY DISTRIBUTION OF WIND SPEED

	LEVEL A		LEVEL B		LEVEL C	
WIND SPEED	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)
0.5	9	0.11	0	0.00	10	0.13
1.0	25	0.31	0	0.00	40	0.51
1.5	72	0.90	0	0.00	145	1.86
2.0	162	2.03	0	0.00	363	4.66
2.5	284	3.55	0	0.00	668	8.57
3.0	450	5.63	0	0.00	1020	13.08
3.5	641	8.02	0	0.00	1401	17.97
4.0	862	10.78	0	0.00	1836	23.54
4.5	1113	13.92	0	0.00	2333	29.92
5.0	1390	17.38	0	0.00	2813	36.07
5.5	1664	20.81	0	0.00	3330	42.70
6.0	1976	24.71	0	0.00	3779	48.46
6.5	2300	28.76	0	0.00	4318	55.37
7.0	2642	33.04	0	0.00	4816	61.76
7.5	2992	37.42	0	0.00	5278	67.68
8.0	3324	41.57	0	0.00	5702	73.12
8.5	3663	45.81	0	0.00	6038	77.43
9.0	4002	50.05	0	0.00	6361	81.57
9.5	4332	54.18	0	0.00	6613	84.80
10.0	4703	58.82	0	0.00	6838	87.69
11.0	5455	68.22	0	0.00	7186	92.15
12.0	6142	76.81	0	0.00	7417	95.11
13.0	6694	83.72	0	0.00	7547	96.78
14.0	7120	89.04	0	0.00	7634	97.90
15.0	7427	92.88	0	0.00	7692	98.64
16.0	7649	95.66	0	0.00	7730	99.13
17.0	7794	97.47	0	0.00	7754	99.44
18.0	7880	98.55	0	0.00	7773	99.68
19.0	7934	99.22	0	0.00	7783	99.81
20.0	7960	99.55	0	0.00	7788	99.87
21.0	7983	99.84	0	0.00	7792	99.92
>21.0	7996	100.00	0	0.00	7798	100.00

NOTES:

1. SEE NOTE 1 ON PAGE 4.

SITE ID: TX
 SITE LOCATION: AMARILLO, TX.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.7 WIND SPEED PERSISTENCE FREQUENCY (LEVEL A)

NUMBER OF OCCURENCES								

WIND SPEED CLASS, METERS/SEC								
HOURS	< 3	3-4	4-5	5-6	6-7	7-12	12-20	> 20

1	92	201	259	296	332	205	115	4
2	42	51	70	76	85	130	70	5
3	24	18	22	33	29	100	46	3
4	11	10	8	4	10	83	33	2
5	9	4	2	3	3	57	19	1
6	5	0	0	0	2	45	14	0
7	2	0	3	0	1	35	18	0
8	2	0	0	1	0	23	13	0
9	3	0	0	0	0	26	10	0
10	1	0	0	0	0	12	7	0
11	1	0	0	0	0	16	9	0
12	0	0	0	0	0	11	11	0
13	0	0	0	0	0	6	3	0
14	0	0	0	0	0	8	4	0
15	0	0	0	0	0	6	3	0
16	0	0	0	0	0	2	8	0
17	0	0	0	0	0	4	3	0
18	0	0	0	0	0	3	1	0
19	0	0	0	0	0	1	2	0
20	0	0	0	0	0	2	3	0
21	0	0	0	0	0	1	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	3	0	0
>23	0	0	0	0	0	6	2	0

 NOTES:
 SEE NOTE 1 ON PAGE 4.

SITE ID: TX
 SITE LOCATION: AMARILLO, TX.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.8 POWER LAW EXPONENT AND W/D DISTRIBUTION

WIND DIR

(ELEV A)	ALPHA (A,B)	ALPHA (B,C)	ALPHA (A,C)	ALPHA (A,B,C)	%A	%B	%C
N	0.00	0.00	0.15	0.00	5.34	0.00	3.91
NNE	0.00	0.00	0.08	0.00	6.14	0.00	6.59
NE	0.00	0.00	0.10	0.00	3.50	0.00	5.14
ENE	0.00	0.00	0.19	0.00	2.60	0.00	3.03
E	0.00	0.00	0.23	0.00	3.38	0.00	3.01
ESE	0.00	0.00	0.27	0.00	3.75	0.00	3.59
SE	0.00	0.00	0.32	0.00	5.60	0.00	4.32
SSE	0.00	0.00	0.29	0.00	9.10	0.00	8.46
S	0.00	0.00	0.25	0.00	13.64	0.00	12.07
SSW	0.00	0.00	0.20	0.00	12.88	0.00	12.43
SW	0.00	0.00	0.21	0.00	8.68	0.00	9.12
WSW	0.00	0.00	0.24	0.00	6.23	0.00	6.19
W	0.00	0.00	0.19	0.00	4.50	0.00	5.00
WNW	0.00	0.00	0.12	0.00	5.09	0.00	4.51
NW	0.00	0.00	0.17	0.00	3.68	0.00	3.51
NNW	0.00	0.00	0.16	0.00	3.39	0.00	2.87

 NOTES:

$$1. \quad \frac{WS(UP)}{WS(LO)} = \frac{Z(UP)}{Z(LO)}^{\text{ALPHA}}$$

$$2. \quad \text{ALPHA} = \frac{\text{LOG}(WS(UP)/WS(LO))}{\text{LOG}(Z(UP)/Z(LO))}$$

WHERE; Z=ELEVATION
 WS=WIND SPEED

3. SEE NOTE 1 ON PAGE 4.

COUNT OF WIND SPEED VS. DIRECTION
 EACH LINE OF CHARACTERS REPRESENTS 40 OBSERVATIONS
 SPEED INCREASES WITH DISTANCE FROM CENTER OF CIRCLES
 ASSOCIATED RANGES IN MPS ARE 0 -4 4 -10 10 -20 20 -

FIGURE 1. (TX) Wind Rose for Lowest Sensor Level

NOTE: See Note 1 on page 4.

BLOCK ISLAND, RHODE ISLAND

SITE ID: RI
 SITE LOCATION: BLOCK ISLAND, RI.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

1.1 SENSOR PERFORMANCE

TOTAL POSSIBLE SAMPLES: 8784

SENSOR	% ON-LINE	% RECOVERED
WS(A)	100.0	91.0
WD(A)	100.0	66.8
WS(B)	100.0	90.9
WD(B)	100.0	91.0
WS(C)	100.0	90.8
WD(C)	100.0	90.7

1.2 ANNUAL MEANS AND STANDARD DEVIATIONS

	HEIGHT (METERS)	MEAN WS	MEAN WD	POWER WATTS/M**2
SITE DATA (A)	45.7	7.7	293.9	437.9
(B)	30.0	6.7	283.4	287.9
(C)	9.1	5.3	278.8	151.6

1.3 MAXIMUM WIND SPEED

ELEVATION (METERS)	WIND SPEED	WIND DIR.	DATE	TIME	OTHER LEVELS
(A) 45.7	21.3	54.2	03/22/80	05:00	(B) 19.5 (C) 14.9
(B) 30.0	19.5	54.1	03/22/80	05:00	(A) 21.3 (C) 14.9
(C) 9.1	14.9	60.3	03/22/80	05:00	(A) 21.3 (B) 19.5

NOTES:

1. SITE ELEVATION: 14 METERS ABOVE SEA LEVEL.

SITE ID: RI
 SITE LOCATION: BLOCK ISLAND, RI.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.4 WIND SPEED AND DIRECTION VERSUS TIME-OF-DAY

TIME OF DAY	LEVEL A		LEVEL B		LEVEL C	
	WS	WD	WS	WD	WS	WD
00:00	7.9	301.1	6.7	289.8	5.2	285.3
01:00	7.8	307.0	6.6	293.2	5.1	284.8
02:00	7.7	308.2	6.6	295.3	5.0	285.6
03:00	7.7	308.2	6.5	298.8	5.0	289.9
04:00	7.7	310.1	6.6	302.3	5.1	292.1
05:00	7.7	316.2	6.5	306.4	5.0	294.8
06:00	7.6	317.5	6.5	306.2	5.0	296.9
07:00	7.5	317.6	6.5	309.6	5.3	305.7
08:00	7.5	320.0	6.6	312.7	5.5	312.4
09:00	7.3	320.4	6.6	312.7	5.6	313.5
10:00	7.4	317.2	6.7	309.7	5.7	312.2
11:00	7.3	301.9	6.6	295.9	5.7	297.7
12:00	7.4	282.7	6.7	275.2	5.7	275.9
13:00	7.5	268.4	6.8	259.4	5.8	261.1
14:00	7.7	262.2	6.9	254.5	5.8	255.0
15:00	7.8	262.1	6.9	251.7	5.8	252.0
16:00	7.9	262.6	6.9	253.3	5.7	252.1
17:00	8.0	266.4	6.9	256.1	5.5	254.0
18:00	8.0	271.3	6.8	260.6	5.3	256.8
19:00	8.0	271.6	6.7	260.7	5.2	256.7
20:00	8.0	278.4	6.7	266.3	5.2	261.2
21:00	7.9	282.8	6.7	272.1	5.1	267.0
22:00	7.9	288.1	6.6	278.6	5.1	270.1
23:00	7.9	295.8	6.7	284.3	5.1	278.1

SITE ID: RI
 SITE LOCATION: BLOCK ISLAND, RI.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.5 FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A COUNT	LEVEL B % COUNT	LEVEL C % COUNT	LEVEL C %
0.0- 0.5	0	0.0	0	0.0
0.5- 1.0	2	0.0	3	0.0
1.0- 1.5	23	0.3	36	0.5
1.5- 2.0	77	1.0	94	1.2
2.0- 2.5	118	1.5	170	2.1
2.5- 3.0	184	2.3	262	3.3
3.0- 3.5	226	2.8	364	4.6
3.5- 4.0	310	3.9	434	5.4
4.0- 4.5	355	4.4	462	5.8
4.5- 5.0	362	4.5	554	6.9
5.0- 5.5	440	5.5	561	7.0
5.5- 6.0	460	5.8	590	7.4
6.0- 6.5	532	6.7	631	7.9
6.5- 7.0	469	5.9	542	6.8
7.0- 7.5	518	6.5	549	6.9
7.5- 8.0	519	6.5	494	6.2
8.0- 8.5	476	6.0	430	5.4
8.5- 9.0	417	5.2	354	4.4
9.0- 9.5	407	5.1	288	3.6
9.5-10.0	355	4.4	221	2.8
10.0-11.0	581	7.3	335	4.2
11.0-12.0	393	4.9	227	2.8
12.0-13.0	255	3.2	148	1.9
13.0-14.0	175	2.2	111	1.4
14.0-15.0	126	1.6	55	0.7
15.0-16.0	90	1.1	37	0.5
16.0-17.0	53	0.7	20	0.3
17.0-18.0	33	0.4	8	0.1
18.0-19.0	21	0.3	4	0.1
19.0-20.0	12	0.2	2	0.0
20.0-21.0	4	0.1	0	0.0
>21.0	1	0.0	0	0.0

RECOVERY RATES
 LEVEL A LEVEL B LEVEL C
 91.0 90.9 90.8

SITE ID: RI
 SITE LOCATION: BLOCK ISLAND, RI.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.6 CUMULATIVE FREQUENCY DISTRIBUTION OF WIND SPEED

	LEVEL A		LEVEL B		LEVEL C	
WIND SPEED	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)
0.5	0	0.00	0	0.00	0	0.00
1.0	2	0.03	3	0.04	14	0.18
1.5	25	0.31	39	0.49	132	1.66
2.0	102	1.28	133	1.67	365	4.58
2.5	220	2.75	303	3.79	742	9.30
3.0	404	5.05	565	7.07	1236	15.50
3.5	630	7.88	929	11.63	1837	23.03
4.0	940	11.76	1363	17.07	2473	31.01
4.5	1295	16.20	1825	22.85	3150	39.50
5.0	1657	20.73	2379	29.79	3829	48.01
5.5	2097	26.23	2940	36.81	4542	56.95
6.0	2557	31.99	3530	44.20	5210	65.33
6.5	3089	38.64	4161	52.10	5807	72.82
7.0	3558	44.51	4703	58.89	6286	78.82
7.5	4076	50.99	5252	65.77	6644	83.31
8.0	4595	57.48	5746	71.95	6952	87.17
8.5	5071	63.44	6176	77.34	7178	90.01
9.0	5488	68.65	6530	81.77	7350	92.16
9.5	5895	73.74	6818	85.37	7511	94.18
10.0	6250	78.18	7039	88.14	7629	95.66
11.0	6831	85.45	7374	92.34	7817	98.02
12.0	7224	90.37	7601	95.18	7901	99.07
13.0	7479	93.56	7749	97.03	7948	99.66
14.0	7654	95.75	7860	98.42	7970	99.94
15.0	7780	97.32	7915	99.11	7975	100.00
16.0	7870	98.45	7952	99.57	7975	100.00
17.0	7923	99.11	7972	99.82	7975	100.00
18.0	7956	99.52	7980	99.92	7975	100.00
19.0	7977	99.79	7984	99.97	7975	100.00
20.0	7989	99.94	7986	100.00	7975	100.00
21.0	7993	99.99	7986	100.00	7975	100.00
>21.0	7994	100.00	7986	100.00	7975	100.00

SITE ID: RI
 SITE LOCATION: BLOCK ISLAND, RI.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.7 WIND SPEED PERSISTENCE FREQUENCY (LEVEL A)

HOURS	NUMBER OF OCCURENCES							
	WIND SPEED CLASS, METERS/SEC							
	< 3	3-4	4-5	5-6	6-7	7-12	12-20	> 20
1	58	181	273	319	361	147	58	1
2	34	75	102	119	126	66	17	2
3	23	23	29	42	61	57	15	0
4	10	15	12	27	22	48	10	0
5	7	6	11	9	11	38	6	0
6	4	4	4	6	6	23	7	0
7	5	2	0	4	1	29	5	0
8	2	0	3	0	1	15	0	0
9	0	0	0	0	0	12	5	0
10	1	1	0	0	0	16	2	0
11	2	0	0	0	0	7	4	0
12	0	0	0	0	0	12	1	0
13	0	0	0	0	0	13	2	0
14	0	0	0	0	1	9	1	0
15	0	0	0	0	0	11	0	0
16	0	0	0	0	0	2	0	0
17	0	0	0	0	0	3	1	0
18	0	0	0	0	0	7	1	0
19	0	0	0	0	0	3	1	0
20	0	0	0	0	0	6	0	0
21	0	0	0	0	0	7	0	0
22	0	0	0	0	0	3	1	0
23	0	0	0	0	0	4	0	0
>23	1	0	0	0	1	23	7	0

SITE ID: RI
 SITE LOCATION: BLOCK ISLAND, RI.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.8 POWER LAW EXPONENT AND W/D DISTRIBUTION

WIND DIR (ELEV A)	ALPHA (A,B)	ALPHA (B,C)	ALPHA (A,C)	ALPHA (A,B,C)	%A	%B	%C
N	0.36	0.19	0.23	0.22	3.19	4.28	4.00
NNE	0.45	0.15	0.23	0.21	4.82	5.71	5.66
NE	0.45	0.14	0.22	0.20	3.47	4.55	3.74
ENE	0.29	0.15	0.18	0.18	2.56	3.18	3.61
E	0.42	0.17	0.23	0.22	2.74	3.17	2.90
ESE	0.32	0.15	0.19	0.18	2.39	2.89	3.22
SE	0.54	0.14	0.24	0.22	2.21	2.87	2.81
SSE	0.39	0.22	0.26	0.25	2.33	2.98	2.73
S	0.65	0.22	0.33	0.31	2.91	4.24	4.11
SSW	0.58	0.23	0.32	0.30	3.73	6.57	7.36
SW	0.49	0.27	0.32	0.31	7.27	10.48	10.83
WSW	0.42	0.26	0.30	0.29	5.95	10.19	10.53
W	0.51	0.25	0.32	0.30	5.70	7.99	7.35
WNW	0.41	0.20	0.25	0.24	6.57	8.18	9.04
NW	0.33	0.14	0.19	0.18	10.98	14.41	14.71
NNW	0.22	0.10	0.13	0.13	6.54	8.28	7.01

 NOTES:

$$1. \quad \frac{WS(UP)}{WS(LO)} = \frac{Z(UP)^{ALPHA}}{Z(LO)^{ALPHA}}$$

$$2. \quad ALPHA = \frac{\log(WS(UP)/WS(LO))}{\log(Z(UP)/Z(LO))} \quad \text{WHERE; } Z=\text{ELEVATION} \\ \text{WS}=\text{WIND SPED}$$

FIGURE 1. (RI) Wind Rose for Lowest Sensor Level

BOARDMAN, OREGON

SITE ID: OR
 SITE LOCATION: BOARDMAN, OR
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.1 SENSOR PERFORMANCE

TOTAL POSSIBLE SAMPLES: 8784

SENSOR	% ON-LINE	% RECOVERED
WS(A)	100.0	93.9
WD(A)	100.0	94.2
WS(B)	100.0	93.8
WD(B)	100.0	94.3
WS(C)	100.0	57.9
WD(C)	100.0	94.5

 1.2 ANNUAL MEANS AND STANDARD DEVIATIONS

	HEIGHT (METERS)	MEAN WS	MEAN WD	POWER WATTS/M**2
SITE DATA (A)	70.1	5.6	256.7	283.1
(B)	39.6	4.9	242.0	190.1
(C)	9.1	3.4	240.7	97.6

 1.3 MAXIMUM WIND SPEED

ELEVATION (METERS)	WIND SPEED	WIND DIR.	DATE	TIME	OTHER LEVELS
(A) 70.1	21.0	264.0	06/01/80	12:00	(B)-999.9 (C)-999.9
(B) 39.6	21.9	276.0	03/29/80	11:00	(A) 17.0 (C)-999.9
(C) 9.1	19.7	251.0	03/22/80	12:00	(A) 15.6 (B) 15.2

 NOTES:

1. SITE ELEVATION: 212 METERS ABOVE SEA LEVEL.

SITE ID: OR
 SITE LOCATION: BOARDMAN, OR
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.4 WIND SPEED AND DIRECTION VERSUS TIME-OF-DAY

TIME OF DAY	LEVEL A		LEVEL B		LEVEL C	
	WS	WD	WS	WD	WS	WD
00:00	5.9	236.7	5.1	224.2	3.2	226.0
01:00	5.9	235.6	5.0	223.9	3.2	227.3
02:00	5.8	237.1	4.9	225.3	3.3	226.6
03:00	5.9	235.2	5.0	223.8	3.3	229.0
04:00	5.8	234.7	4.9	225.0	3.1	229.2
05:00	5.6	239.7	4.7	228.0	3.1	231.1
06:00	5.3	243.0	4.6	234.3	3.2	233.7
07:00	5.1	256.4	4.6	249.4	3.3	243.9
08:00	4.7	270.2	4.3	262.0	3.3	252.6
09:00	4.6	282.5	4.3	268.2	3.2	258.1
10:00	4.7	287.5	4.4	272.5	3.4	261.1
11:00	4.8	298.9	4.5	279.3	3.6	264.1
12:00	5.0	300.2	4.5	285.3	3.6	263.2
13:00	5.1	307.7	4.7	292.1	3.7	261.5
14:00	5.1	308.5	4.7	305.5	3.8	261.8
15:00	5.4	301.5	4.9	297.5	4.0	258.6
16:00	5.8	283.8	5.1	277.1	3.8	251.0
17:00	6.2	276.3	5.4	272.6	3.8	245.7
18:00	6.3	257.6	5.4	246.0	3.6	241.0
19:00	6.3	251.2	5.4	236.0	3.6	236.9
20:00	6.3	250.5	5.4	235.6	3.6	237.9
21:00	6.2	242.6	5.2	233.4	3.4	236.1
22:00	6.0	242.0	5.1	232.5	3.3	229.5
23:00	6.0	241.7	5.0	229.9	3.2	230.3

SITE ID: OR
 SITE LOCATION: BOARDMAN, OR
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.5 FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A COUNT	LEVEL B % COUNT	LEVEL C % COUNT	%
0.0- 0.5	272	3.3	297	3.6
0.5- 1.0	457	5.5	517	6.3
1.0- 1.5	580	7.0	646	7.8
1.5- 2.0	569	6.9	664	8.1
2.0- 2.5	551	6.7	553	6.7
2.5- 3.0	428	5.2	434	5.3
3.0- 3.5	335	4.1	397	4.8
3.5- 4.0	338	4.1	367	4.5
4.0- 4.5	556	6.7	647	7.9
4.5- 5.0	305	3.7	331	4.0
5.0- 5.5	252	3.1	310	3.8
5.5- 6.0	248	3.0	309	3.8
6.0- 6.5	264	3.2	256	3.1
6.5- 7.0	250	3.0	283	3.4
7.0- 7.5	246	3.0	235	2.9
7.5- 8.0	243	2.9	242	2.9
8.0- 8.5	454	5.5	470	5.7
8.5- 9.0	189	2.3	194	2.4
9.0- 9.5	193	2.3	160	1.9
9.5-10.0	171	2.1	162	2.0
10.0-11.0	356	4.3	256	3.1
11.0-12.0	320	3.9	194	2.4
12.0-13.0	327	4.0	181	2.2
13.0-14.0	136	1.6	69	0.8
14.0-15.0	86	1.0	39	0.5
15.0-16.0	70	0.8	11	0.1
16.0-17.0	28	0.3	10	0.1
17.0-18.0	11	0.1	4	0.0
18.0-19.0	2	0.0	0	0.0
19.0-20.0	7	0.1	0	0.0
20.0-21.0	2	0.0	0	0.0
>21.0	1	0.0	1	0.0

RECOVERY RATES
 LEVEL A LEVEL B LEVEL C
 93.9 93.8 57.9

SITE ID: OR
 SITE LOCATION: BOARDMAN, OR
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.6 CUMULATIVE FREQUENCY DISTRIBUTION OF WIND SPEED

	LEVEL A		LEVEL B		LEVEL C	
WIND SPEED	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)
0.5	272	3.30	297	3.60	334	6.57
1.0	729	8.84	814	9.88	841	16.55
1.5	1309	15.87	1460	17.72	1417	27.88
2.0	1878	22.77	2124	25.78	1945	38.26
2.5	2429	29.45	2677	32.49	2418	47.57
3.0	2857	34.64	3111	37.76	2806	55.20
3.5	3192	38.70	3508	42.58	3160	62.17
4.0	3530	42.80	3875	47.03	3495	68.76
4.5	4086	49.55	4522	54.89	3895	76.63
5.0	4391	53.24	4853	58.90	4043	79.54
5.5	4643	56.30	5163	62.67	4149	81.63
6.0	4891	59.31	5472	66.42	4279	84.18
6.5	5155	62.51	5728	69.52	4380	86.17
7.0	5405	65.54	6011	72.96	4482	88.18
7.5	5651	68.52	6246	75.81	4566	89.83
8.0	5894	71.47	6488	78.75	4647	91.42
8.5	6348	76.97	6958	84.45	4786	94.16
9.0	6537	79.27	7152	86.81	4833	95.08
9.5	6730	81.61	7312	88.75	4871	95.83
10.0	6901	83.68	7474	90.71	4910	96.60
11.0	7257	88.00	7730	93.82	4963	97.64
12.0	7577	91.88	7924	96.18	5001	98.39
13.0	7904	95.84	8105	98.37	5026	98.88
14.0	8040	97.49	8174	99.21	5035	99.06
15.0	8126	98.53	8213	99.68	5049	99.33
16.0	8196	99.38	8224	99.82	5061	99.57
17.0	8224	99.72	8234	99.94	5070	99.74
18.0	8235	99.85	8238	99.99	5077	99.88
19.0	8237	99.88	8238	99.99	5081	99.96
20.0	8244	99.96	8238	99.99	5083	100.00
21.0	8246	99.99	8238	99.99	5083	100.00
>21.0	8247	100.00	8239	100.00	5083	100.00

SITE ID: OR
 SITE LOCATION: BOARDMAN, OR
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

1.7 WIND SPEED PERSISTENCE FREQUENCY (LEVEL A)

HOURS	NUMBER OF OCCURENCES							
	WIND SPEED CLASS, METERS/SEC							
	< 3	3-4	4-5	5-6	6-7	7-12	12-20	> 20
1	88	328	291	275	297	145	56	1
2	64	96	120	52	59	84	36	1
3	38	27	43	21	20	76	24	0
4	43	9	16	9	7	31	16	0
5	23	6	10	3	1	28	18	0
6	21	1	7	0	1	19	7	0
7	18	0	3	1	0	20	1	0
8	23	0	3	0	0	13	6	0
9	9	0	0	0	0	17	0	0
10	11	0	0	0	0	13	4	0
11	10	0	0	0	0	8	3	0
12	11	0	0	0	0	9	1	0
13	7	0	0	0	0	5	2	0
14	8	0	0	0	0	0	1	0
15	11	0	0	0	0	4	1	0
16	6	0	0	0	0	4	1	0
17	2	0	0	0	0	1	1	0
18	2	0	0	0	0	1	0	0
19	0	0	0	0	0	3	0	0
20	2	0	0	0	0	2	0	0
21	0	0	0	0	0	0	1	0
22	1	0	0	0	0	2	1	0
23	0	0	0	0	0	0	0	0
>23	16	0	0	0	0	6	0	0

SITE ID: OR
 SITE LOCATION: BOARDMAN, OR
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.8 POWER LAW EXPONENT AND W/D DISTRIBUTION

WIND DIR

(ELEV A)	ALPHA (A,B)	ALPHA (B,C)	ALPHA (A,C)	ALPHA (A,B,C)	%A	%B	%C
N	-0.34	0.13	0.00	0.03	3.67	1.59	4.27
NNE	0.04	0.14	0.11	0.12	5.21	4.50	5.82
NE	0.34	0.08	0.15	0.14	6.52	6.34	5.39
ENE	0.37	0.06	0.15	0.13	5.41	5.33	4.78
E	0.32	0.09	0.15	0.14	3.82	3.98	2.91
ESE	0.25	0.11	0.15	0.14	2.21	3.22	3.05
SE	0.17	0.19	0.18	0.18	1.52	2.12	1.95
SSE	0.30	0.04	0.11	0.09	1.04	2.01	2.28
S	0.05	0.12	0.10	0.10	2.07	3.31	7.10
SSW	0.19	0.21	0.20	0.20	4.81	8.57	14.20
SW	0.36	0.22	0.26	0.25	14.82	14.31	11.67
WSW	0.26	0.12	0.16	0.15	26.76	22.55	15.72
W	0.03	0.21	0.16	0.17	12.82	14.58	10.19
WNW	-0.08	0.20	0.12	0.14	3.90	4.92	4.62
NW	-0.06	0.09	0.04	0.05	2.80	1.94	3.05
NNW	-0.14	0.18	0.09	0.11	2.46	0.72	2.99

 NOTES:

$$1. \frac{WS(UP)}{WS(LO)} = \frac{Z(UP)^{ALPHA}}{Z(LO)^{ALPHA}}$$

$$2. ALPHA = \frac{\log(WS(UP)/WS(LO))}{\log(Z(UP)/Z(LO))}$$

WHERE; Z=ELEVATION
 WS=WIND SPEED

FIGURE 1. (OR) Wind Rose for Lowest Sensor Level

BOONE, NORTH CAROLINA

SITE ID: NC
 SITE LOCATION: BOONE, NC.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.1 SENSOR PERFORMANCE

TOTAL POSSIBLE SAMPLES: 8784

SENSOR	% ON-LINE	% RECOVERED
WS(A)	100.0	68.1
WD(A)	100.0	68.0
WS(B)	100.0	62.9
WD(B)	100.0	63.6
WS(C)	100.0	65.3
WD(C)	100.0	70.2

 1.2 ANNUAL MEANS AND STANDARD DEVIATIONS

	HEIGHT (METERS)	MEAN WS	MEAN WD	POWER WATTS/M**2
SITE DATA (A)	76.2	8.3	292.2	594.1
(B)	45.7	7.8	294.5	496.9
(C)	18.2	6.3	288.4	338.3

 1.3 MAXIMUM WIND SPEED

ELEVATION (METERS)	WIND SPEED	WIND DIR.	DATE	TIME	OTHER LEVELS
(A) 76.2	28.4	314.2	03/22/80	07:00	(B) 28.4
					(C) 25.4
(B) 45.7	29.3	319.1	03/21/80	23:00	(A) 28.0
					(C) 25.0
(C) 18.2	27.1	310.6	03/14/80	08:00	(A) 23.3
					(B) 25.2

 NOTES:

1. SITE ELEVATION: 1347 METERS ABOVE SEA LEVEL.

SITE ID: NC
 SITE LOCATION: BOONE, NC.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.4 WIND SPEED AND DIRECTION VERSUS TIME-OF-DAY

TIME OF DAY	LEVEL A		LEVEL B		LEVEL C	
	WS	WD	WS	WD	WS	WD
00:00	8.8	288.3	8.2	291.7	6.6	288.5
01:00	9.1	287.2	8.4	289.5	6.9	288.1
02:00	9.1	290.3	8.5	290.0	6.9	287.6
03:00	9.4	292.8	8.7	293.4	7.2	291.6
04:00	9.3	295.4	8.6	296.9	7.0	294.8
05:00	9.3	297.2	8.5	298.8	7.0	295.5
06:00	9.4	298.9	8.7	300.7	7.1	299.6
07:00	9.3	306.0	8.6	306.1	6.9	301.2
08:00	8.7	306.7	8.1	307.1	6.6	300.7
09:00	8.3	305.9	7.6	303.0	6.1	295.9
10:00	7.6	306.4	7.1	302.1	5.7	294.8
11:00	7.2	295.9	6.9	298.1	5.5	288.2
12:00	7.1	292.7	6.8	294.9	5.4	285.3
13:00	7.1	285.0	6.8	285.5	5.4	277.0
14:00	7.0	283.1	6.8	286.9	5.3	279.4
15:00	7.0	287.8	6.8	289.6	5.3	282.3
16:00	7.2	286.9	7.0	292.2	5.5	281.9
17:00	7.4	288.9	7.1	295.4	5.5	282.9
18:00	7.7	286.4	7.4	291.6	5.9	283.5
19:00	7.9	285.0	7.5	292.7	6.2	284.0
20:00	8.3	283.3	7.7	288.0	6.4	281.4
21:00	8.6	286.1	8.0	290.6	6.7	283.3
22:00	8.6	285.1	7.9	290.3	6.6	284.8
23:00	8.8	286.6	8.1	290.1	6.7	285.6

SITE ID: NC
 SITE LOCATION: BOONE, NC.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.5 FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A COUNT	LEVEL B % COUNT	LEVEL C % COUNT	LEVEL C %
0.0- 0.5	6	0.1	8	0.1
0.5- 1.0	15	0.3	15	0.3
1.0- 1.5	54	0.9	49	0.9
1.5- 2.0	81	1.4	78	1.4
2.0- 2.5	103	1.7	124	2.2
2.5- 3.0	181	3.0	168	3.0
3.0- 3.5	185	3.1	223	4.0
3.5- 4.0	257	4.3	237	4.3
4.0- 4.5	256	4.3	280	5.1
4.5- 5.0	286	4.8	301	5.5
5.0- 5.5	321	5.4	305	5.5
5.5- 6.0	283	4.7	341	6.2
6.0- 6.5	339	5.7	314	5.7
6.5- 7.0	304	5.1	312	5.7
7.0- 7.5	339	5.7	329	6.0
7.5- 8.0	304	5.1	256	4.6
8.0- 8.5	267	4.5	277	5.0
8.5- 9.0	246	4.1	219	4.0
9.0- 9.5	244	4.1	220	4.0
9.5-10.0	214	3.6	169	3.1
10.0-11.0	347	5.8	278	5.0
11.0-12.0	270	4.5	229	4.1
12.0-13.0	232	3.9	186	3.4
13.0-14.0	214	3.6	139	2.5
14.0-15.0	143	2.4	135	2.4
15.0-16.0	131	2.2	80	1.4
16.0-17.0	85	1.4	63	1.1
17.0-18.0	66	1.1	42	0.8
18.0-19.0	42	0.7	44	0.8
19.0-20.0	40	0.7	26	0.5
20.0-21.0	39	0.7	27	0.5
>21.0	85	1.4	47	0.9

RECOVERY RATES
 LEVEL A LEVEL B LEVEL C
 68.1 62.9 65.3

SITE ID: NC
 SITE LOCATION: BOONE, NC.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.6 CUMULATIVE FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A		LEVEL B		LEVEL C	
	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)
0.5	6	0.10	8	0.14	11	0.19
1.0	21	0.35	23	0.42	104	1.81
1.5	75	1.25	72	1.30	332	5.79
2.0	156	2.61	150	2.72	613	10.68
2.5	259	4.33	274	4.96	875	15.25
3.0	440	7.36	442	8.01	1140	19.87
3.5	625	10.45	665	12.04	1452	25.30
4.0	882	14.75	902	16.34	1802	31.40
4.5	1138	19.03	1182	21.41	2143	37.35
5.0	1424	23.82	1483	26.86	2505	43.66
5.5	1745	29.19	1788	32.39	2906	50.64
6.0	2028	33.92	2129	38.56	3234	56.36
6.5	2367	39.59	2443	44.25	3530	61.52
7.0	2671	44.67	2755	49.90	3786	65.98
7.5	3010	50.34	3084	55.86	4030	70.23
8.0	3314	55.43	3340	60.50	4221	73.56
8.5	3581	59.89	3617	65.51	4437	77.33
9.0	3827	64.01	3836	69.48	4623	80.57
9.5	4071	68.09	4056	73.46	4751	82.80
10.0	4285	71.67	4225	76.53	4897	85.34
11.0	4632	77.47	4503	81.56	5102	88.92
12.0	4902	81.99	4732	85.71	5249	91.48
13.0	5134	85.87	4918	89.08	5357	93.36
14.0	5348	89.45	5057	91.60	5447	94.93
15.0	5491	91.84	5192	94.04	5513	96.08
16.0	5622	94.03	5272	95.49	5565	96.99
17.0	5707	95.45	5335	96.63	5606	97.70
18.0	5773	96.55	5377	97.39	5636	98.22
19.0	5815	97.26	5421	98.19	5661	98.66
20.0	5855	97.93	5447	98.66	5682	99.02
21.0	5894	98.58	5474	99.15	5695	99.25
>21.0	5979	100.00	5521	100.00	5738	100.00

SITE ID: NC
 SITE LOCATION: BOONE, NC.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.7 WIND SPEED PERSISTENCE FREQUENCY (LEVEL A)

HOURS	NUMBER OF OCCURENCES							

	WIND SPEED CLASS, METERS/SEC							
	< 3	3-4	4-5	5-6	6-7	7-12	12-20	> 20

1	56	178	230	292	310	156	73	17
2	35	53	81	85	81	106	35	7
3	23	24	26	26	31	61	31	5
4	15	14	8	5	11	41	17	7
5	7	2	4	2	2	46	15	0
6	4	1	3	2	2	24	15	2
7	3	0	0	2	0	19	14	0
8	1	0	0	1	2	20	7	0
9	6	0	0	0	0	20	5	0
10	2	0	0	0	0	12	6	1
11	2	0	0	0	0	11	5	0
12	0	1	0	0	0	5	1	1
13	0	0	0	0	0	5	3	0
14	0	0	0	0	0	5	1	0
15	0	0	0	0	0	1	2	0
16	0	0	0	0	0	3	1	1
17	0	0	0	0	0	1	0	0
18	0	0	0	0	0	1	1	0
19	0	0	0	0	0	3	1	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	1	0	0
22	0	0	0	0	0	0	1	0
23	0	0	0	0	0	0	0	0
>23	0	1	0	0	0	2	0	0

SITE ID: NC
 SITE LOCATION: BOONE, NC.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.8 POWER LAW EXPONENT AND W/D DISTRIBUTION

WIND DIR (ELEV A)	ALPHA (A,B)	ALPHA (B,C)	ALPHA (A,C)	ALPHA (A,B,C)	%A	%B	%C
N	-0.07	0.32	0.18	0.20	4.52	4.24	4.39
NNE	0.62	0.24	0.37	0.36	1.25	1.10	1.46
NE	-0.37	0.58	0.25	0.29	0.94	1.92	1.76
ENE	-0.23	0.62	0.32	0.35	1.22	1.70	1.60
E	0.54	0.63	0.60	0.60	1.52	1.34	1.81
ESE	0.12	0.77	0.54	0.56	2.46	2.23	1.52
SE	0.22	1.17	0.83	0.87	3.93	4.75	2.41
SSE	0.11	0.90	0.62	0.65	4.16	3.60	3.85
S	-0.08	0.63	0.38	0.41	4.11	4.29	5.39
SSW	0.11	0.30	0.23	0.24	5.64	6.34	7.39
SW	0.11	0.15	0.14	0.14	5.94	5.40	5.75
WSW	0.17	0.19	0.18	0.18	5.35	4.84	4.71
W	0.01	0.05	0.03	0.04	6.14	6.59	8.64
WNW	0.08	0.14	0.12	0.12	13.90	14.45	16.68
NW	0.20	0.13	0.15	0.15	20.14	20.88	19.43
NNW	0.18	0.26	0.23	0.23	15.49	14.64	12.60

 NOTES:

$$1. \quad \frac{WS(UP)}{WS(LO)} = \frac{Z(UP)}{Z(LO)}^{\text{ALPHA}}$$

$$2. \quad \text{ALPHA} = \frac{\text{LOG}(WS(UP)/WS(LO))}{\text{LOG}(Z(UP)/Z(LO))}$$

WHERE; Z=ELEVATION
 WS=WIND SPEED

FIGURE 1. (NC) Wind Rose for Lowest Sensor Level

CLAYTON, NEW MEXICO

SITE ID: NM
 SITE LOCATION: CLAYTON, NM.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.1 SENSOR PERFORMANCE

TOTAL POSSIBLE SAMPLES: 8784

SENSOR	% ON-LINE	% RECOVERED
WS(A)	100.0	86.4
WD(A)	100.0	90.3
WS(B)	100.0	81.1
WD(B)	100.0	90.3
WS(C)	100.0	89.3
WD(C)	100.0	90.3

 1.2 ANNUAL MEANS AND STANDARD DEVIATIONS

	HEIGHT (METERS)	MEAN WS	MEAN WD	POWER WATTS/M**2
SITE DATA (A)	45.7	7.3	221.7	325.9
(B)	30.0	6.6	218.4	259.6
(C)	9.1	5.2	234.4	147.0

 1.3 MAXIMUM WIND SPEED

ELEVATION (METERS)	WIND SPEED	WIND DIR.	DATE	TIME	OTHER LEVELS
(A) 45.7	23.8	282.3	03/31/80	23:00	(B) 22.4 (C) 19.6
(B) 30.0	22.4	287.5	03/31/80	23:00	(A) 23.8 (C) 19.6
(C) 9.1	19.6	288.1	03/31/80	23:00	(A) 23.8 (B) 22.4

 NOTES:

1. SITE ELEVATION: 1536 METERS ABOVE SEA LEVEL.

SITE ID: NM
 SITE LOCATION: CLAYTON, NM.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.4 WIND SPEED AND DIRECTION VERSUS TIME-OF-DAY

TIME OF DAY	LEVEL A		LEVEL B		LEVEL C	
	WS	WD	WS	WD	WS	WD
00:00	7.0	241.3	6.1	245.6	4.3	257.3
01:00	7.1	247.6	6.1	253.0	4.3	262.3
02:00	7.1	253.2	6.1	258.3	4.3	264.0
03:00	7.1	255.8	6.1	262.3	4.2	267.2
04:00	6.9	258.8	5.9	264.0	4.1	268.1
05:00	6.8	261.4	5.9	269.8	4.0	269.0
06:00	6.7	261.9	5.8	270.1	4.0	268.1
07:00	6.6	263.7	5.9	271.4	4.6	266.3
08:00	6.8	258.5	6.4	265.1	5.5	259.4
09:00	7.2	243.3	6.9	245.5	6.2	253.2
10:00	7.4	226.1	7.2	210.2	6.3	238.0
11:00	7.3	195.0	7.1	170.7	6.3	200.7
12:00	7.4	177.4	7.2	163.2	6.4	180.6
13:00	7.5	171.4	7.3	158.4	6.5	172.8
14:00	7.7	162.2	7.5	151.0	6.6	163.1
15:00	7.9	163.4	7.6	154.3	6.6	164.7
16:00	8.0	156.9	7.5	148.6	6.5	156.2
17:00	8.0	155.0	7.4	145.8	6.2	152.3
18:00	8.0	163.8	7.3	153.4	5.8	160.5
19:00	7.8	166.4	6.8	152.9	5.2	159.6
20:00	7.5	173.7	6.4	165.4	4.8	184.5
21:00	7.3	195.7	6.2	189.3	4.5	226.9
22:00	7.1	215.4	6.0	216.4	4.4	244.5
23:00	7.0	229.4	6.1	236.3	4.3	249.7

SITE ID: NM
 SITE LOCATION: CLAYTON, NM.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.5 FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A COUNT	LEVEL B % COUNT	LEVEL C % COUNT	LEVEL C %
0.0- 0.5	3	0.0	1	0.0
0.5- 1.0	7	0.1	8	0.1
1.0- 1.5	41	0.5	45	0.6
1.5- 2.0	97	1.3	128	1.8
2.0- 2.5	155	2.0	184	2.6
2.5- 3.0	208	2.7	324	4.5
3.0- 3.5	289	3.8	384	5.4
3.5- 4.0	343	4.5	474	6.7
4.0- 4.5	377	5.0	434	6.1
4.5- 5.0	412	5.4	470	6.6
5.0- 5.5	474	6.2	473	6.6
5.5- 6.0	454	6.0	459	6.4
6.0- 6.5	447	5.9	403	5.7
6.5- 7.0	460	6.1	410	5.8
7.0- 7.5	453	6.0	395	5.5
7.5- 8.0	425	5.6	400	5.6
8.0- 8.5	398	5.2	350	4.9
8.5- 9.0	393	5.2	296	4.2
9.0- 9.5	414	5.5	293	4.1
9.5-10.0	321	4.2	229	3.2
10.0-11.0	501	6.6	347	4.9
11.0-12.0	349	4.6	250	3.5
12.0-13.0	225	3.0	134	1.9
13.0-14.0	131	1.7	87	1.2
14.0-15.0	71	0.9	56	0.8
15.0-16.0	66	0.9	42	0.6
16.0-17.0	24	0.3	19	0.3
17.0-18.0	18	0.2	13	0.2
18.0-19.0	14	0.2	4	0.1
19.0-20.0	7	0.1	6	0.1
20.0-21.0	2	0.0	3	0.0
>21.0	8	0.1	5	0.1

RECOVERY RATES
 LEVEL A LEVEL B LEVEL C
 86.4 81.1 89.3

SITE ID: NM
 SITE LOCATION: CLAYTON, NM.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.6 CUMULATIVE FREQUENCY DISTRIBUTION OF WIND SPEED

	LEVEL A		LEVEL B		LEVEL C	
WIND SPEED	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)
0.5	3	0.04	1	0.01	0	0.00
1.0	10	0.13	9	0.13	49	0.62
1.5	51	0.67	54	0.76	417	5.32
2.0	148	1.95	182	2.55	890	11.35
2.5	303	3.99	366	5.14	1365	17.41
3.0	511	6.74	690	9.68	1854	23.65
3.5	800	10.54	1074	15.07	2399	30.60
4.0	1143	15.07	1548	21.72	2931	37.39
4.5	1520	20.03	1982	27.81	3491	44.53
5.0	1932	25.46	2452	34.41	4075	51.98
5.5	2406	31.71	2925	41.05	4638	59.16
6.0	2860	37.70	3384	47.49	5138	65.54
6.5	3307	43.59	3787	53.14	5574	71.10
7.0	3767	49.65	4197	58.90	5928	75.61
7.5	4220	55.62	4592	64.44	6231	79.48
8.0	4645	61.22	4992	70.05	6535	83.35
8.5	5043	66.47	5342	74.96	6800	86.73
9.0	5436	71.65	5638	79.12	7036	89.74
9.5	5850	77.11	5931	83.23	7245	92.41
10.0	6171	81.34	6160	86.44	7380	94.13
11.0	6672	87.94	6507	91.31	7577	96.65
12.0	7021	92.54	6757	94.82	7690	98.09
13.0	7246	95.51	6891	96.70	7752	98.88
14.0	7377	97.23	6978	97.92	7796	99.44
15.0	7448	98.17	7034	98.71	7816	99.69
16.0	7514	99.04	7076	99.30	7830	99.87
17.0	7538	99.35	7095	99.56	7833	99.91
18.0	7556	99.59	7108	99.75	7835	99.94
19.0	7570	99.78	7112	99.80	7838	99.97
20.0	7577	99.87	7118	99.89	7840	100.00
21.0	7579	99.89	7121	99.93	7840	100.00
>21.0	7587	100.00	7126	100.00	7840	100.00

SITE ID: NM
 SITE LOCATION: CLAYTON, NM.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

1.7 WIND SPEED PERSISTENCE FREQUENCY (LEVEL A)

HOURS	NUMBER OF OCCURENCES							
	WIND SPEED CLASS, METERS/SEC							
	< 3	3-4	4-5	5-6	6-7	7-12	12-20	> 20
1	81	261	373	454	437	183	71	1
2	56	95	114	130	122	129	40	0
3	40	32	30	32	46	92	18	0
4	16	11	11	15	15	54	14	1
5	10	5	7	7	4	56	5	1
6	4	2	2	2	2	44	9	0
7	1	0	1	0	0	35	6	0
8	2	0	0	1	0	17	3	0
9	2	1	0	0	0	23	3	0
10	0	0	0	0	0	16	1	0
11	0	0	0	0	0	12	2	0
12	1	0	0	0	0	15	4	0
13	0	0	0	0	0	5	2	0
14	0	0	0	0	0	8	0	0
15	0	0	0	0	0	2	0	0
16	0	0	0	0	0	4	0	0
17	0	0	0	0	0	1	1	0
18	0	0	0	0	0	5	0	0
19	0	0	0	0	0	2	0	0
20	0	0	0	0	0	1	0	0
21	0	0	0	0	0	3	0	0
22	0	0	0	0	0	3	0	0
23	0	0	0	0	0	1	0	0
>23	1	0	0	0	0	5	0	0

SITE ID: NM
SITE LOCATION: CLAYTON, NM.
DATA : JANUARY 1980 THROUGH DECEMBER 1980

1.8 POWER LAW EXPONENT AND W/D DISTRIBUTION

WIND DIR

(ELEV A)	ALPHA (A,B)	ALPHA (B,C)	ALPHA (A,C)	ALPHA (A,B,C)	%A	%B	%C
N	0.14	0.17	0.16	0.16	7.30	7.42	6.99
NNE	0.05	0.14	0.12	0.12	4.35	5.02	4.82
NE	0.18	0.13	0.15	0.14	3.33	3.90	3.53
ENE	0.19	0.18	0.18	0.18	2.53	2.67	2.67
E	0.23	0.19	0.20	0.20	3.23	3.21	3.12
ESE	0.15	0.19	0.18	0.18	3.66	3.55	3.52
SE	0.30	0.09	0.15	0.13	4.35	3.87	3.74
SSE	0.21	0.16	0.17	0.17	8.01	7.03	7.41
S	0.15	0.16	0.16	0.16	12.21	11.73	11.89
SSW	0.07	0.15	0.13	0.13	10.29	9.63	9.22
SW	0.26	0.26	0.26	0.26	9.16	7.83	8.16
WSW	0.27	0.25	0.26	0.25	8.00	8.62	8.65
W	0.44	0.33	0.36	0.36	5.96	7.17	7.21
WNW	0.51	0.33	0.37	0.36	4.85	6.06	5.97
NW	0.31	0.27	0.28	0.28	5.65	5.39	5.62
NNW	0.14	0.19	0.18	0.18	6.92	6.74	7.31

NOTES:

$$1. \frac{WS(UP)}{WS(LO)} = \frac{Z(UP)}{Z(LO)}$$
$$2. \text{ ALPHA} = \frac{\text{LOG(WS(UP)/WS(L0))}}{\text{LOG(Z(UP)/Z(L0))}}$$

WHERE; Z=ELEVATION
WS=WIND SPEED

COUNT OF WIND SPEED VS. DIRECTION
 EACH LINE OF CHARACTERS REPRESENTS 40 OBSERVATIONS
 SPEED INCREASES WITH DISTANCE FROM CENTER OF CIRCLES
 ASSOCIATED RANGES IN MPS ARE 0 -4 4 -10 10 -20 20 -

FIGURE 1. (NM) Wind Rose for Lowest Sensor Level

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COLD BAY, ALASKA

SITE ID: AK
 SITE LOCATION: COLD BAY, AK.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.1 SENSOR PERFORMANCE

TOTAL POSSIBLE SAMPLES: 8784

SENSOR	% ON-LINE	% RECOVERED
WS(A)	100.0	67.7
WD(A)	100.0	75.5
WS(C)	100.0	73.7
WD(C)	100.0	58.7

 1.2 ANNUAL MEANS AND STANDARD DEVIATIONS

	HEIGHT (METERS)	MEAN WS	MEAN WD	POWER WATTS/M**2
SITE DATA (A)	21.8	7.1	134.1	472.4
(C)	9.1	6.5	107.3	344.0

 1.3 MAXIMUM WIND SPEED

ELEVATION (METERS)	WIND SPEED	WIND DIR.	DATE	TIME	OTHER LEVELS
(A) 21.8	22.1	125.3	06/19/80	13:00	(B)-999.9 (C) 19.0
(C) 9.1	20.2	117.3	01/03/80	16:00	(A) 21.3 (B)-999.9

 NOTES:

1. SITE ELEVATION: 29 METERS ABOVE SEA LEVEL.
3. SENSOR LEVEL B NOT AVAILABLE AT SITE AK.

SITE ID: AK
 SITE LOCATION: COLD BAY, AK.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.4 WIND SPEED AND DIRECTION VERSUS TIME-OF-DAY

TIME OF DAY	LEVEL A		LEVEL B		LEVEL C	
	WS	WD	WS	WD	WS	WD
00:00	7.0	131.2	0.0	0.0	6.2	110.4
01:00	6.9	133.1	0.0	0.0	6.2	105.9
02:00	6.7	135.0	0.0	0.0	6.1	104.2
03:00	6.8	146.1	0.0	0.0	6.2	106.8
04:00	6.9	142.1	0.0	0.0	6.2	104.6
05:00	6.9	137.9	0.0	0.0	6.2	103.5
06:00	6.9	143.5	0.0	0.0	6.2	109.3
07:00	6.8	140.8	0.0	0.0	6.2	110.5
08:00	7.0	130.2	0.0	0.0	6.4	98.0
09:00	7.0	126.3	0.0	0.0	6.5	99.6
10:00	7.0	115.6	0.0	0.0	6.6	98.2
11:00	7.2	116.3	0.0	0.0	6.7	101.0
12:00	7.4	125.9	0.0	0.0	6.9	107.9
13:00	7.4	122.5	0.0	0.0	6.9	101.3
14:00	7.4	149.2	0.0	0.0	6.9	123.9
15:00	7.6	158.9	0.0	0.0	7.0	132.3
16:00	7.7	147.9	0.0	0.0	7.0	130.3
17:00	7.4	154.0	0.0	0.0	6.8	132.8
18:00	7.2	139.7	0.0	0.0	6.6	116.5
19:00	7.0	128.2	0.0	0.0	6.4	109.8
20:00	6.9	130.1	0.0	0.0	6.2	94.7
21:00	6.9	132.5	0.0	0.0	6.2	106.2
22:00	6.8	125.8	0.0	0.0	6.2	97.8
23:00	6.9	133.0	0.0	0.0	6.1	110.9

SITE ID: AK
 SITE LOCATION: COLD BAY, AK.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.5 FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A COUNT	LEVEL B % COUNT	LEVEL C % COUNT	%
0.0- 0.5	37	0.6	0	0.0
0.5- 1.0	90	1.5	0	0.0
1.0- 1.5	193	3.2	0	0.0
1.5- 2.0	251	4.2	0	0.0
2.0- 2.5	286	4.8	0	0.0
2.5- 3.0	303	5.1	0	0.0
3.0- 3.5	247	4.2	0	0.0
3.5- 4.0	267	4.5	0	0.0
4.0- 4.5	238	4.0	0	0.0
4.5- 5.0	247	4.2	0	0.0
5.0- 5.5	267	4.5	0	0.0
5.5- 6.0	255	4.3	0	0.0
6.0- 6.5	273	4.6	0	0.0
6.5- 7.0	258	4.3	0	0.0
7.0- 7.5	225	3.8	0	0.0
7.5- 8.0	238	4.0	0	0.0
8.0- 8.5	205	3.4	0	0.0
8.5- 9.0	250	4.2	0	0.0
9.0- 9.5	212	3.6	0	0.0
9.5-10.0	181	3.0	0	0.0
10.0-11.0	351	5.9	0	0.0
11.0-12.0	285	4.8	0	0.0
12.0-13.0	240	4.0	0	0.0
13.0-14.0	187	3.1	0	0.0
14.0-15.0	101	1.7	0	0.0
15.0-16.0	84	1.4	0	0.0
16.0-17.0	55	0.9	0	0.0
17.0-18.0	32	0.5	0	0.0
18.0-19.0	33	0.6	0	0.0
19.0-20.0	22	0.4	0	0.0
20.0-21.0	25	0.4	0	0.0
>21.0	10	0.2	0	0.0

RECOVERY RATES
 LEVEL A LEVEL B LEVEL C
 67.7 0.0 73.7

SITE ID: AK
 SITE LOCATION: COLD BAY, AK.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.6 CUMULATIVE FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A		LEVEL B		LEVEL C	
	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)
0.5	37	0.62	0	0.00	48	0.74
1.0	127	2.14	0	0.00	193	2.98
1.5	320	5.38	0	0.00	422	6.52
2.0	571	9.60	0	0.00	701	10.83
2.5	857	14.41	0	0.00	1013	15.65
3.0	1160	19.50	0	0.00	1319	20.37
3.5	1407	23.66	0	0.00	1657	25.59
4.0	1674	28.14	0	0.00	1960	30.27
4.5	1912	32.15	0	0.00	2261	34.92
5.0	2159	36.30	0	0.00	2583	39.90
5.5	2426	40.79	0	0.00	2897	44.75
6.0	2681	45.07	0	0.00	3189	49.26
6.5	2954	49.66	0	0.00	3480	53.75
7.0	3212	54.00	0	0.00	3775	58.31
7.5	3437	57.78	0	0.00	4067	62.82
8.0	3675	61.79	0	0.00	4373	67.55
8.5	3880	65.23	0	0.00	4647	71.78
9.0	4130	69.44	0	0.00	4891	75.55
9.5	4342	73.00	0	0.00	5129	79.22
10.0	4523	76.04	0	0.00	5342	82.51
11.0	4874	81.94	0	0.00	5682	87.77
12.0	5159	86.74	0	0.00	5937	91.71
13.0	5399	90.77	0	0.00	6156	95.09
14.0	5586	93.91	0	0.00	6268	96.82
15.0	5687	95.61	0	0.00	6350	98.08
16.0	5771	97.02	0	0.00	6383	98.59
17.0	5826	97.95	0	0.00	6423	99.21
18.0	5858	98.49	0	0.00	6448	99.60
19.0	5891	99.04	0	0.00	6468	99.91
20.0	5913	99.41	0	0.00	6472	99.97
21.0	5938	99.83	0	0.00	6474	100.00
>21.0	5948	100.00	0	0.00	6474	100.00

SITE ID: AK
 SITE LOCATION: COLD BAY, AK.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.7 WIND SPEED PERSISTENCE FREQUENCY (LEVEL A)

	NUMBER OF OCCURENCES								

	WIND SPEED CLASS, METERS/SEC								
HOURS	< 3	3-4	4-5	5-6	6-7	7-12	12-20	> 20	
-----	-----								
1	103	232	218	223	313	118	55	5	
2	57	73	60	62	62	64	35	3	
3	37	24	19	30	31	52	18	1	
4	24	7	9	7	14	24	12	1	
5	21	2	6	7	4	27	9	2	
6	13	3	1	1	2	18	9	0	
7	7	1	1	1	1	23	6	1	
8	5	1	0	0	1	14	6	0	
9	9	0	1	1	0	12	4	0	
10	5	0	0	0	0	10	2	0	
11	7	0	0	0	0	12	4	0	
12	3	0	0	0	0	4	2	0	
13	6	0	0	0	0	4	4	0	
14	4	0	0	0	0	4	1	0	
15	3	0	0	0	0	7	1	0	
16	1	0	0	0	0	1	0	0	
17	0	0	0	0	0	3	0	0	
18	1	0	0	0	0	2	0	0	
19	0	0	0	0	0	4	1	0	
20	0	0	0	0	0	1	1	0	
21	0	0	0	0	0	0	1	0	
22	0	0	0	0	0	0	0	0	
23	0	0	0	0	0	1	0	0	
>23	0	0	0	0	0	4	2	0	

SITE ID: AK
 SITE LOCATION: COLD BAY, AK.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.8 POWER LAW EXPONENT AND W/D DISTRIBUTION

WIND DIR (ELEV A)	ALPHA (A,B)	ALPHA (B,C)	ALPHA (A,C)	ALPHA (A,B,C)	%A	%B	%C
N	0.00	0.00	0.04	0.00	3.85	0.00	3.49
NNE	0.00	0.00	-0.16	0.00	3.46	0.00	4.91
NE	0.00	0.00	0.18	0.00	3.01	0.00	4.48
ENE	0.00	0.00	0.50	0.00	5.80	0.00	2.09
E	0.00	0.00	0.23	0.00	5.53	0.00	3.95
ESE	0.00	0.00	0.17	0.00	10.54	0.00	12.43
SE	0.00	0.00	0.20	0.00	15.33	0.00	10.35
SSE	0.00	0.00	-0.05	0.00	4.09	0.00	5.10
S	0.00	0.00	-0.35	0.00	3.23	0.00	2.80
SSW	0.00	0.00	0.07	0.00	3.23	0.00	2.70
SW	0.00	0.00	-0.31	0.00	5.75	0.00	3.51
WSW	0.00	0.00	0.26	0.00	6.96	0.00	3.04
W	0.00	0.00	0.08	0.00	7.95	0.00	3.46
WNW	0.00	0.00	0.13	0.00	7.50	0.00	4.36
NW	0.00	0.00	0.05	0.00	7.85	0.00	6.32
NNW	0.00	0.00	0.09	0.00	5.43	0.00	3.58

 NOTES:

$$1. \quad \frac{WS(UP)}{WS(LO)} = \frac{Z(UP)}{Z(LO)}^{\text{ALPHA}}$$

$$2. \quad \text{ALPHA} = \frac{\text{LOG}(WS(UP)/WS(LO))}{\text{LOG}(Z(UP)/Z(LO))}$$

WHERE; Z=ELEVATION
 WS=WIND SPEED

COUNT OF WIND SPEED VS. DIRECTION
 EACH LINE OF CHARACTERS REPRESENTS 40 OBSERVATIONS
 SPEED INCREASES WITH DISTANCE FROM CENTER OF CIRCLES
 ASSOCIATED RANGES IN MPS ARE 0 -4 4 -10 10 -20 20 -

FIGURE 1. (AK) Wind Rose for Lowest Sensor Level

CULEBRA, PUERTO RICO

SITE ID: PR
 SITE LOCATION: CULEBRA, PR.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.1 SENSOR PERFORMANCE

TOTAL POSSIBLE SAMPLES: 8784

SENSOR	% ON-LINE	% RECOVERED
WS(A)	100.0	91.1
WD(A)	100.0	76.7
WS(C)	100.0	90.8
WD(C)	100.0	91.0

 1.2 ANNUAL MEANS AND STANDARD DEVIATIONS

	HEIGHT (METERS)	MEAN WS	MEAN WD	POWER WATTS/M**2
SITE DATA (A)	45.7	6.7	93.8	244.1
(C)	9.1	5.9	94.0	178.5

 1.3 MAXIMUM WIND SPEED

ELEVATION (METERS)	WIND SPEED	WIND DIR.	DATE	TIME	OTHER LEVELS
(A) 45.7	17.4	-999.9	08/04/80	18:00	(B)-999.9 (C) 15.7
(C) 9.1	15.8	81.1	08/04/80	14:00	(A) 16.9 (B)-999.9

 NOTES:

1. SITE ELEVATION: 80 METERS ABOVE SEA LEVEL.
3. SENSOR LEVEL B NOT AVAILABLE AT SITE PR.

SITE ID: PR
 SITE LOCATION: CULEBRA, PR.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.4 WIND SPEED AND DIRECTION VERSUS TIME-OF-DAY

TIME OF DAY	LEVEL A		LEVEL B		LEVEL C	
	WS	WD	WS	WD	WS	WD
00:00	6.5	91.6	0.0	0.0	5.6	94.3
01:00	6.5	90.7	0.0	0.0	5.6	94.5
02:00	6.5	91.2	0.0	0.0	5.6	94.9
03:00	6.4	92.1	0.0	0.0	5.5	95.4
04:00	6.5	92.3	0.0	0.0	5.5	94.9
05:00	6.6	93.2	0.0	0.0	5.6	94.7
06:00	6.6	92.1	0.0	0.0	5.6	94.4
07:00	6.5	89.6	0.0	0.0	5.8	91.6
08:00	6.7	89.1	0.0	0.0	6.2	89.6
09:00	7.1	92.2	0.0	0.0	6.5	90.4
10:00	7.2	94.9	0.0	0.0	6.6	91.9
11:00	7.2	97.2	0.0	0.0	6.6	93.1
12:00	7.2	98.5	0.0	0.0	6.5	94.4
13:00	7.1	98.4	0.0	0.0	6.4	94.9
14:00	7.0	98.4	0.0	0.0	6.4	94.0
15:00	6.9	98.9	0.0	0.0	6.2	93.7
16:00	6.8	99.0	0.0	0.0	6.1	94.1
17:00	6.5	98.3	0.0	0.0	5.8	96.4
18:00	6.7	96.5	0.0	0.0	5.7	96.4
19:00	6.8	94.8	0.0	0.0	5.8	95.8
20:00	6.8	92.3	0.0	0.0	5.8	94.4
21:00	6.7	90.9	0.0	0.0	5.8	93.9
22:00	6.6	90.9	0.0	0.0	5.7	93.8
23:00	6.5	91.6	0.0	0.0	5.6	94.0

SITE ID: PR
 SITE LOCATION: CULEBRA, PR.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.5 FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A COUNT	LEVEL B % COUNT	LEVEL C % COUNT	%
0.0- 0.5	3	0.0	0	0.0
0.5- 1.0	8	0.1	0	0.0
1.0- 1.5	17	0.2	0	0.0
1.5- 2.0	34	0.4	0	0.0
2.0- 2.5	53	0.7	0	0.0
2.5- 3.0	82	1.0	0	0.0
3.0- 3.5	139	1.7	0	0.0
3.5- 4.0	226	2.8	0	0.0
4.0- 4.5	418	5.2	0	0.0
4.5- 5.0	579	7.2	0	0.0
5.0- 5.5	656	8.2	0	0.0
5.5- 6.0	816	10.2	0	0.0
6.0- 6.5	896	11.2	0	0.0
6.5- 7.0	917	11.5	0	0.0
7.0- 7.5	738	9.2	0	0.0
7.5- 8.0	604	7.5	0	0.0
8.0- 8.5	475	5.9	0	0.0
8.5- 9.0	274	3.4	0	0.0
9.0- 9.5	265	3.3	0	0.0
9.5-10.0	178	2.2	0	0.0
10.0-11.0	280	3.5	0	0.0
11.0-12.0	184	2.3	0	0.0
12.0-13.0	81	1.0	0	0.0
13.0-14.0	47	0.6	0	0.0
14.0-15.0	20	0.2	0	0.0
15.0-16.0	9	0.1	0	0.0
16.0-17.0	2	0.0	0	0.0
17.0-18.0	1	0.0	0	0.0
18.0-19.0	0	0.0	0	0.0
19.0-20.0	0	0.0	0	0.0
20.0-21.0	0	0.0	0	0.0
>21.0	0	0.0	0	0.0

RECOVERY RATES
 LEVEL A LEVEL B LEVEL C
 91.1 0.0 90.8

SITE ID: PR
 SITE LOCATION: CULEBRA, PR.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

1.6 CUMULATIVE FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A		LEVEL B		LEVEL C	
	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)
0.5	3	0.04	0	0.00	6	0.08
1.0	11	0.14	0	0.00	22	0.28
1.5	28	0.35	0	0.00	52	0.65
2.0	62	0.77	0	0.00	138	1.73
2.5	115	1.44	0	0.00	333	4.17
3.0	197	2.46	0	0.00	619	7.76
3.5	336	4.20	0	0.00	1003	12.57
4.0	562	7.02	0	0.00	1482	18.57
4.5	980	12.25	0	0.00	2006	25.14
5.0	1559	19.48	0	0.00	2692	33.74
5.5	2215	27.68	0	0.00	3485	43.68
6.0	3031	37.88	0	0.00	4271	53.53
6.5	3927	49.08	0	0.00	5076	63.62
7.0	4844	60.53	0	0.00	5802	72.72
7.5	5582	69.76	0	0.00	6314	79.13
8.0	6186	77.31	0	0.00	6758	84.70
8.5	6661	83.24	0	0.00	7073	88.65
9.0	6935	86.67	0	0.00	7306	91.57
9.5	7200	89.98	0	0.00	7497	93.96
10.0	7378	92.20	0	0.00	7637	95.71
11.0	7658	95.70	0	0.00	7847	98.35
12.0	7842	98.00	0	0.00	7918	99.24
13.0	7923	99.01	0	0.00	7954	99.69
14.0	7970	99.60	0	0.00	7971	99.90
15.0	7990	99.85	0	0.00	7975	99.95
16.0	7999	99.96	0	0.00	7979	100.00
17.0	8001	99.99	0	0.00	7979	100.00
18.0	8002	100.00	0	0.00	7979	100.00
19.0	8002	100.00	0	0.00	7979	100.00
20.0	8002	100.00	0	0.00	7979	100.00
21.0	8002	100.00	0	0.00	7979	100.00
>21.0	8002	100.00	0	0.00	7979	100.00

SITE ID: PR
 SITE LOCATION: CULEBRA, PR.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.7 WIND SPEED PERSISTENCE FREQUENCY (LEVEL A)

HOURS	NUMBER OF OCCURENCES								

	WIND SPEED CLASS, METERS/SEC								
	< 3	3-4	4-5	5-6	6-7	7-12	12-20	> 20	

1	32	115	227	380	453	193	16	0	
2	16	44	80	139	221	103	11	0	
3	2	19	58	82	99	56	3	0	
4	4	10	30	46	56	41	3	0	
5	3	6	16	25	30	26	4	0	
6	1	2	17	18	20	27	0	0	
7	1	4	11	10	6	16	0	0	
8	2	0	1	3	4	22	1	0	
9	0	0	2	3	0	14	0	0	
10	0	0	2	3	2	15	1	0	
11	1	0	1	0	1	6	0	0	
12	1	0	0	0	0	10	0	0	
13	0	0	0	0	2	5	1	0	
14	0	0	0	0	0	4	0	0	
15	0	0	0	0	0	5	2	0	
16	0	0	0	0	0	9	0	0	
17	0	0	0	0	0	5	0	0	
18	1	0	0	0	0	6	0	0	
19	0	0	0	0	0	8	0	0	
20	1	0	0	0	0	3	1	0	
21	0	0	0	0	0	1	0	0	
22	0	0	0	0	0	2	0	0	
23	0	0	0	0	0	1	0	0	
>23	0	0	0	0	1	13	0	0	

SITE ID: PR
 SITE LOCATION: CULEBRA, PR.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.8 POWER LAW EXPONENT AND W/D DISTRIBUTION

WIND DIR (ELEV A)	ALPHA (A,B)	ALPHA (B,C)	ALPHA (A,C)	ALPHA (A,B,C)	%A	%B	%C
N	0.00	0.00	0.17	0.00	0.56	0.00	0.38
NNE	0.00	0.00	0.18	0.00	2.14	0.00	0.53
NE	0.00	0.00	0.14	0.00	4.84	0.00	1.91
ENE	0.00	0.00	0.01	0.00	18.48	0.00	19.69
E	0.00	0.00	0.03	0.00	27.81	0.00	49.17
ESE	0.00	0.00	0.16	0.00	15.00	0.00	16.58
SE	0.00	0.00	0.22	0.00	6.74	0.00	4.59
SSE	0.00	0.00	0.32	0.00	3.99	0.00	2.26
S	0.00	0.00	0.33	0.00	2.54	0.00	2.43
SSW	0.00	0.00	0.43	0.00	0.91	0.00	1.18
SW	0.00	0.00	0.30	0.00	0.31	0.00	0.49
WSW	0.00	0.00	0.29	0.00	0.12	0.00	0.09
W	0.00	0.00	0.20	0.00	0.06	0.00	0.05
WNW	0.00	0.00	0.07	0.00	0.07	0.00	0.06
NW	0.00	0.00	0.13	0.00	0.06	0.00	0.09
NNW	0.00	0.00	0.15	0.00	0.49	0.00	0.45

 NOTES:

$$1. \quad \frac{WS(UP)}{WS(LO)} = \frac{Z(UP)}{Z(LO)}^{\text{ALPHA}}$$

$$2. \quad \text{ALPHA} = \frac{\text{LOG}(WS(UP)/WS(LO))}{\text{LOG}(Z(UP)/Z(LO))} \quad \text{WHERE; } \begin{matrix} Z=\text{ELEVATION} \\ WS=\text{WIND SPEED} \end{matrix}$$

FIGURE 1. (PR) Wind Rose for Lowest Sensor Level

HOLYOKE, MASSACHUSETTS

SITE ID: MA
 SITE LOCATION: HOLYOKE, MA.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.1 SENSOR PERFORMANCE

TOTAL POSSIBLE SAMPLES: 8784

SENSOR	% ON-LINE	% RECOVERED
WS(A)	100.0	79.7
WD(A)	100.0	72.9
WS(C)	100.0	79.6
WD(C)	100.0	80.1

 1.2 ANNUAL MEANS AND STANDARD DEVIATIONS

	HEIGHT (METERS)	MEAN WS	MEAN WD	POWER WATTS/M**2
SITE DATA (A)	45.7	7.0	254.8	382.7
(C)	18.2	4.6	261.0	110.6

 1.3 MAXIMUM WIND SPEED

ELEVATION (METERS)	WIND SPEED	WIND DIR.	DATE	TIME	OTHER LEVELS
(A) 45.7	26.3	264.2	03/12/80	07:00	(B)-999.9
					(C) 19.0
(C) 18.2	19.0	253.2	03/12/80	07:00	(A) 26.3
					(B)-999.9

 NOTES:

1. SITE ELEVATION: 372 METERS ABOVE SEA LEVEL.
3. SENSOR LEVEL B NOT AVAILABLE AT SITE MA.

SITE ID: MA
 SITE LOCATION: HOLYOKE, MA.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.4 WIND SPEED AND DIRECTION VERSUS TIME-OF-DAY

TIME OF DAY	LEVEL A		LEVEL B		LEVEL C	
	WS	WD	WS	WD	WS	WD
00:00	7.0	256.8	0.0	0.0	4.8	263.0
01:00	7.0	258.9	0.0	0.0	4.7	266.7
02:00	7.0	263.3	0.0	0.0	4.7	270.5
03:00	6.8	266.4	0.0	0.0	4.6	274.7
04:00	6.8	268.0	0.0	0.0	4.6	275.0
05:00	6.7	264.8	0.0	0.0	4.5	272.8
06:00	6.7	269.2	0.0	0.0	4.5	279.6
07:00	6.5	274.6	0.0	0.0	4.3	283.2
08:00	6.3	276.7	0.0	0.0	4.2	281.6
09:00	6.2	269.2	0.0	0.0	4.2	280.2
10:00	6.2	265.1	0.0	0.0	4.2	275.3
11:00	6.5	264.7	0.0	0.0	4.3	266.6
12:00	6.8	248.9	0.0	0.0	4.6	256.2
13:00	7.0	237.5	0.0	0.0	4.5	245.1
14:00	7.2	234.4	0.0	0.0	4.7	239.4
15:00	7.4	237.0	0.0	0.0	4.7	242.1
16:00	7.5	242.1	0.0	0.0	4.7	241.9
17:00	7.3	244.5	0.0	0.0	4.6	246.0
18:00	7.2	242.4	0.0	0.0	4.7	243.8
19:00	7.3	243.7	0.0	0.0	4.8	244.4
20:00	7.4	243.6	0.0	0.0	4.9	248.5
21:00	7.4	244.6	0.0	0.0	5.0	250.2
22:00	7.3	247.0	0.0	0.0	5.0	253.6
23:00	7.2	253.1	0.0	0.0	4.9	258.2

SITE ID: MA
 SITE LOCATION: HOLYOKE, MA.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.5 FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A COUNT	LEVEL B % COUNT	LEVEL C % COUNT	%
0.0- 0.5	11	0.2	0	0.0
0.5- 1.0	64	0.9	0	0.0
1.0- 1.5	145	2.1	0	0.0
1.5- 2.0	209	3.0	0	0.0
2.0- 2.5	250	3.6	0	0.0
2.5- 3.0	246	3.5	0	0.0
3.0- 3.5	294	4.2	0	0.0
3.5- 4.0	320	4.6	0	0.0
4.0- 4.5	335	4.8	0	0.0
4.5- 5.0	396	5.7	0	0.0
5.0- 5.5	422	6.0	0	0.0
5.5- 6.0	414	5.9	0	0.0
6.0- 6.5	413	5.9	0	0.0
6.5- 7.0	409	5.8	0	0.0
7.0- 7.5	368	5.3	0	0.0
7.5- 8.0	353	5.0	0	0.0
8.0- 8.5	304	4.3	0	0.0
8.5- 9.0	268	3.8	0	0.0
9.0- 9.5	232	3.3	0	0.0
9.5-10.0	237	3.4	0	0.0
10.0-11.0	341	4.9	0	0.0
11.0-12.0	286	4.1	0	0.0
12.0-13.0	216	3.1	0	0.0
13.0-14.0	152	2.2	0	0.0
14.0-15.0	98	1.4	0	0.0
15.0-16.0	79	1.1	0	0.0
16.0-17.0	53	0.8	0	0.0
17.0-18.0	25	0.4	0	0.0
18.0-19.0	25	0.4	0	0.0
19.0-20.0	15	0.2	0	0.0
20.0-21.0	7	0.1	0	0.0
>21.0	10	0.1	0	0.0

RECOVERY RATES
 LEVEL A LEVEL B LEVEL C
 79.7 0.0 79.6

SITE ID: MA
 SITE LOCATION: HOLYOKE, MA.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.6 CUMULATIVE FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A		LEVEL B		LEVEL C	
	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)
0.5	11	0.16	0	0.00	18	0.26
1.0	75	1.07	0	0.00	131	1.87
1.5	220	3.14	0	0.00	414	5.92
2.0	429	6.13	0	0.00	818	11.71
2.5	679	9.70	0	0.00	1334	19.09
3.0	925	13.22	0	0.00	1912	27.36
3.5	1219	17.42	0	0.00	2506	35.86
4.0	1539	22.00	0	0.00	3199	45.78
4.5	1874	26.78	0	0.00	3813	54.56
5.0	2270	32.44	0	0.00	4369	62.52
5.5	2692	38.47	0	0.00	4865	69.62
6.0	3106	44.39	0	0.00	5294	75.76
6.5	3519	50.29	0	0.00	5639	80.70
7.0	3928	56.14	0	0.00	5913	84.62
7.5	4296	61.40	0	0.00	6165	88.22
8.0	4649	66.44	0	0.00	6354	90.93
8.5	4953	70.79	0	0.00	6515	93.23
9.0	5221	74.62	0	0.00	6628	94.85
9.5	5453	77.93	0	0.00	6717	96.12
10.0	5690	81.32	0	0.00	6782	97.05
11.0	6031	86.19	0	0.00	6877	98.41
12.0	6317	90.28	0	0.00	6936	99.26
13.0	6533	93.37	0	0.00	6966	99.69
14.0	6685	95.54	0	0.00	6979	99.87
15.0	6783	96.94	0	0.00	6983	99.93
16.0	6862	98.07	0	0.00	6985	99.96
17.0	6915	98.83	0	0.00	6986	99.97
18.0	6940	99.19	0	0.00	6987	99.99
19.0	6965	99.54	0	0.00	6987	99.99
20.0	6980	99.76	0	0.00	6988	100.00
21.0	6987	99.86	0	0.00	6988	100.00
>21.0	6997	100.00	0	0.00	6988	100.00

SITE ID: MA
 SITE LOCATION: HOLYOKE, MA.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.7 WIND SPEED PERSISTENCE FREQUENCY (LEVEL A)

HOURS	NUMBER OF OCCURENCES							
	WIND SPEED CLASS, METERS/SEC							
	< 3	3-4	4-5	5-6	6-7	7-12	12-20	> 20
1	77	252	342	370	395	169	71	5
2	37	92	106	115	116	110	30	1
3	33	24	28	43	40	77	19	0
4	24	17	7	18	13	49	8	1
5	17	3	11	3	4	50	13	0
6	18	3	0	1	0	25	5	1
7	10	1	0	2	1	26	4	0
8	13	0	0	0	0	22	8	0
9	6	0	0	0	0	12	2	0
10	1	0	1	0	0	5	4	0
11	4	0	0	0	0	11	2	0
12	5	0	0	0	0	8	2	0
13	2	0	0	0	0	7	4	0
14	0	0	0	0	0	5	0	0
15	1	0	0	0	0	4	0	0
16	0	0	0	0	0	0	1	0
17	0	0	0	0	0	1	0	0
18	0	0	0	0	0	3	0	0
19	0	0	0	0	0	3	0	0
20	0	0	0	0	0	1	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	1	0
23	0	0	0	0	0	1	0	0
>23	0	1	0	0	0	2	2	0

SITE ID: MA
 SITE LOCATION: HOLYOKE, MA.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.8 POWER LAW EXPONENT AND W/D DISTRIBUTION

WIND DIR (ELEV A)	ALPHA (A,B)	ALPHA (B,C)	ALPHA (A,C)	ALPHA (A,B,C)	%A	%B	%C
N	0.00	0.00	0.38	0.00	3.66	0.00	5.77
NNE	0.00	0.00	0.43	0.00	3.02	0.00	3.09
NE	0.00	0.00	0.42	0.00	2.62	0.00	2.46
ENE	0.00	0.00	0.17	0.00	2.83	0.00	2.93
E	0.00	0.00	0.18	0.00	2.44	0.00	2.93
ESE	0.00	0.00	0.25	0.00	2.87	0.00	3.56
SE	0.00	0.00	0.20	0.00	5.17	0.00	5.57
SSE	0.00	0.00	0.36	0.00	7.59	0.00	7.17
S	0.00	0.00	0.40	0.00	6.37	0.00	5.78
SSW	0.00	0.00	0.41	0.00	4.67	0.00	4.89
SW	0.00	0.00	0.43	0.00	4.89	0.00	5.77
WSW	0.00	0.00	0.31	0.00	7.25	0.00	8.93
W	0.00	0.00	0.51	0.00	17.94	0.00	19.45
WNW	0.00	0.00	0.58	0.00	10.03	0.00	10.69
NW	0.00	0.00	0.59	0.00	3.89	0.00	4.45
NNW	0.00	0.00	0.61	0.00	5.53	0.00	6.27

 NOTES:

$$1. \quad \frac{WS(UP)}{WS(LO)} = \frac{Z(UP)}{Z(LO)}^{\text{ALPHA}}$$

$$2. \quad \text{ALPHA} = \frac{\text{LOG}(WS(UP)/WS(LO))}{\text{LOG}(Z(UP)/Z(LO))}$$

WHERE; Z=ELEVATION
 WS=WIND SPEED

COUNT OF WIND SPEED VS. DIRECTION
 EACH LINE OF CHARACTERS REPRESENTS 40 OBSERVATIONS
 SPEED INCREASES WITH DISTANCE FROM CENTER OF CIRCLES
 ASSOCIATED RANGES IN MPS ARE 0 -4 4 -10 10 -20 20 -

FIGURE 1. (MA) Wind Rose for Lowest Sensor Level

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HURON, SOUTH DAKOTA

SITE ID: SD
 SITE LOCATION: HURON, SD.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.1 SENSOR PERFORMANCE

TOTAL POSSIBLE SAMPLES: 8784

SENSOR	% ON-LINE	% RECOVERED
WS(A)	100.0	85.3
WD(A)	100.0	80.1
WS(C)	100.0	77.0
WD(C)	100.0	85.2

 1.2 ANNUAL MEANS AND STANDARD DEVIATIONS

	HEIGHT (METERS)	MEAN WS	MEAN WD	POWER WATTS/M**2
SITE DATA (A)	45.7	6.5	26.9	297.1
(C)	9.1	4.6	48.9	124.0

 1.3 MAXIMUM WIND SPEED

ELEVATION (METERS)	WIND SPEED	WIND DIR.	DATE	TIME	OTHER LEVELS
(A) 45.7	24.6	176.4	10/16/80	17:00	(B)-999.9
					(C) 20.6
(C) 9.1	20.6	178.9	10/16/80	17:00	(A) 24.6
					(B)-999.9

 NOTES:

1. SITE ELEVATION: 396 METERS ABOVE SEA LEVEL.
3. SENSOR LEVEL B NOT AVAILABLE AT SITE SD.

SITE ID: SD
 SITE LOCATION: HURON, SD.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.4 WIND SPEED AND DIRECTION VERSUS TIME-OF-DAY

TIME OF DAY	LEVEL A		LEVEL B		LEVEL C	
	WS	WD	WS	WD	WS	WD
00:00	6.8	92.9	0.0	0.0	4.2	79.4
01:00	6.7	83.7	0.0	0.0	4.1	81.9
02:00	6.7	88.3	0.0	0.0	4.1	80.2
03:00	6.5	98.5	0.0	0.0	4.0	81.5
04:00	6.4	115.1	0.0	0.0	3.9	80.6
05:00	6.4	2.0	0.0	0.0	3.9	84.7
06:00	6.2	43.7	0.0	0.0	3.9	88.4
07:00	5.9	18.1	0.0	0.0	3.9	79.9
08:00	6.1	19.9	0.0	0.0	4.5	54.6
09:00	6.3	150.6	0.0	0.0	5.0	121.9
10:00	6.4	268.5	0.0	0.0	5.2	261.1
11:00	6.6	299.1	0.0	0.0	5.4	285.2
12:00	6.6	304.7	0.0	0.0	5.5	288.7
13:00	6.7	303.1	0.0	0.0	5.5	288.0
14:00	6.7	314.8	0.0	0.0	5.5	309.1
15:00	6.8	326.3	0.0	0.0	5.6	324.8
16:00	6.6	333.3	0.0	0.0	5.2	338.2
17:00	6.6	358.2	0.0	0.0	4.9	5.4
18:00	6.4	31.7	0.0	0.0	4.7	38.5
19:00	6.5	50.5	0.0	0.0	4.5	59.0
20:00	6.7	57.1	0.0	0.0	4.3	66.8
21:00	6.8	72.0	0.0	0.0	4.2	72.0
22:00	6.8	77.9	0.0	0.0	4.2	73.6
23:00	6.7	85.5	0.0	0.0	4.2	80.6

SITE ID: SD
 SITE LOCATION: HURON, SD.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

1.5 FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A COUNT	LEVEL B % COUNT	LEVEL C % COUNT	%
0.0- 0.5	14	0.2	0	0.0
0.5- 1.0	85	1.1	0	0.0
1.0- 1.5	152	2.0	0	0.0
1.5- 2.0	212	2.8	0	0.0
2.0- 2.5	284	3.8	0	0.0
2.5- 3.0	338	4.5	0	0.0
3.0- 3.5	333	4.4	0	0.0
3.5- 4.0	372	5.0	0	0.0
4.0- 4.5	403	5.4	0	0.0
4.5- 5.0	445	5.9	0	0.0
5.0- 5.5	480	6.4	0	0.0
5.5- 6.0	474	6.3	0	0.0
6.0- 6.5	415	5.5	0	0.0
6.5- 7.0	407	5.4	0	0.0
7.0- 7.5	389	5.2	0	0.0
7.5- 8.0	386	5.1	0	0.0
8.0- 8.5	374	5.0	0	0.0
8.5- 9.0	322	4.3	0	0.0
9.0- 9.5	296	3.9	0	0.0
9.5-10.0	228	3.0	0	0.0
10.0-11.0	405	5.4	0	0.0
11.0-12.0	280	3.7	0	0.0
12.0-13.0	172	2.3	0	0.0
13.0-14.0	84	1.1	0	0.0
14.0-15.0	48	0.6	0	0.0
15.0-16.0	36	0.5	0	0.0
16.0-17.0	19	0.3	0	0.0
17.0-18.0	17	0.2	0	0.0
18.0-19.0	16	0.2	0	0.0
19.0-20.0	5	0.1	0	0.0
20.0-21.0	2	0.0	0	0.0
>21.0	4	0.1	0	0.0

RECOVERY RATES
 LEVEL A LEVEL B LEVEL C
 85.3 0.0 77.0

SITE ID: SD
 SITE LOCATION: HURON, SD.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.6 CUMULATIVE FREQUENCY DISTRIBUTION OF WIND SPEED

	LEVEL A		LEVEL B		LEVEL C	
WIND SPEED	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)
0.5	14	0.19	0	0.00	22	0.33
1.0	99	1.32	0	0.00	191	2.82
1.5	251	3.35	0	0.00	544	8.04
2.0	463	6.18	0	0.00	1059	15.65
2.5	747	9.96	0	0.00	1609	23.78
3.0	1085	14.47	0	0.00	2159	31.90
3.5	1418	18.91	0	0.00	2657	39.26
4.0	1790	23.88	0	0.00	3192	47.17
4.5	2193	29.25	0	0.00	3716	54.91
5.0	2638	35.19	0	0.00	4234	62.57
5.5	3118	41.59	0	0.00	4624	68.33
6.0	3592	47.91	0	0.00	4980	73.59
6.5	4007	53.45	0	0.00	5271	77.89
7.0	4414	58.88	0	0.00	5511	81.44
7.5	4803	64.07	0	0.00	5782	85.44
8.0	5189	69.21	0	0.00	6008	88.78
8.5	5563	74.20	0	0.00	6198	91.59
9.0	5885	78.50	0	0.00	6352	93.87
9.5	6181	82.45	0	0.00	6452	95.35
10.0	6409	85.49	0	0.00	6533	96.54
11.0	6814	90.89	0	0.00	6633	98.02
12.0	7094	94.62	0	0.00	6687	98.82
13.0	7266	96.92	0	0.00	6717	99.26
14.0	7350	98.04	0	0.00	6740	99.60
15.0	7398	98.68	0	0.00	6751	99.76
16.0	7434	99.16	0	0.00	6760	99.90
17.0	7453	99.41	0	0.00	6762	99.93
18.0	7470	99.64	0	0.00	6765	99.97
19.0	7486	99.85	0	0.00	6765	99.97
20.0	7491	99.92	0	0.00	6765	99.97
21.0	7493	99.95	0	0.00	6767	100.00
>21.0	7497	100.00	0	0.00	6767	100.00

SITE ID: SD
 SITE LOCATION: HURON, SD.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.7 WIND SPEED PERSISTENCE FREQUENCY (LEVEL A)

HOURS	NUMBER OF OCCURENCES							
	WIND SPEED CLASS, METERS/SEC							
	< 3	3-4	4-5	5-6	6-7	7-12	12-20	> 20
1	80	319	401	386	412	128	44	1
2	68	108	105	132	101	98	28	1
3	36	33	38	42	23	80	16	1
4	35	9	17	19	17	46	9	0
5	14	5	4	9	4	39	9	0
6	16	0	3	2	3	22	3	0
7	14	1	0	3	1	19	4	0
8	6	0	1	3	0	27	4	0
9	9	1	1	0	0	9	1	0
10	2	0	0	0	3	21	2	0
11	9	0	0	0	0	8	2	0
12	0	0	0	0	0	9	2	0
13	3	0	0	0	0	7	1	0
14	2	0	0	0	0	10	0	0
15	0	0	0	0	0	4	0	0
16	0	0	0	0	0	2	0	0
17	0	0	0	0	0	2	0	0
18	0	0	0	0	0	6	0	0
19	1	0	0	0	0	1	0	0
20	0	0	0	0	0	3	0	0
21	0	0	0	0	0	2	0	0
22	0	0	0	0	0	1	0	0
23	0	0	0	0	0	2	0	0
>23	1	0	0	0	0	4	0	0

SITE ID: SD
 SITE LOCATION: HURON, SD.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.8 POWER LAW EXPONENT AND W/D DISTRIBUTION

WIND DIR (ELEV A)	ALPHA (A,B)	ALPHA (B,C)	ALPHA (A,C)	ALPHA (A,B,C)	%A	%B	%C
N	0.00	0.00	0.30	0.00	6.32	0.00	5.85
NNE	0.00	0.00	0.20	0.00	4.44	0.00	3.90
NE	0.00	0.00	0.25	0.00	2.91	0.00	2.60
ENE	0.00	0.00	0.27	0.00	3.04	0.00	3.15
E	0.00	0.00	0.21	0.00	5.14	0.00	5.19
ESE	0.00	0.00	0.25	0.00	7.72	0.00	8.28
SE	0.00	0.00	0.25	0.00	10.28	0.00	13.20
SSE	0.00	0.00	0.20	0.00	9.51	0.00	11.29
S	0.00	0.00	0.13	0.00	5.07	0.00	4.76
SSW	0.00	0.00	0.20	0.00	2.20	0.00	1.89
SW	0.00	0.00	0.20	0.00	1.87	0.00	2.25
WSW	0.00	0.00	0.38	0.00	3.00	0.00	3.12
W	0.00	0.00	0.26	0.00	5.20	0.00	5.01
WNW	0.00	0.00	0.17	0.00	7.90	0.00	8.25
NW	0.00	0.00	0.20	0.00	9.70	0.00	10.89
NNW	0.00	0.00	0.18	0.00	9.52	0.00	10.06

 NOTES:

$$1. \quad \frac{WS(UP)}{WS(LO)} = \frac{Z(UP)}{Z(LO)}^{\text{ALPHA}}$$

$$2. \quad \text{ALPHA} = \frac{\text{LOG}(WS(UP)/WS(LO))}{\text{LOG}(Z(UP)/Z(LO))}$$

WHERE; Z=ELEVATION
 WS=WIND SPEED

COUNT OF WIND SPEED VS. DIRECTION
 EACH LINE OF CHARACTERS REPRESENTS 40 OBSERVATIONS
 SPEED INCREASES WITH DISTANCE FROM CENTER OF CIRCLES
 ASSOCIATED RANGES IN MPS ARE 0 -4 4 -10 10 -20 20 -

FIGURE 1. (SD) Wind Rose for Lowest Sensor Level

KINGSLEY DAM, NEBRASKA

SITE ID: NB
 SITE LOCATION: KINGSLEY DAM, NB.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.1 SENSOR PERFORMANCE

TOTAL POSSIBLE SAMPLES: 8784

SENSOR	% ON-LINE	% RECOVERED
WS(A)	100.0	97.8
WD(A)	100.0	98.4
WS(C)	100.0	98.1
WD(C)	100.0	97.9

 1.2 ANNUAL MEANS AND STANDARD DEVIATIONS

	HEIGHT (METERS)	MEAN WS	MEAN WD	POWER WATTS/M**2
SITE DATA (A)	45.7	6.3	249.4	257.3
(C)	9.1	4.7	254.2	108.6

 1.3 MAXIMUM WIND SPEED

ELEVATION (METERS)	WIND SPEED	WIND DIR.	DATE	TIME	OTHER LEVELS
(A) 45.7	27.2	319.4	01/06/80	12:00	(B)-999.9 (C) 21.6
(C) 9.1	21.6	323.9	01/06/80	12:00	(A) 27.2 (B)-999.9

 NOTES:

1. SITE ELEVATION: 1024 METERS ABOVE SEA LEVEL.
3. SENSOR LEVEL B NOT AVAILABLE AT SITE NB.

SITE ID: NR
 SITE LOCATION: KINGSLEY DAM, NB.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.4 WIND SPEED AND DIRECTION VERSUS TIME-OF-DAY

TIME OF DAY	LEVEL A		LEVEL B		LEVEL C	
	WS	WD	WS	WD	WS	WD
00:00	6.7	186.7	0.0	0.0	4.6	196.1
01:00	6.6	228.7	0.0	0.0	4.5	233.4
02:00	6.4	243.6	0.0	0.0	4.4	246.7
03:00	6.2	250.2	0.0	0.0	4.3	248.5
04:00	6.0	260.4	0.0	0.0	4.1	259.5
05:00	5.9	264.1	0.0	0.0	4.1	267.4
06:00	5.8	266.1	0.0	0.0	4.1	265.4
07:00	5.8	261.8	0.0	0.0	4.4	271.7
08:00	5.8	263.9	0.0	0.0	4.7	277.6
09:00	5.8	264.3	0.0	0.0	4.8	282.3
10:00	5.8	270.8	0.0	0.0	4.9	288.7
11:00	6.2	275.5	0.0	0.0	5.1	286.4
12:00	6.3	267.7	0.0	0.0	5.2	282.4
13:00	6.3	272.3	0.0	0.0	5.2	283.6
14:00	6.4	275.6	0.0	0.0	5.2	288.8
15:00	6.4	266.1	0.0	0.0	5.1	281.9
16:00	6.4	280.6	0.0	0.0	5.0	283.0
17:00	6.4	91.5	0.0	0.0	4.8	114.5
18:00	6.5	112.1	0.0	0.0	4.7	127.2
19:00	6.7	109.6	0.0	0.0	4.6	127.8
20:00	6.9	111.1	0.0	0.0	4.7	127.5
21:00	7.0	114.9	0.0	0.0	4.7	134.2
22:00	6.9	117.5	0.0	0.0	4.7	139.7
23:00	6.9	142.1	0.0	0.0	4.7	167.2

SITE ID: NB
 SITE LOCATION: KINGSLEY DAM, NB.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.5 FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A COUNT	LEVEL B % COUNT	LEVEL C % COUNT	%
0.0- 0.5	13	0.2	0	0.5
0.5- 1.0	81	0.9	0	1.8
1.0- 1.5	167	1.9	0	4.1
1.5- 2.0	260	3.0	0	5.9
2.0- 2.5	363	4.2	0	6.9
2.5- 3.0	371	4.3	0	8.2
3.0- 3.5	425	4.9	0	8.4
3.5- 4.0	464	5.4	0	8.1
4.0- 4.5	500	5.8	0	8.3
4.5- 5.0	589	6.9	0	7.6
5.0- 5.5	573	6.7	0	7.3
5.5- 6.0	565	6.6	0	5.8
6.0- 6.5	547	6.4	0	5.2
6.5- 7.0	483	5.6	0	4.7
7.0- 7.5	433	5.0	0	3.6
7.5- 8.0	404	4.7	0	3.3
8.0- 8.5	352	4.1	0	3.0
8.5- 9.0	334	3.9	0	2.2
9.0- 9.5	256	3.0	0	1.5
9.5-10.0	265	3.1	0	1.1
10.0-11.0	406	4.7	0	1.4
11.0-12.0	288	3.4	0	0.6
12.0-13.0	211	2.5	0	0.3
13.0-14.0	115	1.3	0	0.1
14.0-15.0	52	0.6	0	0.0
15.0-16.0	36	0.4	0	0.0
16.0-17.0	15	0.2	0	0.0
17.0-18.0	8	0.1	0	0.0
18.0-19.0	4	0.0	0	0.0
19.0-20.0	4	0.0	0	0.0
20.0-21.0	2	0.0	0	0.0
>21.0	7	0.1	0	0.0

RECOVERY RATES

LEVEL A	LEVEL B	LEVEL C
97.8	0.0	98.1

SITE ID: NB
 SITE LOCATION: KINGSLEY DAM, NB.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.6 CUMULATIVE FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A		LEVEL B		LEVEL C	
	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)
0.5	13	0.15	0	0.00	44	0.51
1.0	94	1.09	0	0.00	196	2.27
1.5	261	3.04	0	0.00	551	6.39
2.0	521	6.06	0	0.00	1056	12.25
2.5	884	10.29	0	0.00	1651	19.16
3.0	1255	14.60	0	0.00	2360	27.39
3.5	1680	19.55	0	0.00	3086	35.81
4.0	2144	24.95	0	0.00	3787	43.95
4.5	2644	30.77	0	0.00	4499	52.21
5.0	3233	37.62	0	0.00	5158	59.86
5.5	3806	44.29	0	0.00	5787	67.16
6.0	4371	50.87	0	0.00	6285	72.94
6.5	4918	57.23	0	0.00	6731	78.11
7.0	5401	62.85	0	0.00	7134	82.79
7.5	5834	67.89	0	0.00	7444	86.39
8.0	6238	72.59	0	0.00	7731	89.72
8.5	6590	76.69	0	0.00	7988	92.70
9.0	6924	80.58	0	0.00	8180	94.93
9.5	7180	83.56	0	0.00	8305	96.38
10.0	7445	86.64	0	0.00	8397	97.45
11.0	7851	91.37	0	0.00	8520	98.87
12.0	8139	94.72	0	0.00	8569	99.44
13.0	8350	97.17	0	0.00	8597	99.77
14.0	8465	98.51	0	0.00	8605	99.86
15.0	8517	99.12	0	0.00	8606	99.87
16.0	8553	99.53	0	0.00	8610	99.92
17.0	8568	99.71	0	0.00	8611	99.93
18.0	8576	99.80	0	0.00	8611	99.93
19.0	8580	99.85	0	0.00	8613	99.95
20.0	8584	99.90	0	0.00	8615	99.98
21.0	8586	99.92	0	0.00	8615	99.98
>21.0	8593	100.00	0	0.00	8617	100.00

SITE ID: NB
 SITE LOCATION: KINGSLEY DAM, NB.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.7 WIND SPEED PERSISTENCE FREQUENCY (LEVEL A)

HOURS	NUMBER OF OCCURENCES							

	WIND SPEED CLASS, METERS/SEC							
	< 3	3-4	4-5	5-6	6-7	7-12	12-20	> 20

1	139	383	459	493	482	210	64	0
2	71	122	163	179	146	116	38	1
3	55	48	61	46	44	77	26	1
4	30	8	15	19	14	64	8	1
5	22	9	7	8	9	43	12	0
6	20	5	3	3	3	30	9	0
7	14	2	0	2	0	27	1	0
8	7	0	1	0	1	24	4	0
9	8	0	0	0	0	13	0	0
10	3	0	0	0	0	13	0	0
11	3	0	0	0	0	7	1	0
12	2	0	0	0	0	4	1	0
13	1	0	0	0	0	9	0	0
14	0	0	0	0	0	5	0	0
15	3	0	0	0	0	3	0	0
16	1	0	0	0	0	4	0	0
17	0	0	0	0	0	2	0	0
18	0	0	0	0	0	0	0	0
19	1	0	0	0	0	2	1	0
20	0	0	0	0	0	2	0	0
21	0	0	0	0	0	3	0	0
22	0	0	0	0	0	2	0	0
23	0	0	0	0	0	1	0	0
>23	2	0	0	1	0	4	0	0

SITE ID: NB
 SITE LOCATION: KINGSLEY DAM, NB.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.8 POWER LAW EXPONENT AND W/D DISTRIBUTION

WIND DIR (ELEV A)	ALPHA (A,B)	ALPHA (B,C)	ALPHA (A,C)	ALPHA (A,B,C)	%A	%B	%C
N	0.00	0.00	0.19	0.00	5.05	0.00	4.89
NNE	0.00	0.00	0.14	0.00	5.20	0.00	5.64
NE	0.00	0.00	0.13	0.00	4.76	0.00	5.34
ENE	0.00	0.00	0.17	0.00	5.62	0.00	5.98
E	0.00	0.00	0.19	0.00	4.89	0.00	5.48
ESE	0.00	0.00	0.25	0.00	5.23	0.00	4.71
SE	0.00	0.00	0.27	0.00	7.35	0.00	5.83
SSE	0.00	0.00	0.18	0.00	8.84	0.00	8.09
S	0.00	0.00	0.14	0.00	6.14	0.00	7.17
SSW	0.00	0.00	0.15	0.00	3.81	0.00	4.49
SW	0.00	0.00	0.17	0.00	3.97	0.00	4.78
WSW	0.00	0.00	0.22	0.00	7.98	0.00	6.21
W	0.00	0.00	0.19	0.00	9.88	0.00	10.22
WNW	0.00	0.00	0.18	0.00	10.22	0.00	10.75
NW	0.00	0.00	0.19	0.00	5.73	0.00	5.77
NNW	0.00	0.00	0.19	0.00	5.14	0.00	4.28

 NOTES:

$$1. \quad \frac{WS(UP)}{WS(LO)} = \frac{Z(UP)^{ALPHA}}{Z(LO)^{ALPHA}}$$

$$2. \quad ALPHA = \frac{\log(WS(UP)/WS(LO))}{\log(Z(UP)/Z(LO))} \quad \text{WHERE; } Z=\text{ELEVATION} \\ \text{WS}=\text{WIND SPEED}$$

COUNT OF WIND SPEED VS. DIRECTION
 EACH LINE OF CHARACTERS REPRESENTS 40 OBSERVATIONS
 SPEED INCREASES WITH DISTANCE FROM CENTER OF CIRCLES
 ASSOCIATED RANGES IN MPS ARE 0 -4 4 -10 10 -20 20 -

FIGURE 1. (NB) Wind Rose for Lowest Sensor Level

MONTAUK POINT, NEW YORK

SITE ID: NY
 SITE LOCATION: MONTAUK POINT, NY.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.1 SENSOR PERFORMANCE

TOTAL POSSIBLE SAMPLES: 8784

SENSOR	% ON-LINE	% RECOVERED
WS(A)	100.0	62.1
WD(A)	100.0	62.1
WS(C)	100.0	62.0
WD(C)	100.0	62.1

 1.2 ANNUAL MEANS AND STANDARD DEVIATIONS

	HEIGHT (METERS)	MEAN WS	MEAN WD	POWER WATTS/M**2
SITE DATA (A)	45.7	7.2	281.6	425.8
(C)	18.2	6.2	287.2	296.8

 1.3 MAXIMUM WIND SPEED

ELEVATION (METERS)	WIND SPEED	WIND DIR.	DATE	TIME	OTHER LEVELS
(A) 45.7	20.7	285.3	03/12/80	01:00	(B)-999.9
					(C) 18.7
(C) 18.2	19.1	285.7	01/24/80	07:00	(A) 20.3
					(B)-999.9

 NOTES:

1. SITE ELEVATION: 2 METERS ABOVE SEA LEVEL.
2. SENSOR LEVEL B NOT AVAILABLE AT SITE NY.
3. SEE NOTE 2 ON PAGE 4.

SITE ID: NY
SITE LOCATION: MONTAUK POINT, NY.
DATA : JANUARY 1980 THROUGH DECEMBER 1980

1.4 WIND SPEED AND DIRECTION VERSUS TIME-OF-DAY

TIME OF DAY	LEVEL A		LEVEL B		LEVEL C	
	WS	WD	WS	WD	WS	WD
00:00	7.2	292.3	0.0	0.0	6.0	296.3
01:00	7.1	295.4	0.0	0.0	6.0	304.8
02:00	7.0	294.7	0.0	0.0	5.9	304.9
03:00	7.1	299.0	0.0	0.0	5.9	307.7
04:00	7.1	300.2	0.0	0.0	5.9	309.8
05:00	7.1	299.4	0.0	0.0	6.0	310.2
06:00	7.1	300.6	0.0	0.0	6.0	311.2
07:00	7.1	303.8	0.0	0.0	6.1	311.6
08:00	7.0	305.1	0.0	0.0	6.2	310.9
09:00	7.0	303.4	0.0	0.0	6.2	308.4
10:00	7.0	300.8	0.0	0.0	6.2	307.2
11:00	6.9	291.8	0.0	0.0	6.2	300.9
12:00	7.0	277.0	0.0	0.0	6.3	282.6
13:00	7.2	265.2	0.0	0.0	6.5	271.4
14:00	7.3	259.9	0.0	0.0	6.6	265.1
15:00	7.4	254.2	0.0	0.0	6.6	258.1
16:00	7.5	252.2	0.0	0.0	6.6	256.4
17:00	7.5	249.7	0.0	0.0	6.5	253.8
18:00	7.6	253.9	0.0	0.0	6.4	256.7
19:00	7.5	260.2	0.0	0.0	6.3	262.5
20:00	7.4	266.7	0.0	0.0	6.1	270.1
21:00	7.5	269.1	0.0	0.0	6.2	270.4
22:00	7.5	276.1	0.0	0.0	6.2	277.0
23:00	7.4	286.2	0.0	0.0	6.3	288.8

NOTES:

1. SEE NOTE 2 ON PAGE 4.

SITE ID: NY
 SITE LOCATION: MONTAUK POINT, NY.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.5 FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A COUNT	LEVEL B % COUNT	LEVEL C % COUNT	%
0.0- 0.5	9	0.2	0	0.0
0.5- 1.0	39	0.7	0	0.0
1.0- 1.5	101	1.9	0	0.0
1.5- 2.0	118	2.2	0	0.0
2.0- 2.5	177	3.2	0	0.0
2.5- 3.0	184	3.4	0	0.0
3.0- 3.5	194	3.6	0	0.0
3.5- 4.0	227	4.2	0	0.0
4.0- 4.5	258	4.7	0	0.0
4.5- 5.0	267	4.9	0	0.0
5.0- 5.5	273	5.0	0	0.0
5.5- 6.0	346	6.3	0	0.0
6.0- 6.5	307	5.6	0	0.0
6.5- 7.0	333	6.1	0	0.0
7.0- 7.5	330	6.0	0	0.0
7.5- 8.0	314	5.8	0	0.0
8.0- 8.5	259	4.7	0	0.0
8.5- 9.0	237	4.3	0	0.0
9.0- 9.5	193	3.5	0	0.0
9.5-10.0	183	3.4	0	0.0
10.0-11.0	300	5.5	0	0.0
11.0-12.0	224	4.1	0	0.0
12.0-13.0	151	2.8	0	0.0
13.0-14.0	128	2.3	0	0.0
14.0-15.0	99	1.8	0	0.0
15.0-16.0	80	1.5	0	0.0
16.0-17.0	58	1.1	0	0.0
17.0-18.0	35	0.6	0	0.0
18.0-19.0	22	0.4	0	0.0
19.0-20.0	5	0.1	0	0.0
20.0-21.0	5	0.1	0	0.0
>21.0	0	0.0	0	0.0

RECOVERY RATES
 LEVEL A LEVEL B LEVEL C
 62.1 0.0 62.0

NOTES:

1. SEE NOTE 2 ON PAGE 4.

NY-03

SITE ID: NY
 SITE LOCATION: MONTAUK POINT, NY.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

1.6 CUMULATIVE FREQUENCY DISTRIBUTION OF WIND SPEED

	LEVEL A		LEVEL B		LEVEL C	
WIND SPEED	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)
0.5	9	0.16	0	0.00	33	0.61
1.0	48	0.88	0	0.00	122	2.24
1.5	149	2.73	0	0.00	279	5.13
2.0	267	4.89	0	0.00	472	8.67
2.5	444	8.14	0	0.00	688	12.64
3.0	628	11.51	0	0.00	926	17.01
3.5	822	15.07	0	0.00	1213	22.29
4.0	1049	19.23	0	0.00	1520	27.93
4.5	1307	23.96	0	0.00	1822	33.47
5.0	1574	28.85	0	0.00	2168	39.83
5.5	1847	33.85	0	0.00	2536	46.59
6.0	2193	40.19	0	0.00	2903	53.33
6.5	2500	45.82	0	0.00	3249	59.69
7.0	2833	51.92	0	0.00	3559	65.39
7.5	3163	57.97	0	0.00	3827	70.31
8.0	3477	63.73	0	0.00	4065	74.68
8.5	3736	68.48	0	0.00	4282	78.67
9.0	3973	72.82	0	0.00	4474	82.20
9.5	4166	76.36	0	0.00	4619	84.86
10.0	4349	79.71	0	0.00	4730	86.90
11.0	4649	85.21	0	0.00	4914	90.28
12.0	4873	89.31	0	0.00	5055	92.87
13.0	5024	92.08	0	0.00	5174	95.06
14.0	5152	94.43	0	0.00	5264	96.71
15.0	5251	96.24	0	0.00	5335	98.02
16.0	5331	97.71	0	0.00	5397	99.15
17.0	5389	98.77	0	0.00	5421	99.60
18.0	5424	99.41	0	0.00	5436	99.87
19.0	5446	99.82	0	0.00	5442	99.98
20.0	5451	99.91	0	0.00	5443	100.00
21.0	5456	100.00	0	0.00	5443	100.00
>21.0	5456	100.00	0	0.00	5443	100.00

NOTES:

1. SEE NOTE 2 ON PAGE 4.

SITE ID: NY
 SITE LOCATION: MONTAUK POINT, NY.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.7 WIND SPEED PERSISTENCE FREQUENCY (LEVEL A)

HOURS	NUMBER OF OCCURENCES							

	WIND SPEED CLASS, METERS/SEC							
	< 3	3-4	4-5	5-6	6-7	7-12	12-20	> 20
-----	-----	-----	-----	-----	-----	-----	-----	-----
1	63	203	225	263	268	125	39	3
2	34	60	60	79	93	75	19	1
3	16	17	31	27	33	45	10	0
4	15	6	13	12	8	27	6	0
5	14	3	3	7	9	22	4	0
6	9	1	2	1	1	25	3	0
7	6	1	0	1	0	18	3	0
8	3	0	1	1	0	17	3	0
9	6	0	0	0	1	18	7	0
10	5	0	0	1	0	7	0	0
11	2	0	0	0	0	7	4	0
12	2	0	0	0	0	9	1	0
13	0	0	0	0	0	3	1	0
14	2	0	0	0	0	9	1	0
15	0	0	0	0	0	3	0	0
16	1	0	0	0	0	2	1	0
17	0	0	0	0	0	1	3	0
18	0	0	0	0	0	1	0	0
19	0	0	0	0	0	0	1	0
20	0	0	0	0	0	3	0	0
21	0	0	0	0	0	2	1	0
22	0	0	0	0	0	0	1	0
23	0	0	0	0	0	0	1	0
>23	0	0	0	1	0	7	2	0

NOTES:

1. SEE NOTE 2 ON PAGE 4.

SITE ID: NY
SITE LOCATION: MONTAUK POINT, NY.
DATA : JANUARY 1980 THROUGH DECEMBER 1980

1.8 POWER LAW EXPONENT AND W/D DISTRIBUTION

WIND DIR

(ELEV A)	ALPHA (A,B)	ALPHA (B,C)	ALPHA (A,C)	ALPHA (A,B,C)	%A	%B	%C
N	0.00	0.00	0.19	0.00	4.09	0.00	4.83
NNE	0.00	0.00	0.26	0.00	3.67	0.00	4.30
NE	0.00	0.00	0.21	0.00	3.32	0.00	3.18
ENE	0.00	0.00	0.21	0.00	3.01	0.00	3.49
E	0.00	0.00	0.22	0.00	3.57	0.00	3.42
ESE	0.00	0.00	0.28	0.00	2.82	0.00	2.54
SE	0.00	0.00	0.26	0.00	3.98	0.00	4.92
SSE	0.00	0.00	0.33	0.00	3.98	0.00	4.34
S	0.00	0.00	0.25	0.00	4.67	0.00	4.59
SSW	0.00	0.00	0.27	0.00	6.09	0.00	5.27
SW	0.00	0.00	0.17	0.00	9.20	0.00	8.01
WSW	0.00	0.00	0.14	0.00	7.51	0.00	7.73
W	0.00	0.00	0.09	0.00	9.59	0.00	8.97
WNW	0.00	0.00	0.20	0.00	10.63	0.00	10.23
NW	0.00	0.00	0.09	0.00	15.05	0.00	14.99
NNW	0.00	0.00	-0.01	0.00	8.83	0.00	9.19

NOTES:

$$1. \frac{WS(UP)}{WS(LO)} = \frac{Z(UP)}{Z(LO)} \quad \text{ALPHA}$$

$$2. \text{ ALPHA} = \frac{\text{LOG(WS(UP)/WS(L0))}}{\text{LOG(Z(UP)/Z(L0))}} \quad \text{WHERE; } \begin{array}{l} \text{Z=ELEVATION} \\ \text{WS=WIND SPEED} \end{array}$$

3. SEE NOTE 2 ON PAGE 4.

COUNT OF WIND SPEED VS. DIRECTION
 EACH LINE OF CHARACTERS REPRESENTS 40 OBSERVATIONS
 SPEED INCREASES WITH DISTANCE FROM CENTER OF CIRCLES
 ASSOCIATED RANGES IN MPS ARE 0 -4 4 -10 10 -20 20 -

FIGURE 1. (NY) Wind Rose for Lowest Sensor Level

NOTE: See note 2 on page 4.

POINT ARENA, CALIFORNIA

SITE ID: CA
 SITE LOCATION: POINT ARENA, CA.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.1 SENSOR PERFORMANCE

TOTAL POSSIBLE SAMPLES: 8784

SENSOR	% ON-LINE	% RECOVERED
WS(A)	100.0	94.3
WD(A)	100.0	76.1
WS(C)	100.0	92.0
WD(C)	100.0	91.3

 1.2 ANNUAL MEANS AND STANDARD DEVIATIONS

	HEIGHT (METERS)	MEAN WS	MEAN WD	POWER WATTS/M**2
SITE DATA (A)	45.7	6.0	338.5	264.0
(C)	9.1	3.8	354.7	80.6

 1.3 MAXIMUM WIND SPEED

ELEVATION (METERS)	WIND SPEED	WIND DIR.	DATE	TIME	OTHER LEVELS
(A) 45.7	20.0	128.9	02/17/80	11:00	(B)-999.9 (C) 14.7
(C) 9.1	17.7	130.3	02/17/80	13:00	(A)-999.9 (B)-999.9

 NOTES:

1. SITE ELEVATION: 21 METERS ABOVE SEA LEVEL.
3. SENSOR LEVEL B NOT AVAILABLE AT SITE CA.

SITE ID: CA
 SITE LOCATION: POINT ARENA, CA.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.4 WIND SPEED AND DIRECTION VERSUS TIME-OF-DAY

TIME OF DAY	LEVEL A		LEVEL B		LEVEL C	
	WS	WD	WS	WD	WS	WD
00:00	5.7	356.5	0.0	0.0	3.5	17.4
01:00	5.6	356.8	0.0	0.0	3.5	20.0
02:00	5.6	358.3	0.0	0.0	3.4	22.7
03:00	5.6	358.7	0.0	0.0	3.4	26.1
04:00	5.5	8.4	0.0	0.0	3.4	29.9
05:00	5.5	9.6	0.0	0.0	3.3	31.3
06:00	5.3	4.9	0.0	0.0	3.4	29.7
07:00	5.4	353.4	0.0	0.0	3.5	21.1
08:00	5.6	338.1	0.0	0.0	3.7	4.1
09:00	5.8	312.3	0.0	0.0	3.9	325.6
10:00	6.1	291.6	0.0	0.0	4.1	299.4
11:00	6.3	294.5	0.0	0.0	4.2	297.3
12:00	6.4	297.2	0.0	0.0	4.3	300.0
13:00	6.6	300.5	0.0	0.0	4.4	305.4
14:00	6.6	308.6	0.0	0.0	4.3	311.5
15:00	6.6	317.1	0.0	0.0	4.2	319.2
16:00	6.5	328.2	0.0	0.0	4.2	329.5
17:00	6.5	332.9	0.0	0.0	4.1	338.1
18:00	6.4	339.7	0.0	0.0	4.0	348.2
19:00	6.2	345.4	0.0	0.0	3.9	355.5
20:00	6.1	350.3	0.0	0.0	3.7	1.8
21:00	5.9	353.3	0.0	0.0	3.6	6.8
22:00	5.8	352.3	0.0	0.0	3.5	9.9
23:00	5.7	354.8	0.0	0.0	3.5	13.3

SITE ID: CA
 SITE LOCATION: POINT ARENA, CA.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.5 FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A COUNT	LEVEL B % COUNT	LEVEL C COUNT	%
0.0- 0.5	38	0.5	0	0.0
0.5- 1.0	187	2.3	0	0.0
1.0- 1.5	307	3.7	0	0.0
1.5- 2.0	387	4.7	0	0.0
2.0- 2.5	440	5.3	0	0.0
2.5- 3.0	449	5.4	0	0.0
3.0- 3.5	479	5.8	0	0.0
3.5- 4.0	475	5.7	0	0.0
4.0- 4.5	460	5.6	0	0.0
4.5- 5.0	441	5.3	0	0.0
5.0- 5.5	408	4.9	0	0.0
5.5- 6.0	392	4.7	0	0.0
6.0- 6.5	433	5.2	0	0.0
6.5- 7.0	408	4.9	0	0.0
7.0- 7.5	363	4.4	0	0.0
7.5- 8.0	355	4.3	0	0.0
8.0- 8.5	361	4.4	0	0.0
8.5- 9.0	293	3.5	0	0.0
9.0- 9.5	278	3.4	0	0.0
9.5-10.0	254	3.1	0	0.0
10.0-11.0	400	4.8	0	0.0
11.0-12.0	275	3.3	0	0.0
12.0-13.0	180	2.2	0	0.0
13.0-14.0	110	1.3	0	0.0
14.0-15.0	49	0.6	0	0.0
15.0-16.0	29	0.4	0	0.0
16.0-17.0	11	0.1	0	0.0
17.0-18.0	8	0.1	0	0.0
18.0-19.0	8	0.1	0	0.0
19.0-20.0	3	0.0	0	0.0
20.0-21.0	0	0.0	0	0.0
>21.0	0	0.0	0	0.0

RECOVERY RATES
 LEVEL A LEVEL B LEVEL C
 94.3 0.0 92.0

SITE ID: CA
 SITE LOCATION: POINT ARENA, CA.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.6 CUMULATIVE FREQUENCY DISTRIBUTION OF WIND SPEED

	LEVEL A		LEVEL B		LEVEL C	
WIND SPEED	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)
0.5	38	0.46	0	0.00	190	2.35
1.0	225	2.72	0	0.00	743	9.20
1.5	532	6.42	0	0.00	1548	19.17
2.0	919	11.10	0	0.00	2352	29.12
2.5	1359	16.41	0	0.00	3117	38.59
3.0	1808	21.83	0	0.00	3774	46.73
3.5	2287	27.62	0	0.00	4371	54.12
4.0	2762	33.35	0	0.00	4828	59.77
4.5	3222	38.91	0	0.00	5256	65.07
5.0	3663	44.23	0	0.00	5656	70.03
5.5	4071	49.16	0	0.00	6063	75.07
6.0	4463	53.89	0	0.00	6460	79.98
6.5	4896	59.12	0	0.00	6815	84.38
7.0	5304	64.05	0	0.00	7114	88.08
7.5	5667	68.43	0	0.00	7387	91.46
8.0	6022	72.72	0	0.00	7600	94.09
8.5	6383	77.08	0	0.00	7738	95.80
9.0	6676	80.62	0	0.00	7855	97.25
9.5	6954	83.98	0	0.00	7935	98.24
10.0	7208	87.04	0	0.00	7985	98.86
11.0	7608	91.87	0	0.00	8040	99.54
12.0	7883	95.19	0	0.00	8063	99.83
13.0	8063	97.37	0	0.00	8069	99.90
14.0	8173	98.70	0	0.00	8072	99.94
15.0	8222	99.29	0	0.00	8076	99.99
16.0	8251	99.64	0	0.00	8076	99.99
17.0	8262	99.77	0	0.00	8076	99.99
18.0	8270	99.87	0	0.00	8077	100.00
19.0	8278	99.96	0	0.00	8077	100.00
20.0	8281	100.00	0	0.00	8077	100.00
21.0	8281	100.00	0	0.00	8077	100.00
>21.0	8281	100.00	0	0.00	8077	100.00

SITE ID: CA
 SITE LOCATION: POINT ARENA, CA.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.7 WIND SPEED PERSISTENCE FREQUENCY (LEVEL A)

HOURS	NUMBER OF OCCURENCES							
	WIND SPEED CLASS, METERS/SEC							
	< 3	3-4	4-5	5-6	6-7	7-12	12-20	> 20
1	103	382	331	307	383	114	36	0
2	72	137	117	89	102	53	18	0
3	56	43	47	50	51	38	15	0
4	44	23	21	24	24	33	9	0
5	37	9	10	7	7	16	4	0
6	28	2	7	3	7	25	7	0
7	19	4	0	0	3	18	3	0
8	11	0	0	2	0	14	3	0
9	12	0	1	0	1	18	2	0
10	7	0	1	0	0	5	0	0
11	9	0	0	0	0	9	1	0
12	5	0	0	0	0	13	2	0
13	3	0	0	0	0	6	3	0
14	3	0	0	0	0	5	0	0
15	6	0	0	0	0	5	0	0
16	0	0	0	0	0	1	0	0
17	2	0	0	0	0	1	0	0
18	0	0	0	0	0	3	1	0
19	0	0	0	0	0	4	0	0
20	2	0	0	0	0	2	0	0
21	1	0	0	0	0	1	0	0
22	0	0	0	0	0	1	0	0
23	0	0	0	0	0	2	0	0
>23	1	0	0	0	0	15	1	0

SITE ID: CA
 SITE LOCATION: POINT ARENA, CA.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.8 POWER LAW EXPONENT AND W/D DISTRIBUTION

WIND DIR (ELEV A)	ALPHA (A,B)	ALPHA (B,C)	ALPHA (A,C)	ALPHA (A,B,C)	%A	%B	%C
N	0.00	0.00	0.19	0.00	6.28	0.00	9.17
NNE	0.00	0.00	0.29	0.00	2.75	0.00	4.44
NE	0.00	0.00	0.26	0.00	1.18	0.00	3.75
ENE	0.00	0.00	0.24	0.00	0.63	0.00	3.58
E	0.00	0.00	0.26	0.00	1.23	0.00	2.74
ESE	0.00	0.00	0.33	0.00	2.60	0.00	3.08
SE	0.00	0.00	0.22	0.00	11.05	0.00	11.44
SSE	0.00	0.00	0.25	0.00	5.10	0.00	6.15
S	0.00	0.00	0.25	0.00	2.03	0.00	1.73
SSW	0.00	0.00	0.31	0.00	1.34	0.00	1.28
SW	0.00	0.00	0.33	0.00	1.04	0.00	0.89
WSW	0.00	0.00	0.41	0.00	1.23	0.00	0.97
W	0.00	0.00	0.52	0.00	2.83	0.00	1.30
WNW	0.00	0.00	0.19	0.00	2.38	0.00	2.54
NW	0.00	0.00	0.23	0.00	11.76	0.00	15.92
NNW	0.00	0.00	0.27	0.00	27.10	0.00	27.66

 NOTES:

$$1. \quad \frac{WS(UP)}{WS(LO)} = \frac{Z(UP)}{Z(LO)}^{\text{ALPHA}}$$

$$2. \quad \text{ALPHA} = \frac{\text{LOG}(WS(UP)/WS(LO))}{\text{LOG}(Z(UP)/Z(LO))} \quad \text{WHERE; } \begin{array}{l} Z=\text{ELEVATION} \\ WS=\text{WIND SPEED} \end{array}$$

FIGURE 1. (CA) Wind Rose for Lowest Sensor Level

RUSSELL, KANSAS

SITE ID: KS
 SITE LOCATION: RUSSELL, KS.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.1 SENSOR PERFORMANCE

TOTAL POSSIBLE SAMPLES: 8784

SENSOR	% ON-LINE	% RECOVERED
WS(A)	100.0	81.6
WD(A)	100.0	79.8
WS(C)	100.0	82.0
WD(C)	100.0	80.7

 1.2 ANNUAL MEANS AND STANDARD DEVIATIONS

	HEIGHT (METERS)	MEAN WS	MEAN WD	POWER WATTS/M**2
SITE DATA (A)	45.7	6.8	180.5	335.3
(C)	9.1	5.0	187.9	142.7

 1.3 MAXIMUM WIND SPEED

ELEVATION (METERS)	WIND SPEED	WIND DIR.	DATE	TIME	OTHER LEVELS
(A) 45.7	22.8	315.1	01/11/80	01:00	(B)-999.9
					(C) 17.6
(C) 9.1	17.6	311.6	01/11/80	01:00	(A) 22.8
					(B)-999.9

 NOTES:

1. SITE ELEVATION: 564 METERS ABOVE SEA LEVEL.
2. SENSOR LEVEL B NOT AVAILABLE AT SITE KS.
3. SEE NOTE 3 ON PAGE 4.

SITE ID: KS
 SITE LOCATION: RUSSELL, KS.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.4 WIND SPEED AND DIRECTION VERSUS TIME-OF-DAY

TIME OF DAY	LEVEL A		LEVEL B		LEVEL C	
	WS	WD	WS	WD	WS	WD
00:00	6.8	157.4	0.0	0.0	4.5	173.4
01:00	6.9	175.9	0.0	0.0	4.5	185.4
02:00	6.9	187.1	0.0	0.0	4.5	194.6
03:00	6.6	207.7	0.0	0.0	4.4	205.9
04:00	6.6	198.2	0.0	0.0	4.3	203.9
05:00	6.5	217.2	0.0	0.0	4.2	210.2
06:00	6.3	214.2	0.0	0.0	4.2	213.9
07:00	6.0	231.3	0.0	0.0	4.2	224.6
08:00	6.1	222.9	0.0	0.0	4.7	217.7
09:00	6.3	230.8	0.0	0.0	5.3	233.2
10:00	6.6	229.8	0.0	0.0	5.7	231.3
11:00	6.7	204.1	0.0	0.0	5.8	211.4
12:00	6.9	213.7	0.0	0.0	5.8	216.2
13:00	7.1	205.7	0.0	0.0	5.9	211.4
14:00	7.3	208.1	0.0	0.0	6.0	208.2
15:00	7.3	201.3	0.0	0.0	6.0	205.2
16:00	7.3	185.9	0.0	0.0	5.8	189.7
17:00	7.1	169.1	0.0	0.0	5.4	172.3
18:00	7.1	145.8	0.0	0.0	5.1	148.9
19:00	7.1	130.7	0.0	0.0	4.9	138.6
20:00	6.9	121.5	0.0	0.0	4.5	131.7
21:00	6.9	119.1	0.0	0.0	4.4	131.4
22:00	6.9	132.3	0.0	0.0	4.4	153.6
23:00	6.9	145.4	0.0	0.0	4.5	163.5

NOTES:

1. SEE NOTE 3 ON PAGE 4.

SITE ID: KS
 SITE LOCATION: RUSSELL, KS.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

1.5 FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A COUNT	LEVEL B % COUNT	LEVEL C % COUNT	%
0.0- 0.5	17	0.2	0	0.4
0.5- 1.0	122	1.7	0	2.2
1.0- 1.5	147	2.1	0	4.2
1.5- 2.0	220	3.1	0	5.8
2.0- 2.5	237	3.3	0	6.9
2.5- 3.0	302	4.2	0	8.8
3.0- 3.5	314	4.4	0	8.0
3.5- 4.0	351	4.9	0	8.1
4.0- 4.5	389	5.4	0	6.8
4.5- 5.0	367	5.1	0	5.9
5.0- 5.5	372	5.2	0	5.3
5.5- 6.0	355	5.0	0	5.6
6.0- 6.5	390	5.4	0	4.6
6.5- 7.0	378	5.3	0	4.4
7.0- 7.5	391	5.5	0	4.1
7.5- 8.0	378	5.3	0	3.3
8.0- 8.5	318	4.4	0	3.1
8.5- 9.0	306	4.3	0	2.7
9.0- 9.5	277	3.9	0	2.5
9.5-10.0	230	3.2	0	1.9
10.0-11.0	408	5.7	0	2.6
11.0-12.0	315	4.4	0	1.7
12.0-13.0	204	2.8	0	0.6
13.0-14.0	155	2.2	0	0.2
14.0-15.0	91	1.3	0	0.1
15.0-16.0	67	0.9	0	0.1
16.0-17.0	42	0.6	0	0.0
17.0-18.0	16	0.2	0	0.0
18.0-19.0	4	0.1	0	0.0
19.0-20.0	3	0.0	0	0.0
20.0-21.0	0	0.0	0	0.0
>21.0	1	0.0	0	0.0

RECOVERY RATES

LEVEL A	LEVEL B	LEVEL C
81.6	0.0	82.0

SITE ID: KS
 SITE LOCATION: RUSSELL, KS.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.6 CUMULATIVE FREQUENCY DISTRIBUTION OF WIND SPEED

	LEVEL A		LEVEL B		LEVEL C	
WIND SPEED	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)
0.5	17	0.24	0	0.00	27	0.37
1.0	130	1.94	0	0.00	186	2.58
1.5	286	3.99	0	0.00	492	6.83
2.0	506	7.06	0	0.00	911	12.65
2.5	743	10.37	0	0.00	1407	19.53
3.0	1045	14.58	0	0.00	2040	28.32
3.5	1359	18.96	0	0.00	2615	36.30
4.0	1710	23.86	0	0.00	3201	44.43
4.5	2099	29.29	0	0.00	3689	51.21
5.0	2466	34.41	0	0.00	4116	57.13
5.5	2838	39.60	0	0.00	4501	62.48
6.0	3193	44.55	0	0.00	4907	68.11
6.5	3583	49.99	0	0.00	5240	72.74
7.0	3961	55.27	0	0.00	5558	77.15
7.5	4352	60.72	0	0.00	5853	81.25
8.0	4730	66.00	0	0.00	6092	84.56
8.5	5048	70.43	0	0.00	6312	87.62
9.0	5354	74.70	0	0.00	6509	90.35
9.5	5631	78.57	0	0.00	6686	92.81
10.0	5861	81.78	0	0.00	6821	94.68
11.0	6269	87.47	0	0.00	7009	97.29
12.0	6584	91.87	0	0.00	7132	99.00
13.0	6788	94.71	0	0.00	7177	99.63
14.0	6943	96.87	0	0.00	7194	99.86
15.0	7034	98.14	0	0.00	7199	99.93
16.0	7101	99.06	0	0.00	7203	99.99
17.0	7143	99.67	0	0.00	7203	99.99
18.0	7159	99.89	0	0.00	7204	100.00
19.0	7163	99.94	0	0.00	7204	100.00
20.0	7166	99.99	0	0.00	7204	100.00
21.0	7166	99.99	0	0.00	7204	100.00
>21.0	7167	100.00	0	0.00	7204	100.00

SITE ID: KS
 SITE LOCATION: RUSSELL, KS.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.7 WIND SPEED PERSISTENCE FREQUENCY (LEVEL A)

HOURS	NUMBER OF OCCURENCES							

	WIND SPEED CLASS, METERS/SEC							
	< 3	3-4	4-5	5-6	6-7	7-12	12-20	> 20
-----	-----	-----	-----	-----	-----	-----	-----	-----
1	96	295	289	345	332	126	42	1
2	48	83	103	96	108	77	17	0
3	18	31	45	33	42	65	10	0
4	28	9	16	12	17	34	11	0
5	19	5	5	5	4	36	15	0
6	18	4	5	3	1	32	6	0
7	10	2	1	0	0	24	5	0
8	8	1	0	0	0	19	5	0
9	7	1	0	0	0	14	5	0
10	1	0	0	0	0	14	3	0
11	6	0	0	0	0	13	2	0
12	2	0	0	0	0	10	3	0
13	1	0	0	0	0	8	2	0
14	3	0	0	0	0	8	1	0
15	2	0	0	0	0	5	0	0
16	1	0	0	0	0	2	2	0
17	0	0	0	0	0	5	0	0
18	1	0	0	0	0	3	1	0
19	0	0	0	0	0	4	0	0
20	0	0	0	0	0	1	0	0
21	0	0	0	0	0	4	0	0
22	0	0	0	0	0	2	0	0
23	0	0	0	0	0	0	1	0
>23	2	0	0	0	0	4	0	0

SITE ID: KS
 SITE LOCATION: RUSSELL, KS.
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.8 POWER LAW EXPONENT AND W/D DISTRIBUTION

WIND DIR (ELEV A)	ALPHA (A,B)	ALPHA (B,C)	ALPHA (A,C)	ALPHA (A,B,C)	%A	%B	%C
N	0.00	0.00	0.14	0.00	6.01	0.00	5.77
NNE	0.00	0.00	0.12	0.00	5.05	0.00	5.11
NE	0.00	0.00	0.13	0.00	3.93	0.00	3.86
ENE	0.00	0.00	0.18	0.00	3.75	0.00	3.51
E	0.00	0.00	0.22	0.00	4.49	0.00	4.47
ESE	0.00	0.00	0.22	0.00	5.37	0.00	5.16
SE	0.00	0.00	0.25	0.00	6.06	0.00	6.33
SSE	0.00	0.00	0.20	0.00	11.09	0.00	10.19
S	0.00	0.00	0.21	0.00	12.40	0.00	12.48
SSW	0.00	0.00	0.18	0.00	7.60	0.00	8.16
SW	0.00	0.00	0.25	0.00	4.76	0.00	6.26
WSW	0.00	0.00	0.29	0.00	3.78	0.00	4.66
W	0.00	0.00	0.30	0.00	3.74	0.00	3.61
WNW	0.00	0.00	0.20	0.00	5.60	0.00	5.32
NW	0.00	0.00	0.19	0.00	6.89	0.00	6.30
NNW	0.00	0.00	0.13	0.00	7.14	0.00	6.94

 NOTES:

$$1. \frac{WS(UP)}{WS(L0)} = \frac{Z(UP)}{Z(L0)}^{\text{ALPHA}}$$

$$2. \text{ALPHA} = \frac{\text{LOG}(WS(UP)/WS(L0))}{\text{LOG}(Z(UP)/Z(L0))} \quad \text{WHERE; } Z=\text{ELEVATION} \\ \text{WS}=\text{WIND SPEED}$$

3. SEE NOTE 3 ON PAGE 4.

COUNT OF WIND SPEED VS. DIRECTION
 EACH LINE OF CHARACTERS REPRESENTS 40 OBSERVATIONS
 SPEED INCREASES WITH DISTANCE FROM CENTER OF CIRCLES
 ASSOCIATED RANGES IN MPS ARE 0 -4 4 -12 12 -20 20 -

FIGURE 1. (KS) Wind Rose for Lowest Sensor Level

NOTE: See note 3 on page 4.

SAN GORGONIO PASS, CALIFORNIA

SITE ID: SG
 SITE LOCATION: SAN GORGONIO PASS, CA
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.1 SENSOR PERFORMANCE

TOTAL POSSIBLE SAMPLES: 8784

SENSOR	% ON-LINE	% RECOVERED
WS(A)	100.0	88.0
WD(A)	100.0	89.3
WS(C)	100.0	89.9
WD(C)	100.0	89.6

 1.2 ANNUAL MEANS AND STANDARD DEVIATIONS

	HEIGHT (METERS)	MEAN WS	MEAN WD	POWER WATTS/M**2
SITE DATA (A)	45.7	8.1	248.4	763.75
(C)	9.1	6.3	255.3	335.87

 1.3 MAXIMUM WIND SPEED

ELEVATION (METERS)	WIND SPEED	WIND DIR.	DATE	TIME	OTHER LEVELS
(A) 45.7	25.3	243.7	08/15/80	04:00	(B)-999.9 (C) 18.9
(C) 9.1	18.9	244.8	08/15/80	04:00	(A) 25.3 (B)-999.9

 NOTES:

1. SITE ELEVATION: 329 METERS ABOVE SEA LEVEL.
3. SENSOR LEVEL B NOT AVAILABLE AT SITE SG.

SITE ID: SG
 SITE LOCATION: SAN GORGONIO PASS, CA
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.4 WIND SPEED AND DIRECTION VERSUS TIME-OF-DAY

TIME OF DAY	LEVEL A		LEVEL B		LEVEL C	
	WS	WD	WS	WD	WS	WD
00:00	8.4	263.9	0.0	0.0	6.4	269.0
01:00	8.2	268.2	0.0	0.0	6.3	273.6
02:00	8.0	268.0	0.0	0.0	6.1	274.4
03:00	7.7	269.7	0.0	0.0	5.9	276.2
04:00	7.7	271.9	0.0	0.0	5.9	276.7
05:00	7.3	271.4	0.0	0.0	5.6	277.6
06:00	7.0	274.1	0.0	0.0	5.4	280.2
07:00	6.7	264.5	0.0	0.0	5.2	268.2
08:00	6.4	233.2	0.0	0.0	5.1	229.7
09:00	6.5	192.2	0.0	0.0	5.4	189.1
10:00	6.9	172.1	0.0	0.0	5.6	169.0
11:00	7.1	169.8	0.0	0.0	5.8	168.6
12:00	7.5	176.6	0.0	0.0	6.1	174.6
13:00	8.1	185.9	0.0	0.0	6.6	183.9
14:00	8.6	194.1	0.0	0.0	6.8	193.3
15:00	8.8	209.4	0.0	0.0	7.0	208.0
16:00	9.1	223.2	0.0	0.0	7.0	228.6
17:00	9.2	239.6	0.0	0.0	7.1	248.5
18:00	9.4	248.5	0.0	0.0	7.2	256.3
19:00	9.7	254.0	0.0	0.0	7.5	258.8
20:00	9.6	255.6	0.0	0.0	7.4	259.3
21:00	9.2	255.9	0.0	0.0	7.1	262.4
22:00	8.9	258.1	0.0	0.0	6.8	265.4
23:00	8.7	261.8	0.0	0.0	6.7	267.6

SITE ID: SG
 SITE LOCATION: SAN GORGONIO PASS, CA
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.5 FREQUENCY DISTRIBUTION OF WIND SPEED

WIND SPEED	LEVEL A COUNT	LEVEL B % COUNT	LEVEL C % COUNT	%
0.0- 0.5	60	0.8	0	0.3
0.5- 1.0	275	3.6	0	1.8
1.0- 1.5	358	4.6	0	4.4
1.5- 2.0	417	5.4	0	7.0
2.0- 2.5	418	5.4	0	8.1
2.5- 3.0	402	5.2	0	6.6
3.0- 3.5	336	4.3	0	5.7
3.5- 4.0	246	3.2	0	4.6
4.0- 4.5	277	3.6	0	4.3
4.5- 5.0	200	2.6	0	4.0
5.0- 5.5	214	2.8	0	3.1
5.5- 6.0	194	2.5	0	2.6
6.0- 6.5	162	2.1	0	2.3
6.5- 7.0	165	2.1	0	2.5
7.0- 7.5	155	2.0	0	2.7
7.5- 8.0	152	2.0	0	3.1
8.0- 8.5	137	1.8	0	3.5
8.5- 9.0	120	1.6	0	3.9
9.0- 9.5	168	2.2	0	3.7
9.5-10.0	182	2.4	0	4.1
10.0-11.0	384	5.0	0	6.7
11.0-12.0	479	6.2	0	6.1
12.0-13.0	464	6.0	0	4.3
13.0-14.0	390	5.0	0	2.5
14.0-15.0	387	5.0	0	1.4
15.0-16.0	344	4.4	0	0.6
16.0-17.0	262	3.4	0	0.2
17.0-18.0	172	2.2	0	0.0
18.0-19.0	92	1.2	0	0.0
19.0-20.0	77	1.0	0	0.0
20.0-21.0	22	0.3	0	0.0
>21.0	22	0.3	0	0.0

RECOVERY RATES
 LEVEL A LEVEL B LEVEL C
 88.0 0.0 89.9

SITE ID: SG
 SITE LOCATION: SAN GORGONIO PASS, CA
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.6 CUMULATIVE FREQUENCY DISTRIBUTION OF WIND SPEED

	LEVEL A		LEVEL B		LEVEL C	
WIND SPEED	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)	CFD (ABS)	CFD (%)
0.5	60	0.78	0	0.00	24	0.30
1.0	335	4.33	0	0.00	164	2.08
1.5	693	8.96	0	0.00	515	6.52
2.0	1110	14.35	0	0.00	1069	13.54
2.5	1528	19.76	0	0.00	1706	21.61
3.0	1930	24.96	0	0.00	2225	28.19
3.5	2266	29.30	0	0.00	2676	33.90
4.0	2512	32.48	0	0.00	3036	38.46
4.5	2789	36.07	0	0.00	3372	42.72
5.0	2989	38.65	0	0.00	3689	46.74
5.5	3203	41.42	0	0.00	3937	49.88
6.0	3397	43.93	0	0.00	4143	52.49
6.5	3559	46.02	0	0.00	4321	54.74
7.0	3724	48.16	0	0.00	4515	57.20
7.5	3879	50.16	0	0.00	4727	59.89
8.0	4031	52.13	0	0.00	4971	62.98
8.5	4168	53.90	0	0.00	5247	66.48
9.0	4288	55.45	0	0.00	5552	70.34
9.5	4456	57.62	0	0.00	5841	74.00
10.0	4638	59.98	0	0.00	6167	78.13
11.0	5022	64.94	0	0.00	6693	84.80
12.0	5501	71.14	0	0.00	7176	90.92
13.0	5965	77.14	0	0.00	7519	95.26
14.0	6355	82.18	0	0.00	7715	97.74
15.0	6742	87.18	0	0.00	7825	99.14
16.0	7086	91.63	0	0.00	7874	99.76
17.0	7348	95.02	0	0.00	7889	99.95
18.0	7520	97.25	0	0.00	7891	99.97
19.0	7612	98.44	0	0.00	7893	100.00
20.0	7689	99.43	0	0.00	7893	100.00
21.0	7711	99.72	0	0.00	7893	100.00
>21.0	7733	100.00	0	0.00	7893	100.00

SITE ID: SG
 SITE LOCATION: SAN GORGONIO PASS, CA
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.7 WIND SPEED PERSISTENCE FREQUENCY (LEVEL A)

HOURS	NUMBER OF OCCURENCES							
	WIND SPEED CLASS, METERS/SEC							
	< 3	3-4	4-5	5-6	6-7	7-12	12-20	> 20
1	106	302	254	254	215	192	100	13
2	87	70	59	52	37	121	41	3
3	45	26	18	11	6	81	27	3
4	45	9	11	3	0	62	27	1
5	32	4	0	1	1	28	12	1
6	25	1	0	0	0	25	6	0
7	24	1	1	0	1	16	9	1
8	12	0	0	0	1	10	15	0
9	12	0	0	0	0	8	17	0
10	11	0	0	0	0	3	12	0
11	4	0	0	0	0	3	5	0
12	3	0	0	0	0	4	6	0
13	2	0	0	0	0	2	4	0
14	3	0	0	0	0	5	4	0
15	2	0	0	0	0	1	7	0
16	2	0	0	0	0	0	5	0
17	1	0	0	0	0	0	4	0
18	0	0	0	0	0	0	3	0
19	1	0	0	0	0	1	3	0
20	1	0	0	0	0	0	2	0
21	0	0	0	0	0	0	2	0
22	2	0	0	0	0	0	5	0
23	0	0	0	0	0	0	0	0
>23	5	0	0	0	0	2	11	0

SITE ID: SG
 SITE LOCATION: SAN GORGONIO PASS, CA
 DATA : JANUARY 1980 THROUGH DECEMBER 1980

 1.8 POWER LAW EXPONENT AND W/D DISTRIBUTION

WIND DIR (ELEV A)	ALPHA (A,B)	ALPHA (B,C)	ALPHA (A,C)	ALPHA (A,B,C)	%A	%B	%C
N	0.00	0.00	0.10	0.00	2.73	0.00	1.96
NNE	0.00	0.00	0.05	0.00	2.75	0.00	2.38
NE	0.00	0.00	0.08	0.00	2.46	0.00	1.95
ENE	0.00	0.00	0.07	0.00	2.53	0.00	2.00
E	0.00	0.00	0.03	0.00	3.80	0.00	3.14
ESE	0.00	0.00	0.09	0.00	7.90	0.00	7.12
SE	0.00	0.00	0.03	0.00	3.09	0.00	2.96
SSE	0.00	0.00	0.04	0.00	1.58	0.00	0.92
S	0.00	0.00	0.00	0.00	1.27	0.00	0.86
SSW	0.00	0.00	0.02	0.00	2.19	0.00	1.81
SW	0.00	0.00	0.12	0.00	9.18	0.00	10.55
WSW	0.00	0.00	0.15	0.00	40.70	0.00	36.99
W	0.00	0.00	0.15	0.00	7.10	0.00	7.37
WNW	0.00	0.00	0.06	0.00	3.57	0.00	8.93
NW	0.00	0.00	0.16	0.00	5.74	0.00	8.63
NNW	0.00	0.00	0.14	0.00	3.17	0.00	2.01

 NOTES:

$$1. \quad \frac{WS(UP)}{WS(LO)} = \frac{Z(UP)}{Z(LO)} \quad \text{ALPHA}$$

$$2. \quad \text{ALPHA} = \frac{\log(WS(UP)/WS(LO))}{\log(Z(UP)/Z(LO))} \quad \text{WHERE; } \begin{array}{l} Z=\text{ELEVATION} \\ WS=\text{WIND SPEED} \end{array}$$

FIGURE 1. (SG) Wind Rose for Lowest Sensor Level

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