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THE SYNTHETIC CLIMATOLOGY OF THE RESOLUTE, N.W.T. NEW TOWNSITE

PART I : OVERVIEW

PART II: RESULTS

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ABBREVIATIONS

R B (1) – south camp	:	geographical location	74°41′N 94°55′W
	:	elevation	56′ ASL
	:	period of record	October 1947 – October 1953
R B (2) – airport	:	geographical location	74°41′N 94°59′W
	:	elevation	209′ ASL
	:	period of record	1954-1970
R B (N) – proposed townsite	:	geographical location	≈ 74°42′N 94°49′W
	:	elevation	≈ 90′ ASL
	:	period of record	nil

THE SYNTHETIC CLIMATOLOGY OF THE RESOLUTE, N.W.T. NEW TOWNSITE

PART I : OVERVIEW

1. INTRODUCTION

The following synthesized climatology was made at the behest of the Northwest Territories Government. Meteorological advice was required in connection with a feasibility study to relocate the settlement sites at Resolute away from the airport and currently existing Eskimo settlement.

The site under consideration is on the general plateau, at 80 to 100 feet elevation, directly below Signal Hill (where below was taken to mean due south). This would put it near a small unnamed lake about 1¼ miles east-southeast of the shore of Char Lake, about 1½ miles east of the old base camp and about 1/3 mile inland from Resolute Bay (see Figure 1).

2. METHOD AND ANALYSIS

With the constraints imposed by the lack of meso-scale meteorological data, a suitable solution appeared to involve the development of equations which would predict climatic conditions at the location in question by using known data from south camp and the airport. First, the distance from the new townsite to south camp and the airport was determined (Table 1). Now, since statistically one would expect the correlation of

Table 1: Resolute New Townsite

Station	Proportional Separation Distance	Ratio	Coefficient	Variable (X_i)
South Camp	4	1	$a_1 = 0.64$	X_1
Airport Location	7	0.57	$a_2 = 0.36$	X_2

climatological parameters to be greatest between stations having the least separation (strictly true only for homogeneous geophysical systems), an equation was formulated in such a way as to give the greatest weight to the station nearest the one for which a climatology was required (weighted average). This was done as follows:

1) an equation, which would predict a value at the new townsite, of the form

$$X_j = a_1 X_1 + a_2 X_2 + \ldots + a_n X_n = \sum_{i=1}^{n} a_i X_i \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

was generated;

2) since the sum of the coefficients must equal one $\left(\sum_{i=1}^{n} a_i = 1\right)$, then the coefficients of each station were determined as follows:

$$a_N + \left[\left(\frac{d_N}{d_{N+1}} a_N\right) = a_{N+1}\right] + \left[\left(\frac{d_N}{d_{N+2}} a_N\right) = a_{N+2}\right] + \ldots + \left[\left(\frac{d_N}{d_{N+n}} a_N\right) = a_{N+n}\right] = 1$$

as the contribution of each station is proportionately that of the nearest and where:

a_N = coefficient of the nearest station;
d_N = distance to the nearest station;
a_{N+1} = coefficient of the next nearest station;
d_{N+1} = distance to the next nearest station;
↓
a_{N+n} = coefficient of farthest station;
d_{N+n} = distance to farthest station

and

$$a_N = \left\{ \frac{1}{1 + \frac{d_N}{d_{N+1}} + \frac{d_N}{d_{N+2}} + \ldots\ldots\ldots + \frac{d_N}{d_{N+n}}} \right\} \quad \ldots\ldots\ldots\ldots\ldots (2)$$

These values were entered in Table 1 and the prediction equation arrived at was

$$X_N = 0.64\ X_1 + 0.36\ X_2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The climatic normals of temperature and precipitation from the airport and south camp were inserted into equation (3) to arrive at values for the new townsite (see Tables 2 and 3).

Wind data, as listed in Table 4 and illustrated in Figures 2 to 15 were taken from the climatic summaries and normals (1959, 1968, 1970). However, the formulation of a synthetic wind field was more complex. For direction frequencies equation (3) was used for all speeds plus various speed classes with values < 46 mph; for higher values the two stations were simply averaged. The results are illustrated in Table 5 and Figures 16 to 22.

Wind speeds were adjusted further. First, an initial value was determined by equation (3) and designated V_∞. Then these values were modified by first applying the theory of the stream function (Burns, 1973) from fluid mechanics and then by a further subjective adjustment for the shooting flow phenomena (Fraser; 1959, 1970). Thus, the equations for the final adjustment to the wind speed are for:

1) N 1.44 V_∞;

2) NE, NW 1.25 V_∞;

3) E 1.36 V_∞;

4) SE 1.20 V_∞;

5) S, SW, W V_∞;

The resulting values are entered in Table 5. The estimated wind speeds may appear to be somewhat high, but experience has shown that at locations near hills along arctic coasts winds are generally higher than expected.

One should remember that the prevailing direction depends on local air drainage and the mean pressure pattern, while the most frequent direction of strong winds is determined by the orientation of large scale channelling.

Please note that the synthesized data may be subject to large anomalies. This is particularly true of the new townsite location where the relatively high terrain to the northwest clockwise through the southeast could cause:

1) cold air drainage or ponding which would significantly lower minimum and winter temperatures;

2) increased local precipitation amounts due to orographically induced vertical motion fields (upslope);

3) disruption in the wind field leading to turbulence, deviations in wind direction frequencies and large variations in local wind velocity.

3. ADDITIONAL NOTES

During the Polar Night in the Resolute area there is:

1) a ± 5°F horizontal variation over one mile on the plateaux areas;

2) a temperature increase with elevation of about 3°F/100′;

3) an 81% probability of ice fog when the wind is from the northwest at 10 to 15 mph, the temperature is −24°F to −30°F and the relative humidity is 66% to 74%;

4) a high probability of snowfall when the wind is from the southeast clockwise through west and the temperature is < 0°F;

5) in general, a visibility drop as wind increases – primarily due to blowing snow;

6) an open lead about 30 miles to the west of Resolute in late December, which closes in late January and re-opens in early March – during this period, with west winds, there may be frequent stratus and fog or ice fog.

In recently received (June 5, 1973) private correspondence from Mr. L. de March (I.B.P. Char Lake Project), he makes the following observations:

1) average snow-cover of the Char Lake drainage basin = 30.3 centimeters with an extreme amount of variation ranging from no snow cover on exposed areas to depths > 3 meters in ravines and at the bases of hills running east-west;

2) obstructions cause snow to pile up in huge drifts of extremely hard dense snow. The project buildings, for instance, have been almost buried during the past three winters by drifts over eight feet high;

3) this year's (1973) snow cover in the Char Lake basin is quite different from last year – estimate less than half of last year and drift patterns are different; great areas are completely bare but as before, ravines and hills bases are deep in snow;

4) both here in Resolute and on the Devon Island I.B.P. site, buildings have been erected without thought as to wind direction, etc. They are close together and lined up such that the wind is funnelled at an angle – resulting in huge drifts. Last week the main "street" in Resolute was totally blocked by enormous drifts in a two day blow.

It is apparent from this letter that a careful meso-wind and snow pattern study should be conducted prior to the relocation of the Resolute townsite.

PART II : RESULTS

1. TEMPERATURE

Table 2 shows the following:

1) the mean daily maximum and mean daily temperatures are above freezing (> 32°F) only three months of the year – June through August;

2) the mean daily minimum temperature is above freezing only two months of the year – July and August;

3) R B (N) is estimated to be colder than R B (2) during January and February likely due to its lower elevation. However, with leads developing in March it should become warmer and remain so throughout June. During the period July through October the two locations are about the same, but R B (N) would be warmer in November-December due to the effect of Resolute Bay;

4) the extremes indicate that R B (2) has a more continental and R B (N) a more marine thermal climate;

5) extreme summer highs are 60° to 65°F with extreme winter lows ranging from –55°F to –61°F;

6) July has the fewest number of days with frost.

2. PRECIPITATION

Table 3 shows the following:

1) in winter and summer R B (2) would have more precipitation than R B (N), but the reverse holds in May and September because of the proximity of R B (N) to open water;

2) the greatest snowfall occurs in May, September and October, with more in the latter months.

3) most rainfall occurs during the period July through August;

4) the mean annual precipitation is about 5.5 inches;

5) extreme 24-hour precipitation amounts range from ¾ to one inch;

6) the snowfall water equivalent ranges from 7″ to 13″ of snow to 1″ of water.

3. WIND FIELD

The wind roses of Figures 2 to 22 indicate that the wind generally blows out of the sector northwest clockwise through southeast. The prevailing wind direction is northwest, but during the period June through August it tends to be evenly divided between northwest and southeast. Furthermore, the prevailing winds in the higher speed categories generally blow out of the sector northeast clockwise through southeast with the strongest winds from the east.

Figure 23 indicates that the mean wind speed is enhanced by the proximity of relief and Table 6 lists the percentage probability that the highest monthly wind speed will be from a particular direction – greatest for east.

Figures 24 through 28 are return period graphs of wind speed based on the double exponential distribution. Since theoretically these graphs apply to data samples $> 10^{12}$ values, caution must be exercised in their use particularly with respect to the extrapolation of the lines. These graphs indicate the wind speed that may be expected to be equalled or exceeded at least once every so many years. For example, we find from Figure 24 that a mean wind speed of 72 mph may be equalled or exceeded at least once every 10 years.

Tables 4 and 5 contain the percentage frequency of wind direction and wind speed values for R B (1), R B (2) and R B (N). These indicate that the major prevailing wind direction is northwest – the minor directions are north clockwise through southeast – with a low percentage frequency of calms which is reflected in the mean annual wind speed of greater than 10 mph.

The reader should note that the wind field for the new townsite is an *estimate* only; based on physical reasoning and the best available data. The placing of a town in the area under consideration will constitute a major disturbance to the local climate; likely serving to alter it considerably. For example, although recent photos of the area indicate that it is well swept by the wind, a town will trap a large portion of the drifting or blowing snow. In effect it will become a local deposition zone much like the Eskimo village across the Bay (see page 4).

4. RADIATION AND SUNSHINE

Table 7 shows the following:

1) the amount of incoming radiation is greatest in June;

2) the amount of reflected radiation is greatest in May, indicating an albedo maximum;

3) the largest net gain in radiant energy occurs during the summer while a net loss occurs during the winter;

4) the greatest number of hours with bright sunshine occur during the period April through July.

5. BLOWING SNOW

Figure 29 illustrates the following:

1) there is no preference for blowing snow at any particular time of day;

2) blowing snow occurs on the average about 9% of the time in the period September through May;

3) blowing snow occurs most frequently in January, about 20% of the time, decreasing quasi-linearly on either side to about 2% in September and about 1% in June.

6. FREEZING PRECIPITATION

Figure 30 illustrates the following:

1) during early summer, freezing precipitation occurs most often in the evening or early morning and in the fall during morning or late afternoon;

2) freezing precipitation occurs 0.4% of the time during the period May through October (freezing precipitation year);

3) freezing precipitation occurs most frequently in September and June, about 2% and 1% of the time respectively, and least in May and July, about 0.2% of the time.

7. FOG

Figure 31 shows that:

1) fog occurs in all months;

2) during March and April fog occurs most often from mid-morning to late afternoon and in July and August in the morning and late evening;

3) fog occurs most frequently (about 18% to 20% of the time) in February – March and July–August with the greatest occurrence in August.

8. MISCELLANEOUS

Table 8 contains monthly mean cloud amounts, mean number of days with thunder and mean sea-level pressure. The mean cloud amount is least in the winter increasing to a maximum of > 8/10 in September. July and August are the only two months with a possibility of thunderstorm activity. The mean sea-level pressure is greatest in the winter and least in the fall indicating a higher incidence of storm center activity.

BIBLIOGRAPHY

Burns, B.M.; 1973: The synthetic climatologies of Inugivik and Wolstenholme, Quebec . . . Can., AES, ACD, ACC (ACCA), Proj. Rep. No. 11, Toronto, in print.

Fraser, D.B.; 1959: Unstable character of northeasterly winds at Resolute, N.W.T. . . . Can., DOT, Meteor. Br., Cir. 3189, Tec. 300, Toronto, 14 pp.

Fraser, D.B.; 1970: Airflow over hills beneath Arctic inversions: Airstream characteristics . . . Unpub. Can., AES, AWC, Edmonton, 13 pp.

Hooper, D.R.; 1968: Probability forecast study Resolute Bay, N.W.T., Canada . . . Unpub., USWB, ESSA, 10 pp.

Longley, R.W.; 1958: Winds and visibility at Resolute, Northwest Territories . . . Can., DOT, Meteor. Br., Cir. 3039, Tec. 269, Toronto, 8 pp.

Thompson, H.A.; 1962: An analysis of terminal weather at Resolute . . . Can., DOT, Meteor. Br., Cir. 3627, Tec. 402, Toronto, 17 pp.

Wilson, H.P.; and Markham, W.E.; 1957: A study of Arctic surface winds . . . Can., DOT, Meteor. Br., Cir. 2923, Tec. 251, Toronto, 14 pp.

Wilson, H.P.; 1961: A comparison of theoretical and actual surface wind data . . Can., DOT, Meteor. Br., Cir. 3518, Tec. 364, Toronto, 16 pp.

Table 2: Temperature Regime

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
PART A (°F)													
Mean Daily Maximum Temperature													
R B (1)	-22.4	-24.6	-15.0	1.3	22.3	37.7	45.1	41.4	27.3	11.3	-1.7	-12.3	9.2
R B (2)	-18.8	-21.9	-18.7	-3.0	17.8	36.0	44.9	41.5	27.3	11.1	-5.8	-14.1	8.0
R B (N)*	-21.1	-23.7	-16.3	-0.3	20.7	37.1	45.0	41.4	27.3	11.2	-3.1	-12.9	8.8
Mean Daily Minimum Temperature													
R B (1)	-35.6	-37.9	-29.7	-15.8	9.4	29.3	35.0	32.3	19.1	-0.9	-15.4	-26.0	-3.0
R B (2)	-31.8	-35.0	-31.6	-16.8	6.4	27.9	35.3	33.2	20.4	0.2	-18.5	-26.8	-3.1
R B (N)*	-34.2	-36.9	-30.4	-16.2	8.3	28.8	35.2	32.3	19.5	-0.5	-16.5	-26.3	-3.1
Mean Daily Temperature													
R B (1)	-29.0	-31.2	-22.4	-7.3	15.9	33.5	40.1	36.9	23.2	5.2	-8.6	-19.2	3.1
R B (2)	-25.3	-28.4	-25.2	-9.9	12.1	32.0	40.0	37.4	23.8	5.7	-12.6	-20.5	2.5
R B (N)*	-27.8	-30.2	-23.4	-8.2	14.5	33.0	40.1	37.1	23.4	5.4	-10.0	-19.7	2.9
Extreme Maximum Temperature													
R B (1)	22	6	20	30	40	57	60	59	42	30	27	17	60
R B (2)	23	25	13	25	35	52	65	58	48	32	27	14	65
R B (N)*	22	13	18	29	38	55	62	58	44	31	27	16	62
Extreme Minimum Temperature													
R B (1)	-53	-54	-55	-38	-20	8	29	17	0	-24	-43	-51	-55
R B (2)	-62	-59	-61	-43	-21	8	27	21	-5	-31	-45	-47	-61
R B (N)*	-56	-56	-57	-40	-20	8	28	18	-2	-27	-44	-49	-57
PART B													
Mean Number of Days with Frost													
R B (1)	31	28	31	30	31	21	7	16	30	31	30	31	317
R B (2)	31	28	31	30	31	25	9	14	29	31	30	31	320
R B (N)*	31	28	31	30	31	23	8	15	30	31	30	31	319

*Estimated values

Table 3: Precipitation Regime

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
PART A (inches)													
Mean Monthly Rainfall													
R B (1)	0	0	0	T	T	.51	.89	.81	.20	T	0	0	2.41
R B (2)	0	0	0	0	T	.20	.91	1.17	.16	T	0	0	2.44
R B (N)*	0	0	0	T	T	.40	.90	.94	.19	T	0	0	2.43
Mean Monthly Snowfall													
R B (1)	0.9	1.0	1.6	2.0	5.1	2.7	0.5	2.1	5.8	6.3	2.1	1.5	31.6
R B (2)	1.2	1.3	1.1	2.3	3.1	1.9	0.8	1.5	5.5	6.5	2.4	2.0	28.6
R B (N)*	1.0	1.2	1.4	2.1	4.4	2.5	0.6	1.9	5.7	6.4	2.2	1.7	31.0
Mean Monthly Precipitation													
R B (1)	.09	.10	.16	.20	.51	.78	.93	1.11	.78	.53	.21	.15	5.55
R B (2)	.12	.13	.11	.23	.30	.38	.99	1.32	.70	.64	.24	.20	5.36
R B (N)*	.10	.12	.14	.21	.43	.64	.95	1.19	.76	.56	.21	.17	5.48
Greatest Rainfall in 24 Hours													
R B (1)	0	0	0	T	T	.57	.71	.51	.36	.01	0	0	.71
R B (2)	0	0	0	T	01	.46	.81	.99	.52	.02	0	0	.99
R B (N)*	0	0	0	T	T	.53	.74	.68	.41	.02	0	0	.74
Greatest Snowfall in 24 Hours													
R B (1)	1.2	.6	1.0	2.0	3.4	2.1	.7	3.1	2.6	3.4	1.8	.8	3.4
R B (2)	1.3	1.4	1.5	2.7	2.5	3.3	2.7	2.7	4.4	3.7	1.4	1.6	4.4
R B (N)*	1.2	0.9	1.2	2.2	3.1	2.6	1.4	2.9	3.2	3.5	1.7	1.1	3.1
Greatest Precipitation in 24 Hours													
R B (1)	.12	.06	.10	.20	.34	.77	.71	.72	.37	.34	.18	.08	.77
R B (2)	.13	.14	.12	.27	.25	.47	.81	.99	.60	.44	.14	.16	.99
R B (N)*	.12	.09	.11	.22	.31	.66	.74	.82	.45	.37	.17	.11	.82

T = trace (< 0.01")

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
PART B													
Mean Number of Days with Rain													
R B (1)	0	0	0	*	*	3	10	8	2	*	0	0	23
R B (2)	0	0	0	0	*	2	8	8	2	*	0	0	20
R B (N)*	0	0	0	*	*	3	10	8	2	*	0	0	23
Mean Number of Days with Snow													
R B (1)	3	4	6	6	10	6	1	4	10	12	7	4	73
R B (2)	6	5	5	7	9	5	2	3	11	15	8	7	83
R B (N)*	4	5	6	6	10	6	2	4	11	13	8	5	80

*Estimated values; in Table means < ½ day

Table 3 (cont'd)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Mean Number of Days with Precipitation													
R B (1)	3	4	6	6	10	8	10	11	11	13	7	4	93
R B (2)	6	5	5	7	9	7	9	10	12	15	8	7	100
R B (N)*	4	5	6	6	10	7	10	11	11	13	8	5	96

*Estimated values

Table 4: Wind Field

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
RB (1)													
Percentage Frequency													
N	12	12	11	8	10	9	12	11	19	24	17	14	13
NE	13	10	12	10	14	10	10	11	13	19	18	17	13
E	9	10	15	13	10	10	10	9	7	8	12	17	11
SE	6	9	13	17	17	26	24	22	10	8	8	9	14
S	1	5	4	3	5	5	3	4	2	1	4	1	3
SW	4	5	5	7	5	9	7	7	8	5	5	3	6
W	8	6	8	7	6	9	8	7	9	5	8	5	7
NW	45	39	28	32	31	21	25	28	31	28	26	31	30
C	2	4	4	3	2	1	1	1	1	2	2	3	2
Mean Speed (mph)													
N	10.8	7.4	11.1	9.6	12.0	16.0	14.6	13.4	12.1	13.1	9.4	8.4	11.5
NE	10.1	11.5	16.7	12.3	13.6	14.1	16.0	14.8	10.9	14.8	14.0	10.9	13.3
E	8.1	7.8	9.3	12.3	11.3	11.2	13.3	11.5	9.3	12.5	9.6	9.3	10.5
SE	14.6	14.0	17.0	12.9	12.5	12.1	9.7	10.1	12.1	13.4	13.4	13.9	13.0
S	6.3	10.4	14.3	6.0	6.8	7.1	5.0	5.4	5.4	5.3	11.3	5.2	7.4
SW	7.4	12.0	12.1	8.8	8.4	8.2	8.1	9.4	10.8	10.5	11.5	6.6	9.5
W	5.4	8.4	5.5	4.1	8.1	9.6	11.5	10.9	14.0	9.0	6.5	4.0	8.1
NW	10.4	8.5	10.6	7.8	10.5	11.6	12.0	12.6	13.1	11.4	8.6	8.0	10.4
All Directions	9.1	10.0	12.1	9.2	10.4	11.2	11.3	11.0	11.0	11.3	10.5	8.3	10.5
RB (2)													
Percentage Frequency													
N	13	16	14	12	18	17	11	12	24	18	16	11	15
NE	11	9	8	8	10	10	9	9	14	12	12	9	10
E	15	19	15	14	12	12	11	19	11	12	18	18	15
SE	11	11	15	15	17	13	19	19	8	12	11	14	14
S	4	6	7	8	8	6	8	5	6	6	5	5	6
SW	2	2	2	2	4	5	4	3	5	7	2	3	3
W	8	6	7	9	8	12	15	10	5	6	5	7	8
NW	26	23	23	22	18	25	18	20	25	23	23	24	23
C	10	9	9	9	5	2	4	3	2	4	9	8	6
Mean Speed (mph)													
N	16.4	14.1	11.5	13.4	14.3	14.5	14.6	15.4	14.8	13.8	10.8	14.0	14.0
NE	20.3	20.7	18.0	17.5	16.4	17.2	18.3	17.0	16.5	19.0	17.7	18.0	18.1
E	16.5	17.7	18.8	19.4	16.6	20.4	20.4	22.9	18.8	19.6	18.8	17.1	18.9
SE	14.6	13.7	13.9	14.5	14.0	14.0	10.9	11.6	14.0	16.7	13.6	15.3	13.9
S	11.6	11.4	11.2	11.9	11.5	9.2	10.0	9.1	13.7	13.6	12.8	13.9	11.7
SW	9.3	8.8	8.7	10.1	9.7	10.2	10.0	9.4	11.3	12.7	8.9	10.5	10.0
W	9.1	7.1	7.7	8.0	7.4	8.9	8.1	8.0	9.9	11.2	7.7	7.8	8.4
NW	12.1	12.4	10.0	9.7	9.9	12.1	11.0	10.5	14.3	12.2	10.5	11.5	11.4
All Directions	13.7	13.2	12.5	13.1	12.5	13.3	12.9	13.0	14.2	14.9	12.6	13.5	13.3

Table 5: Wind Field

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
R B (N)													
Percentage Frequency*													
N	12	13	12	9	13	11	12	11	21	22	17	13	14
NE	12	10	11	9	13	10	10	10	13	17	16	14	12
E	11	13	15	13	11	10	10	13	8	9	14	17	12
SE	8	10	14	16	17	21	22	21	9	9	9	11	14
S	2	5	5	5	6	7	5	4	3	3	4	2	4
SW	3	4	4	5	5	7	6	6	7	6	4	3	5
W	8	6	8	8	7	10	11	8	8	5	7	6	8
NW	38	33	26	29	27	22	23	25	29	26	25	29	28
C	6	6	5	6	1	2	1	2	2	3	4	5	3
Mean Speed* (mph)													
N	18.5	14.3	16.2	15.8	18.5	22.3	21.1	20.3	18.8	19.2	14.3	15.0	17.9
NE	17.2	18.5	21.5	17.7	18.3	19.0	21.1	19.5	16.1	20.4	19.2	16.8	18.8
E	15.1	15.5	17.3	20.2	18.0	19.7	21.6	21.2	17.3	20.5	17.6	16.5	18.4
SE	17.5	16.7	19.1	16.2	15.6	15.3	12.2	12.8	15.3	17.5	16.2	17.3	16.0
S	8.2	10.8	13.2	8.1	8.5	7.9	6.8	6.7	8.4	8.3	11.8	8.3	8.9
SW	8.1	10.8	10.9	9.3	8.9	8.9	8.8	9.4	11.0	11.3	10.6	8.0	9.7
W	6.7	7.9	6.3	5.5	7.8	9.3	10.3	9.9	12.5	9.8	6.9	5.4	8.8
NW	13.8	12.4	13.0	10.6	12.9	14.7	14.6	14.8	16.9	14.6	11.6	11.6	13.5
All Directions	13.1	13.4	14.7	12.9	13.6	14.6	14.6	14.3	14.5	15.2	13.5	12.4	14.0

*Estimated values

Table 6: Percentage Probability that the Highest Monthly Wind Speed will be from the Given Direction (estimated values for R B (N))

N	NE	E	SE	S	SW	W	NW
23	20	33	11	4	1	1	7

Table 7: Radiation (ly/day) and Sunshine

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Mean Monthly Direct Solar Radiation (1957–1970)													
R B (2)	0	14	128	358	559	603	449	271	124	31	1	0	
Mean Monthly Diffuse Sky Radiation (1957–1970)													
R B (2)	0	10	71	178	348	374	247	172	89	22	0	0	
Mean Monthly Reflected Radiation (1957–1970)													
R B (2)	0	10	95	266	398	277	107	64	60	22	0	0	
Mean Monthly Net Radiation (1963–1970)													
R B (2)	-63	-62	-48	4	86	203	206	112	4	-51	-62	-63	
Mean Number of Hours with Bright Sunshine (1948–1970)													
R B (1&2)	0	17	145	267	274	244	276	159	56	21	0	0	1459

NOTE: Values for R B (N) will likely be lower because of its proximatity to relief which will serve to cut off more of the direct solar radiation and sunshine at low sun angles than at R B (2). Conversely, R B (1) will likely have higher values than R B (2) due to its location on relatively flat terrain farther removed from the local relief.

Table 8: Miscellaneous

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Mean Cloud Amount In Tenths (1948–1960)													
R B (1&2)	3.9	4.1	4.0	4.7	6.9	7.2	7.5	7.9	8.2	7.5	4.6	4.0	5.9
Mean Number of Days with Thunder (1948–1960)													
R B (1&2)	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0.2
Mean Sea Level Pressure (mb; 1948–1960)													
R B (1&2)	1014	1015	1020	1021	1019	1015	1011	1012	1012	1010	1013	1014	1015

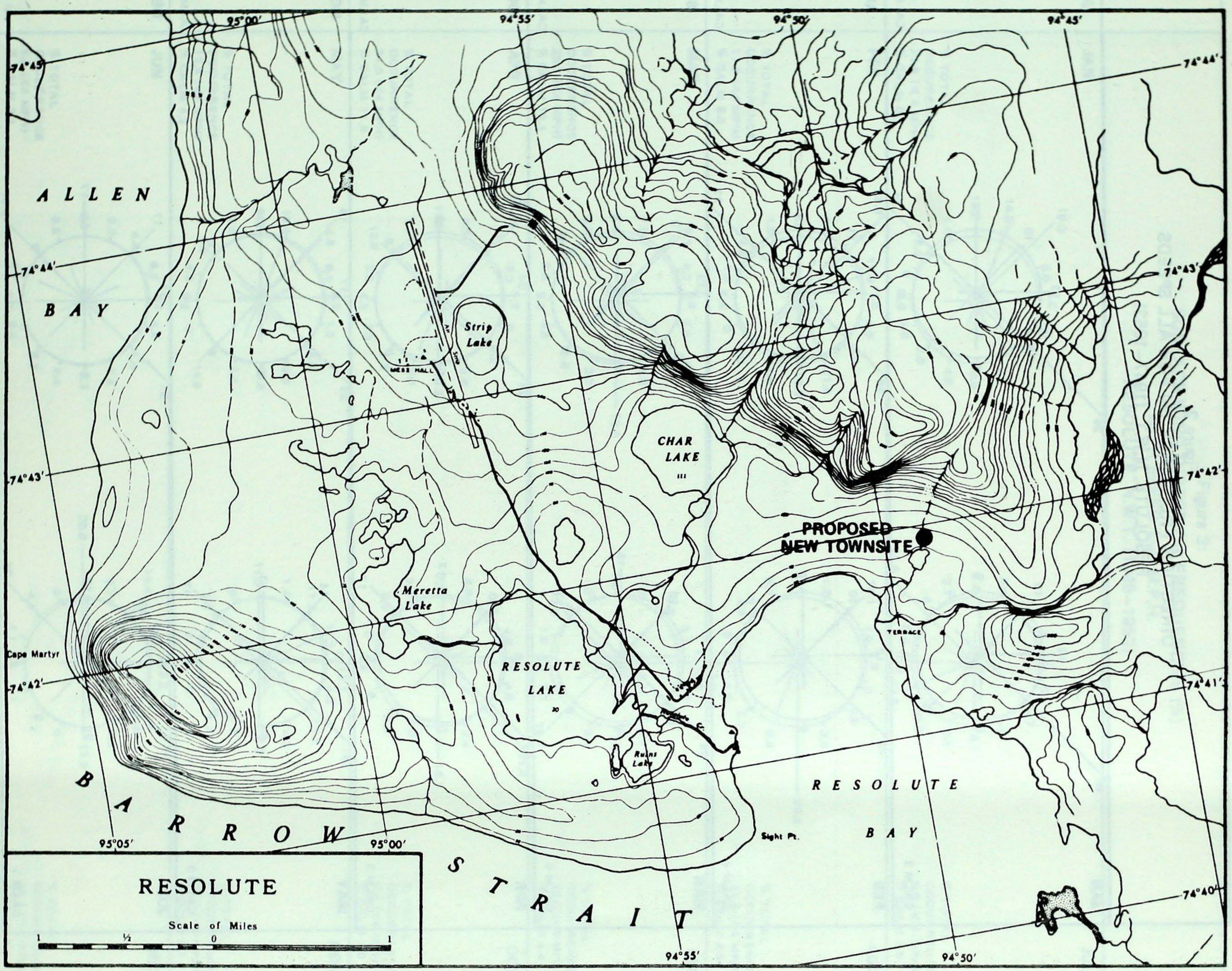


Figure 1. RESOLUTE TOPOGRAPHIC MAP.

Figure 2:
DIRECTION FREQUENCY (%) FOR ALL SPEEDS
RESOLUTE, N.W.T. (1947–1953)

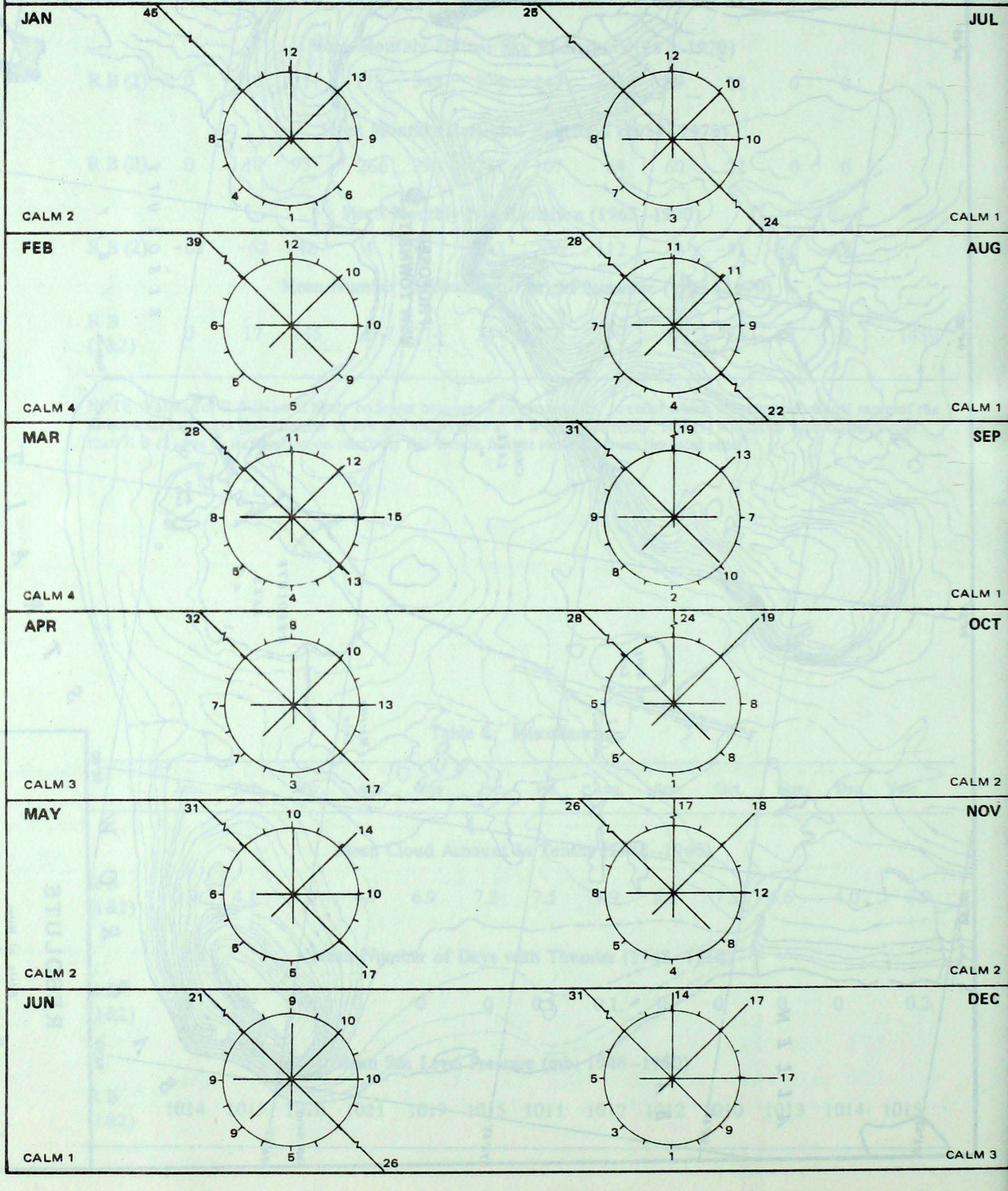


Figure 3:
SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 1–3 M.P.H.
RESOLUTE, N.W.T. (1948–1953)

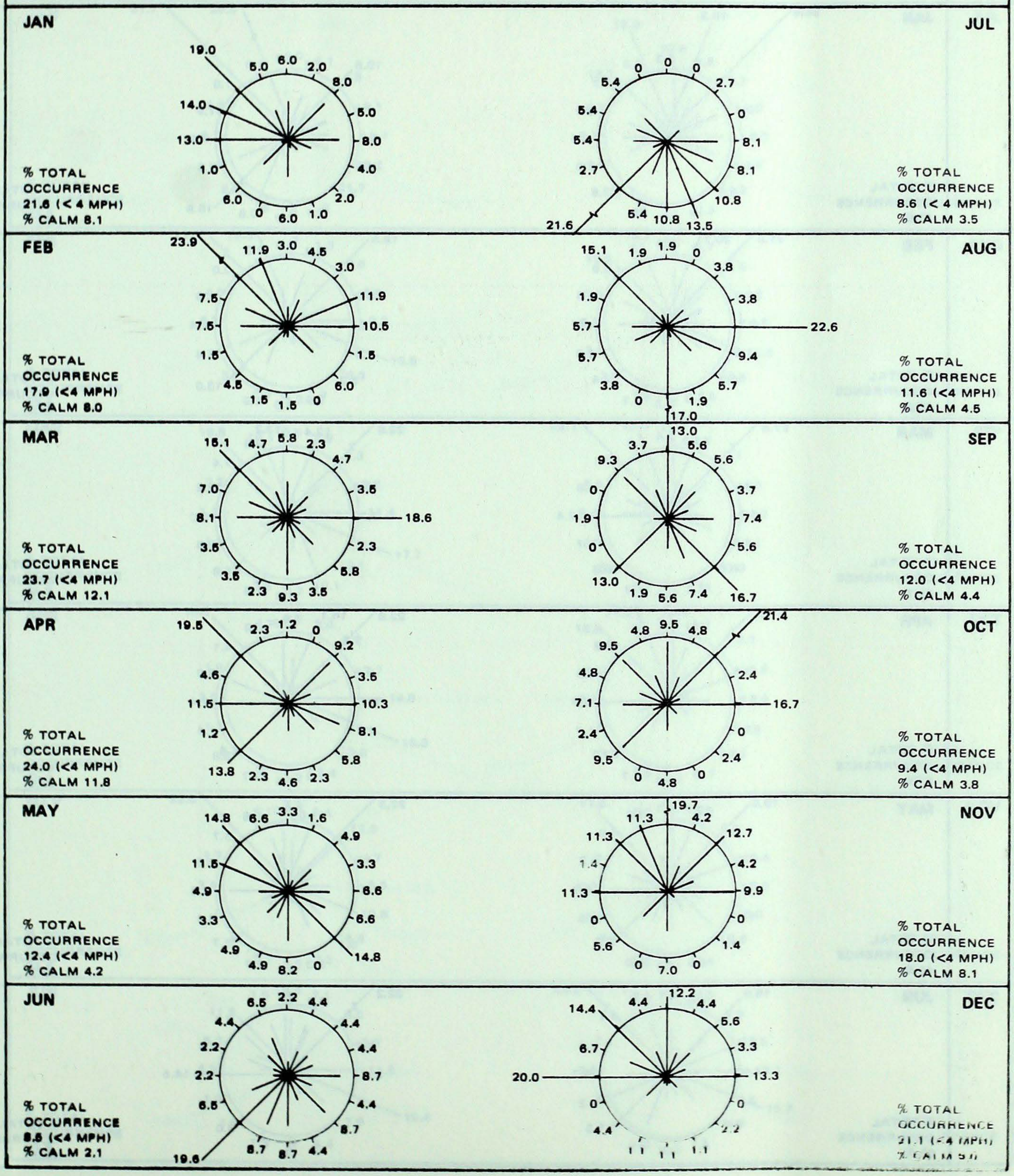


Figure 4:
SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 4–12 M.P.H.
RESOLUTE, N.W.T. (1948–1953)

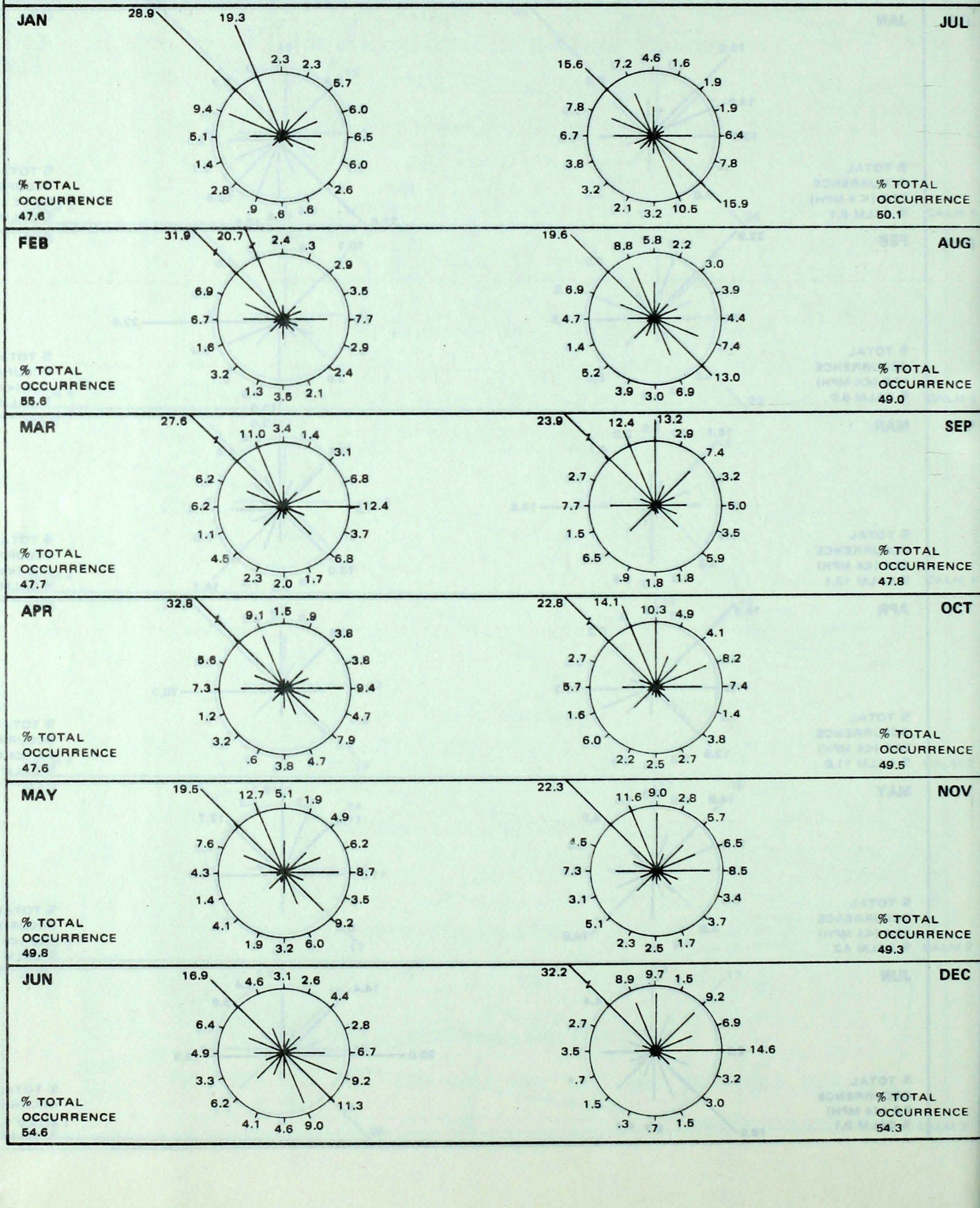


Figure 5:
SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 13–24 M.P.H.
RESOLUTE, N.W.T. (1948–1953)

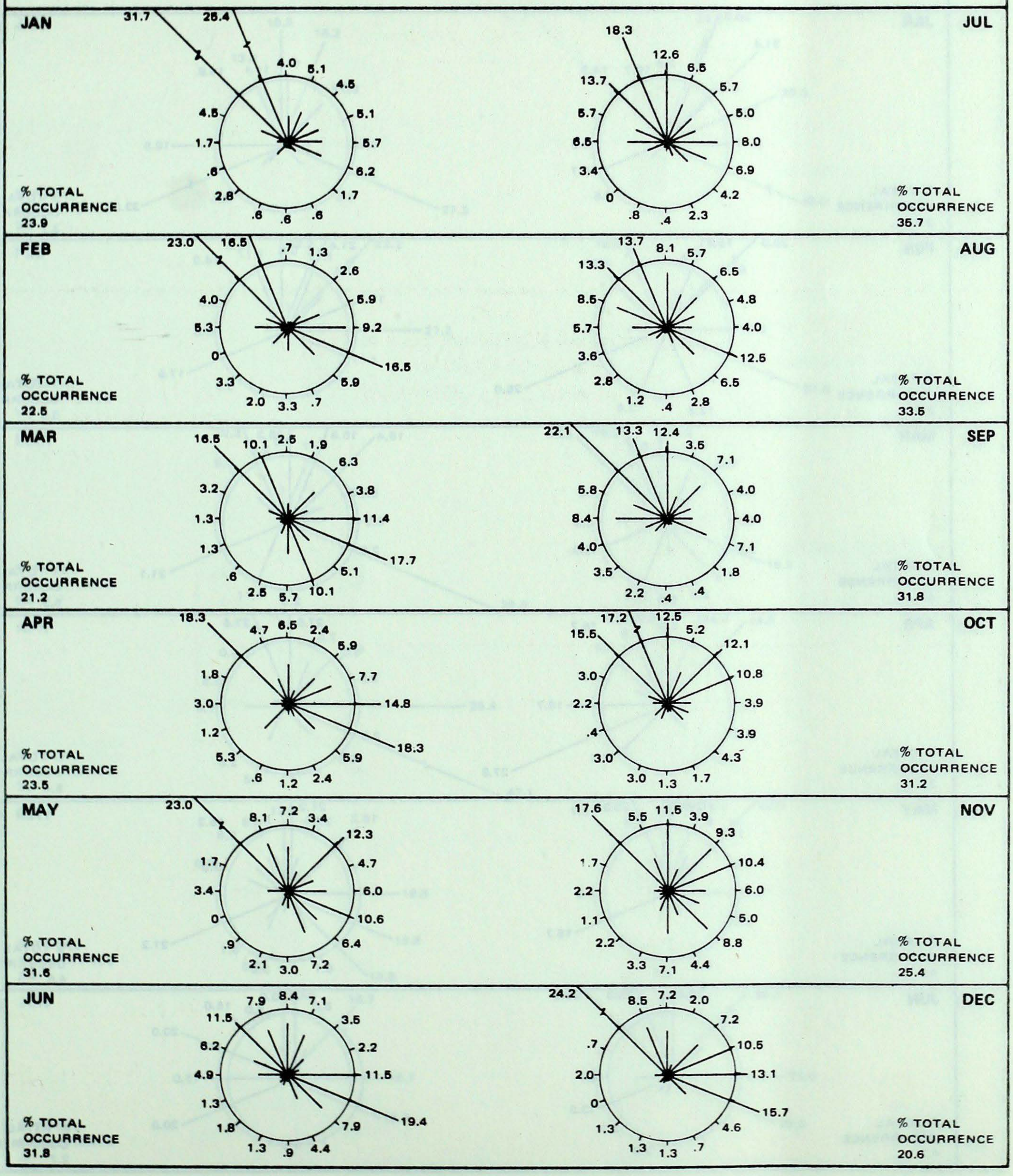


Figure 6:
SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 25–31 M.P.H.
RESOLUTE, N.W.T. (1948–1953)

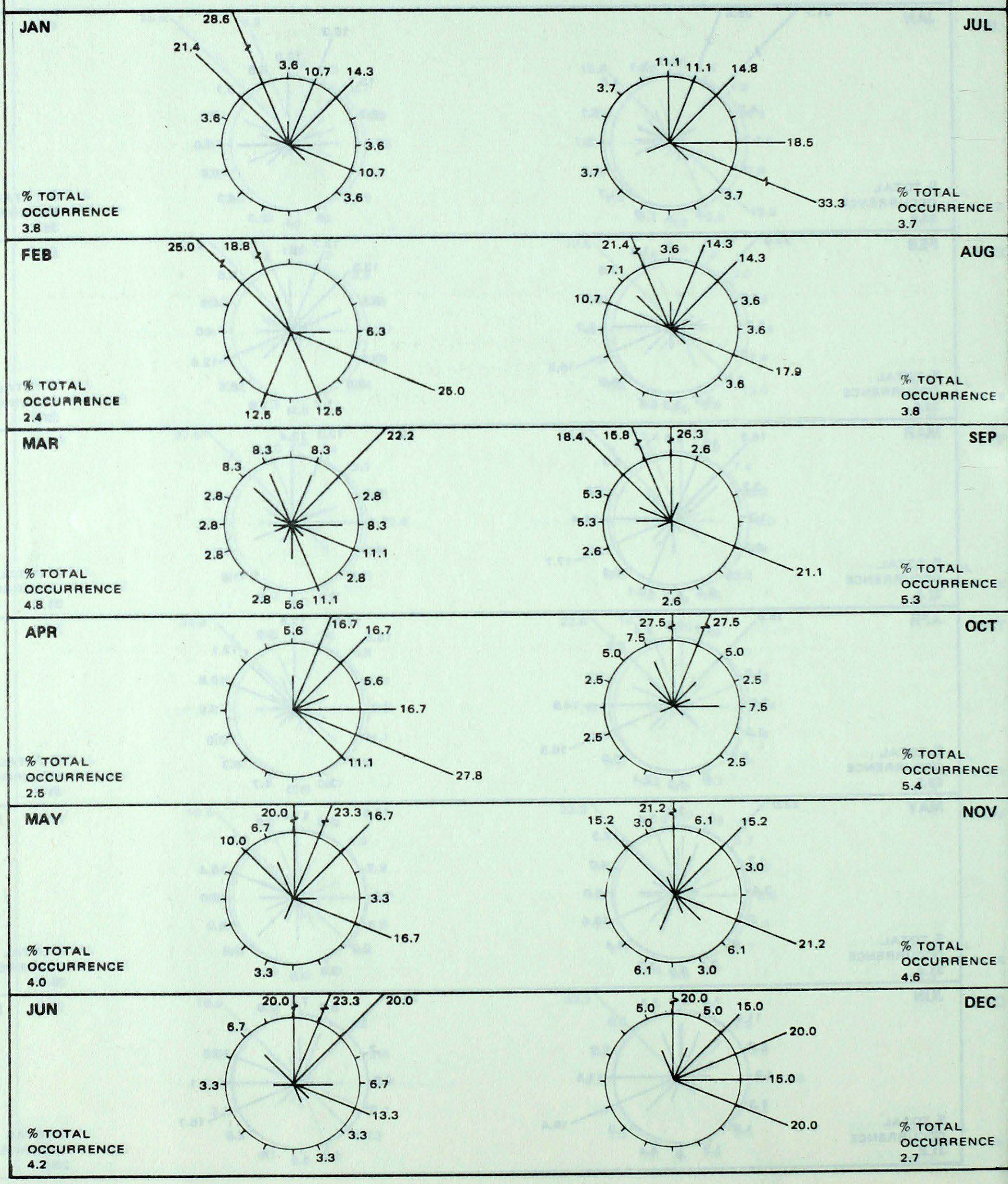


Figure 7:
SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 32–46 M.P.H.
RESOLUTE, N.W.T. (1948–1953)

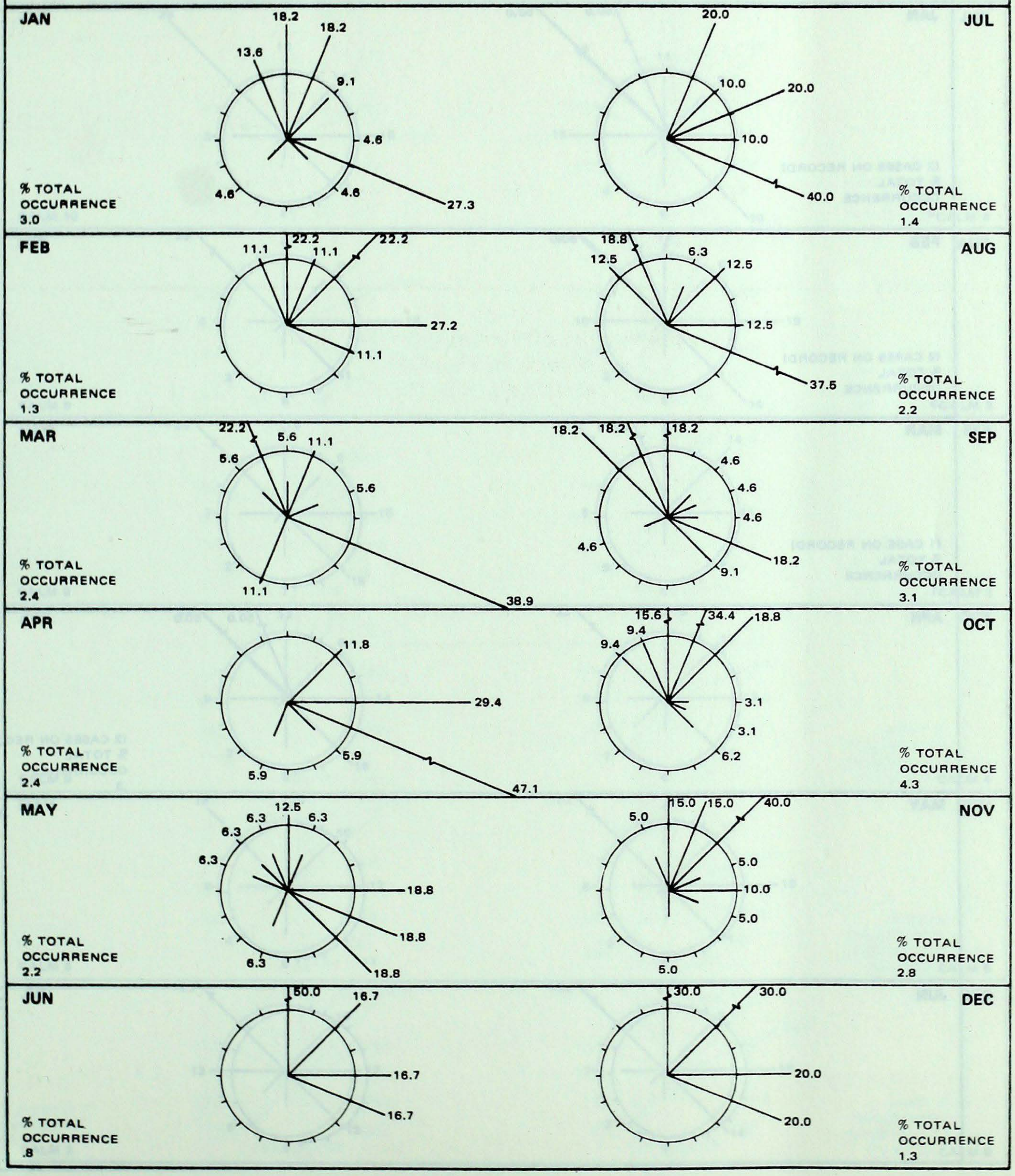


Figure 8:
SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED > 46 M.P.H.
RESOLUTE, N.W.T. (1948–1953)

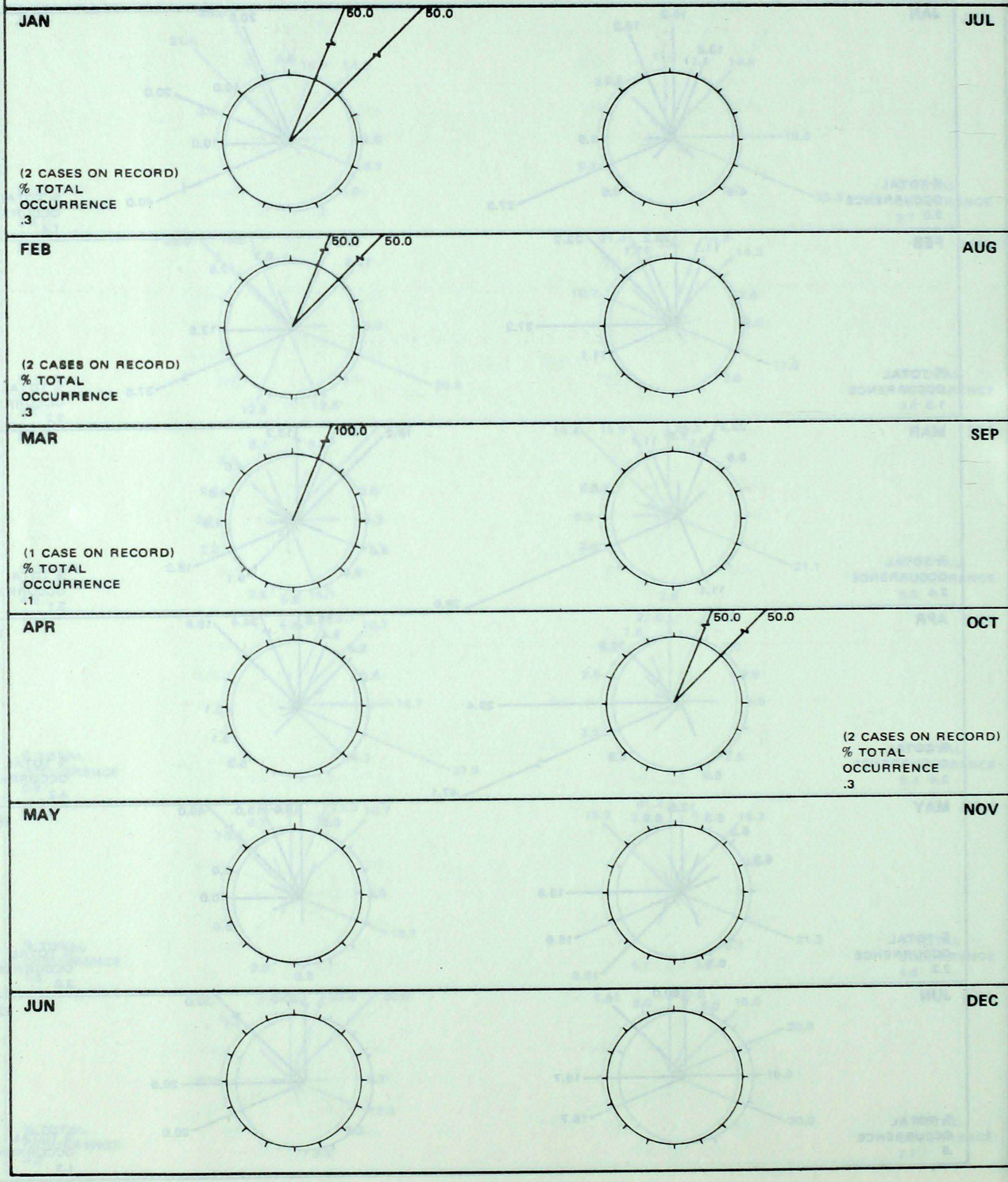


Figure 9:
DIRECTION FREQUENCY (%) FOR ALL SPEEDS
RESOLUTE, N.W.T. (1954–1970)

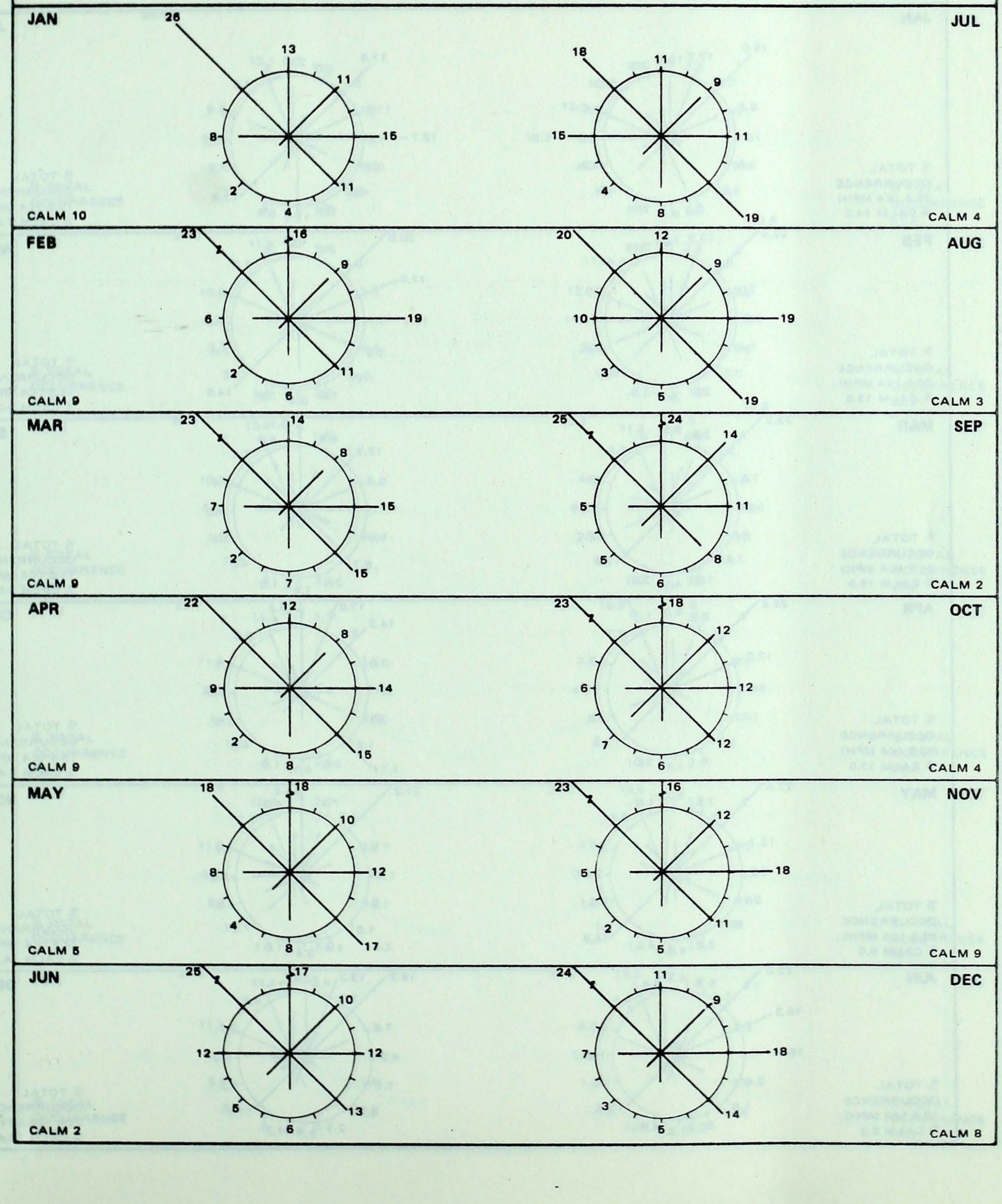


Figure 10:
SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 1–3 M.P.H.
RESOLUTE, N.W.T. (1957–1966)

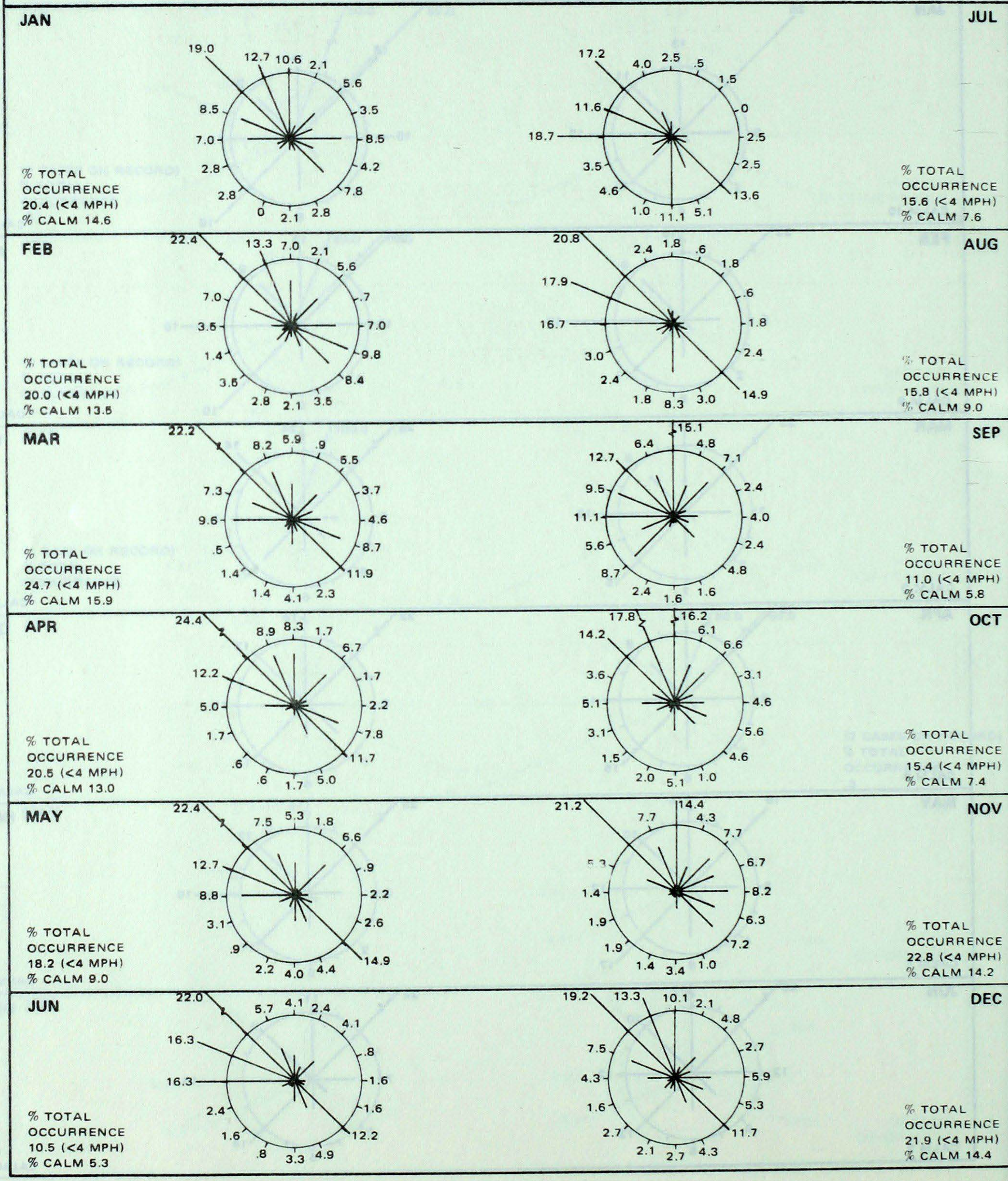


Figure 11:
SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 4–12 M.P.H.
RESOLUTE, N.W.T. (1957–1966)

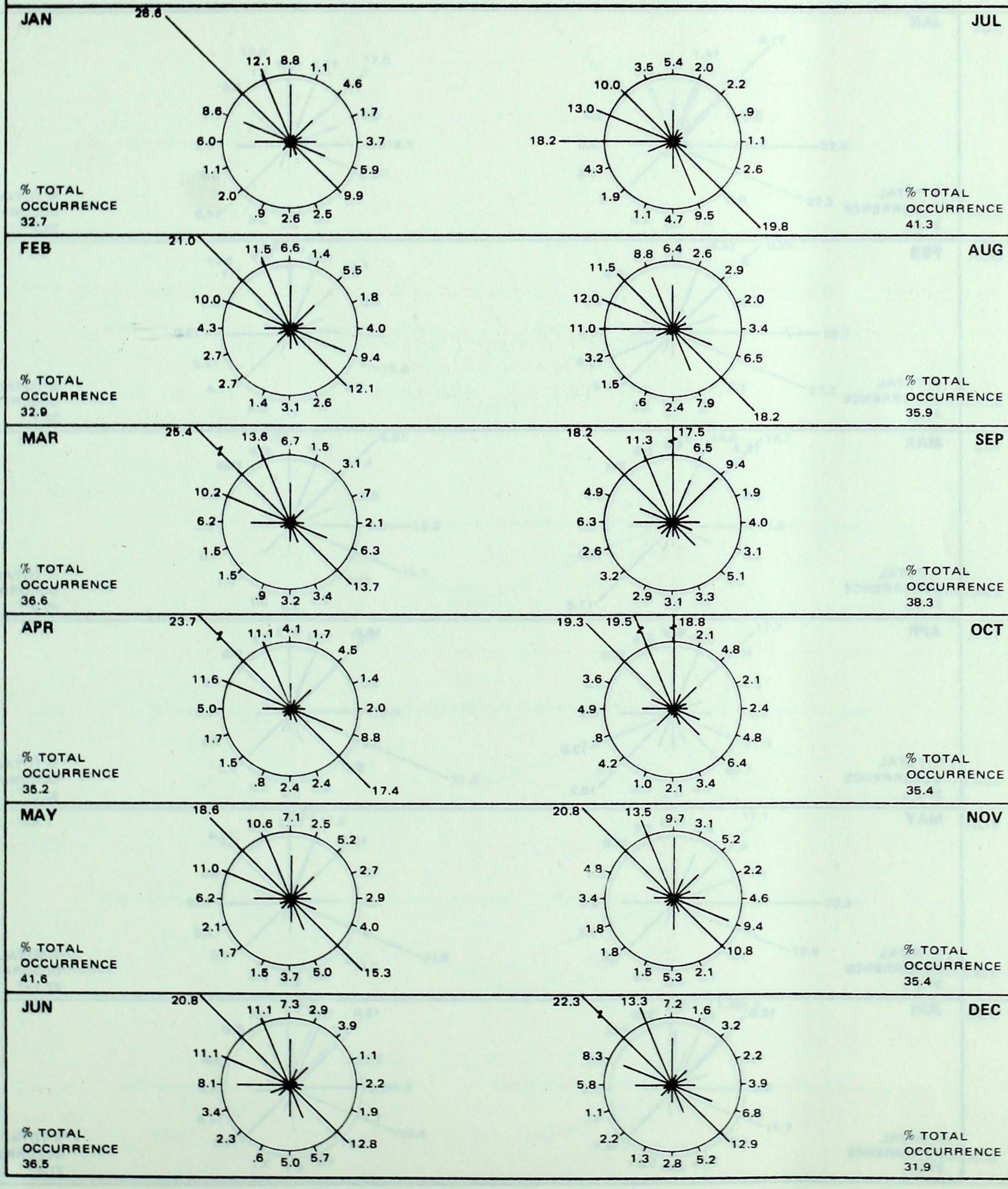


Figure 12:
SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 13–24 M.P.H.
RESOLUTE, N.W.T. (1957–1966)

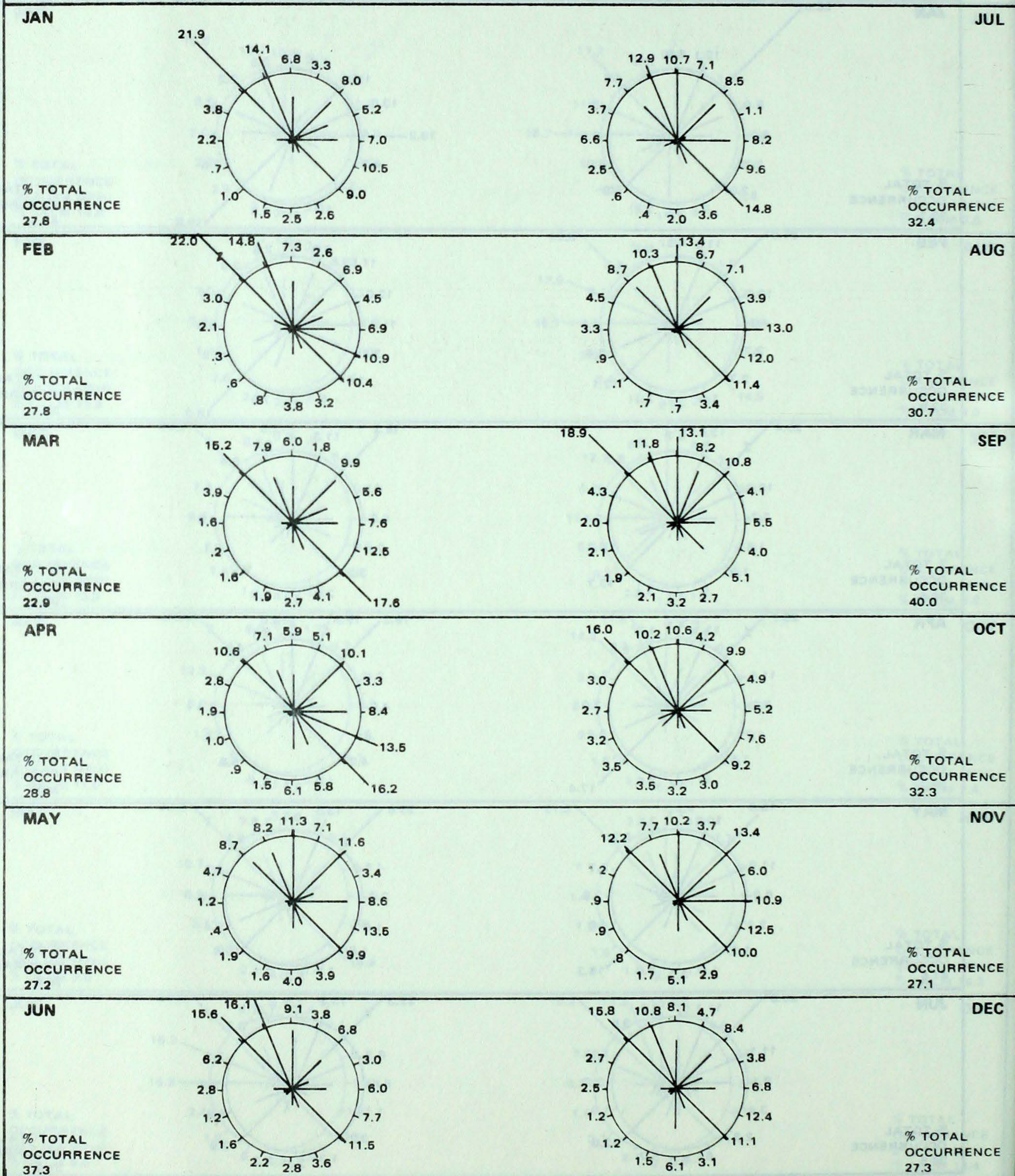


Figure 13:
SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 25–31 M.P.H.
RESOLUTE, N.W.T. (1957–1966)

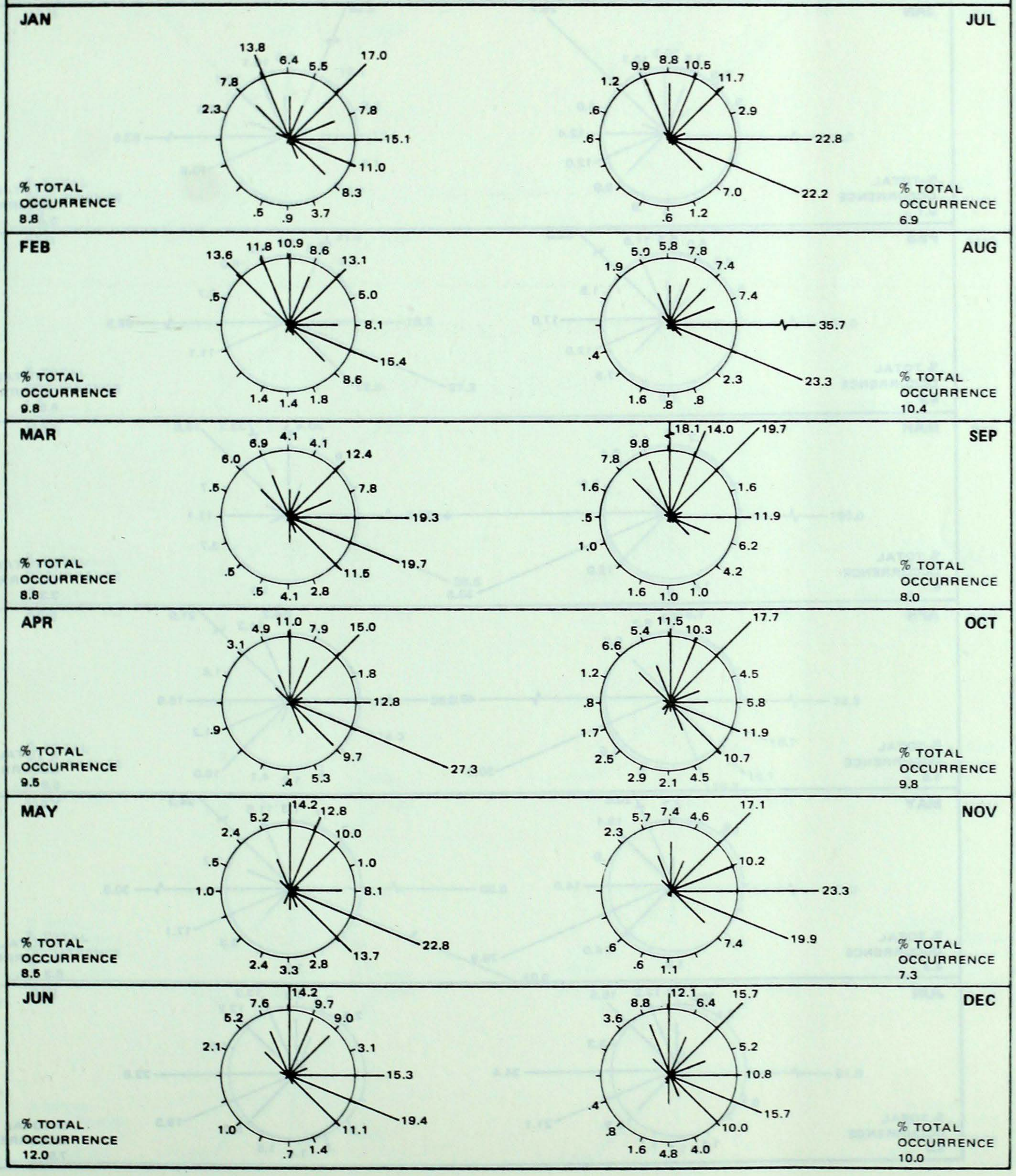


Figure 14:
SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 32–46 M.P.H.
RESOLUTE, N.W.T. (1957–1966)

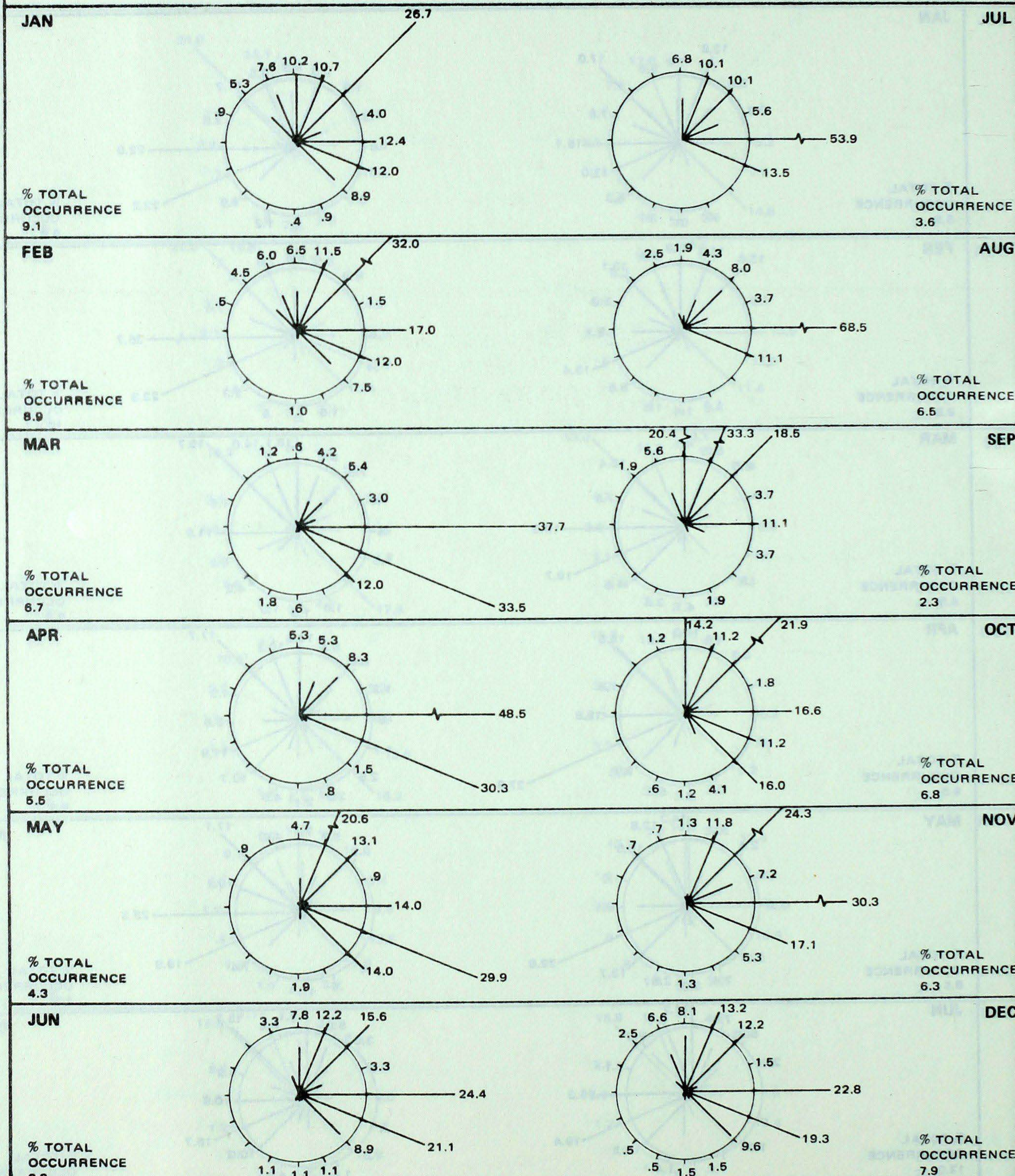


Figure 15:

SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED > 46 M.P.H.
RESOLUTE, N.W.T. (1957–1966)

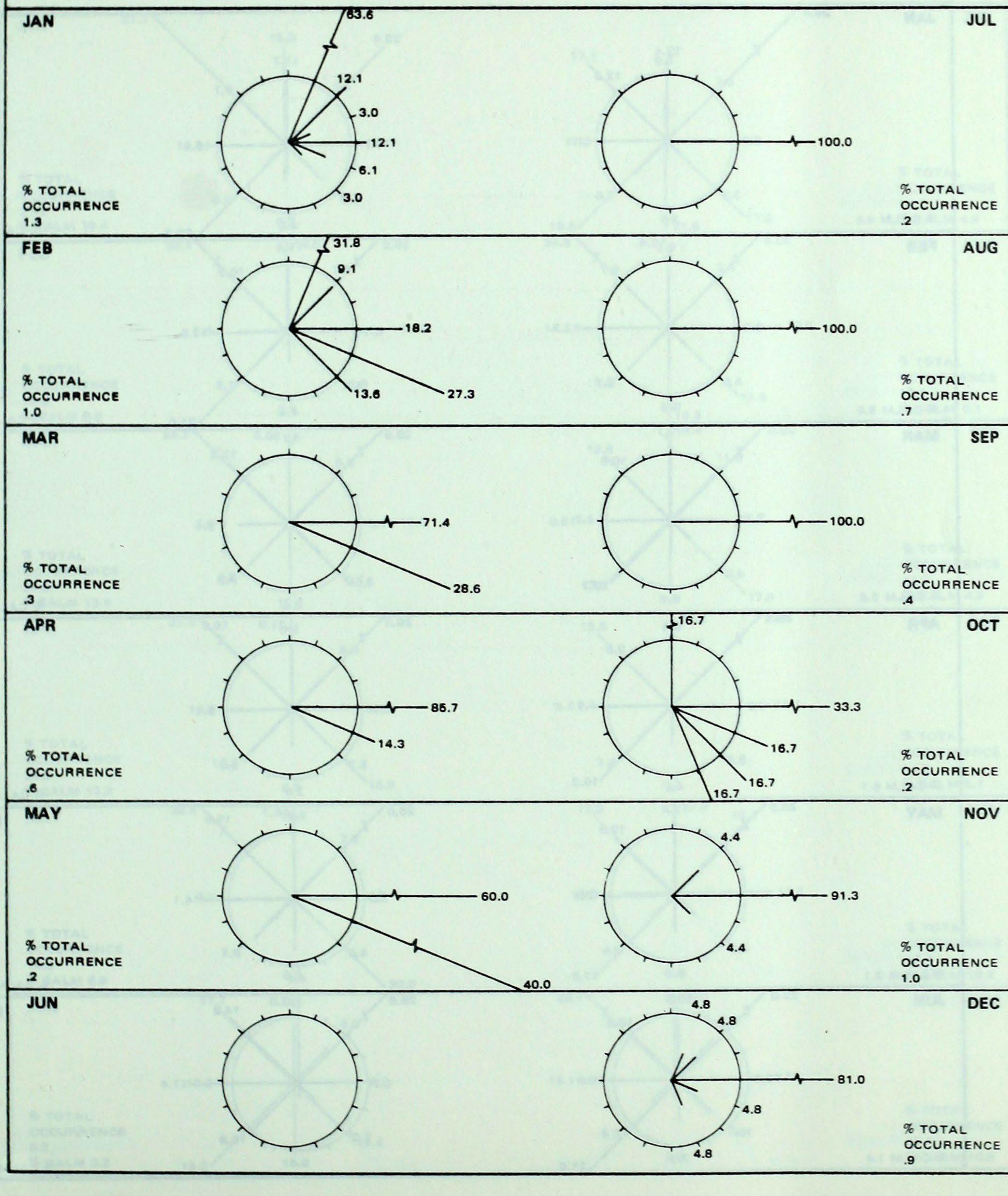


Figure 16:
ESTIMATED WIND DIRECTION FREQUENCIES (%)
ALL SPEEDS
RESOLUTE, N.W.T. (PROPOSED TOWNSITE)

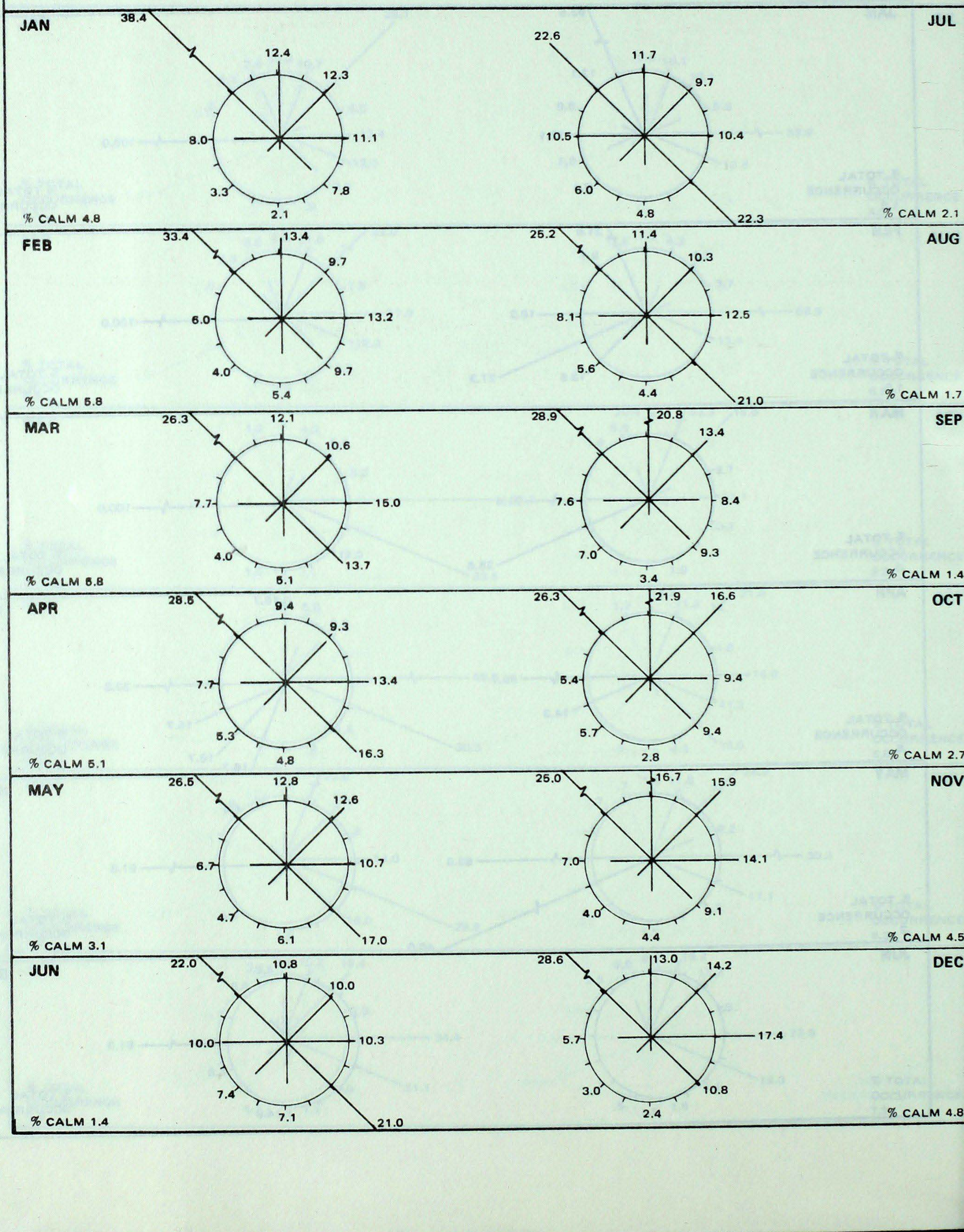


Figure 17:
ESTIMATED SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 1–3 M.P.H.
RESOLUTE, N.W.T. (PROPOSED TOWNSITE)

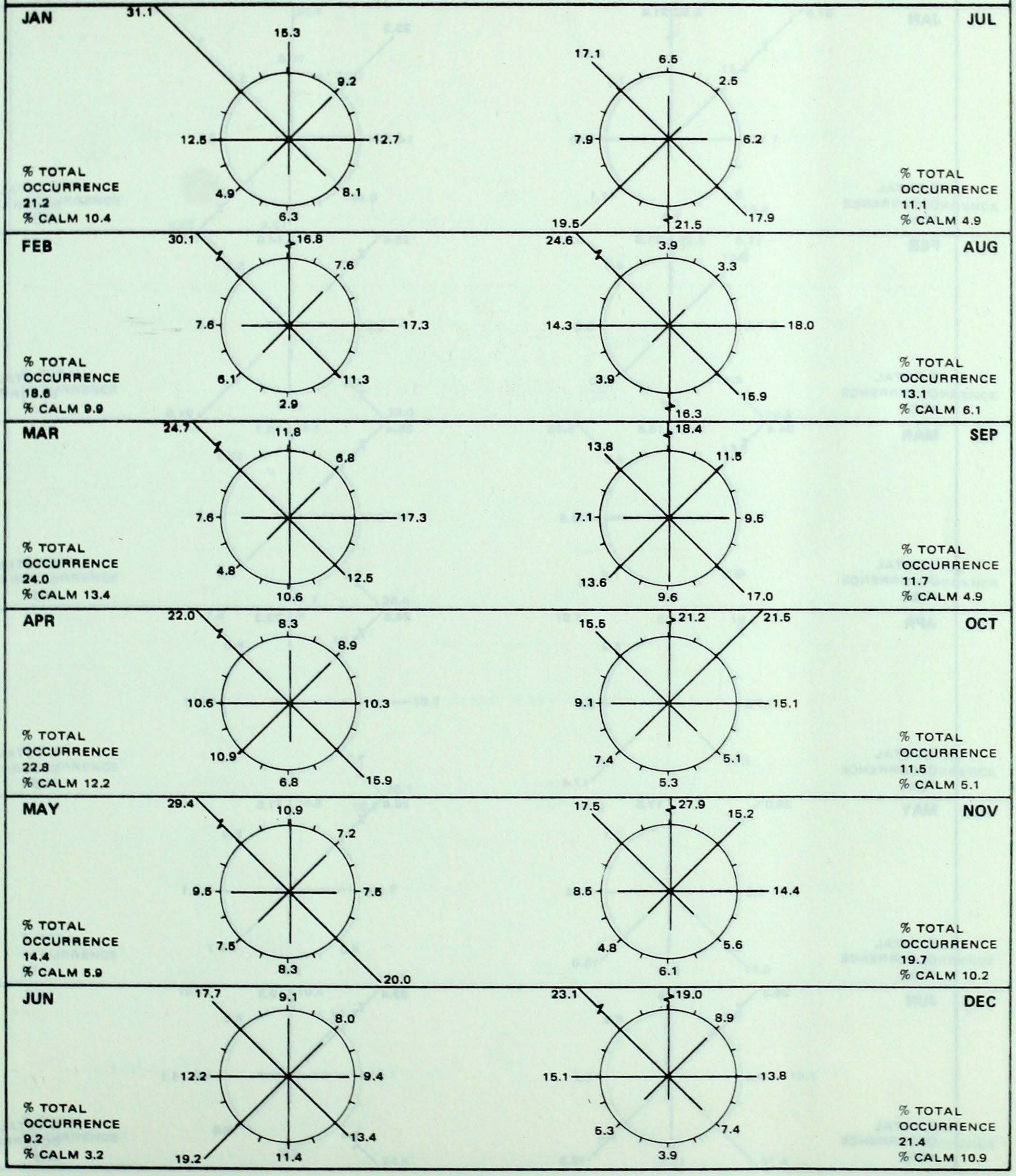


Figure 18:
ESTIMATED SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 4–12 M.P.H.
RESOLUTE, N.W.T. (PROPOSED TOWNSITE)

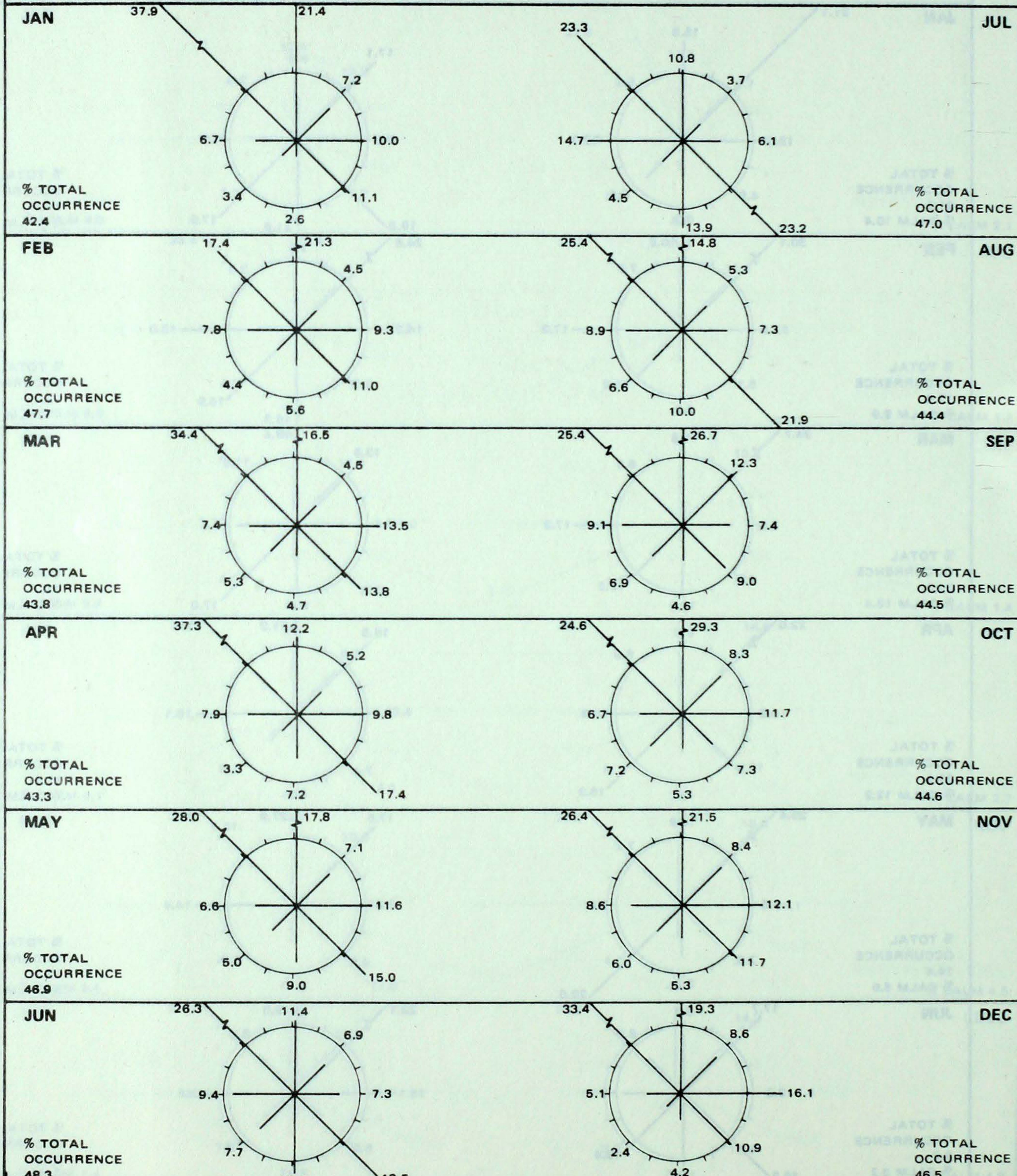


Figure 19:
ESTIMATED SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 13–24 M.P.H.
RESOLUTE, N.W.T. (PROPOSED TOWNSITE)

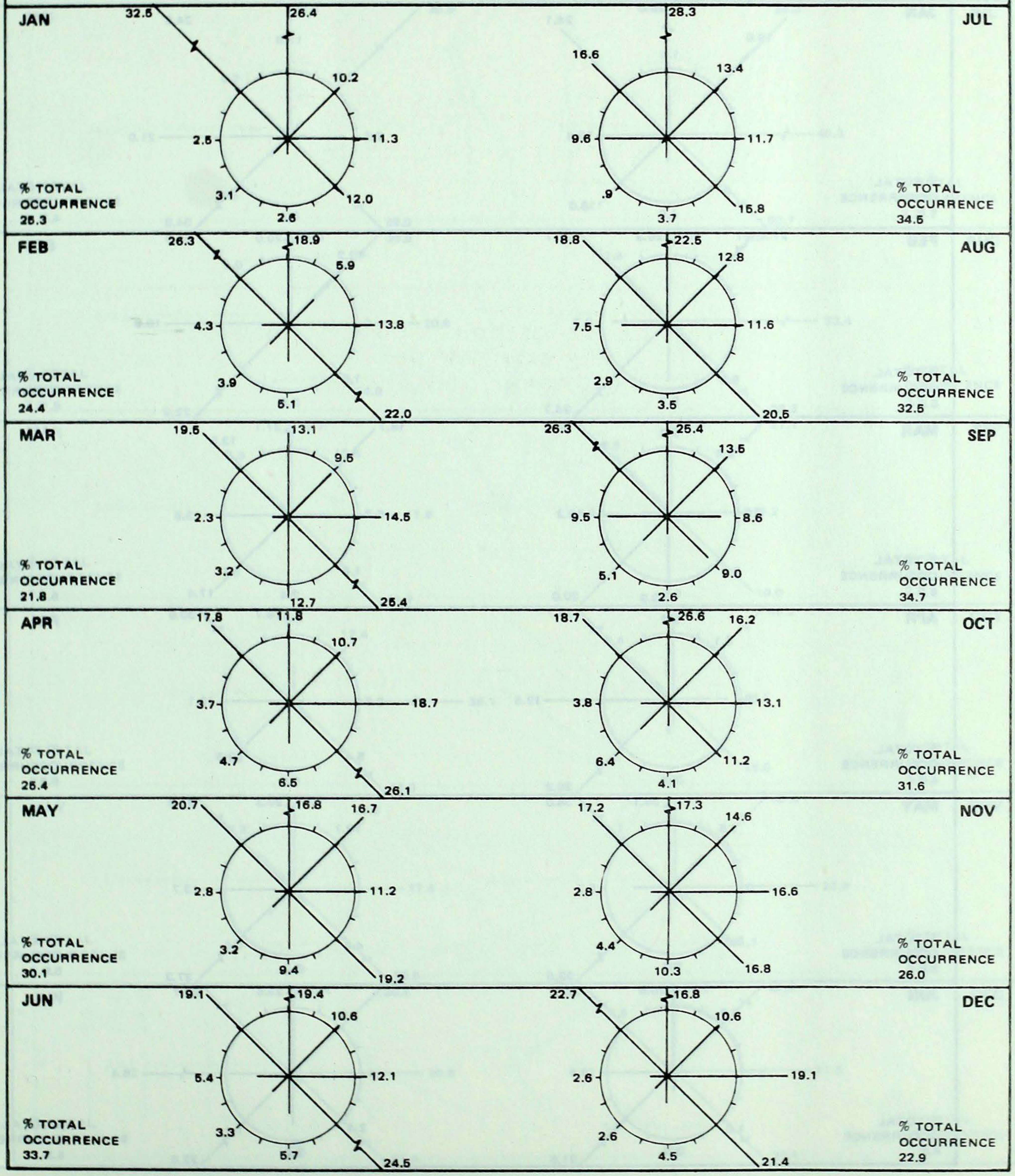


Figure 20:
ESTIMATED SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 25–31 M.P.H.
RESOLUTE, N.W.T. (PROPOSED TOWNSITE)

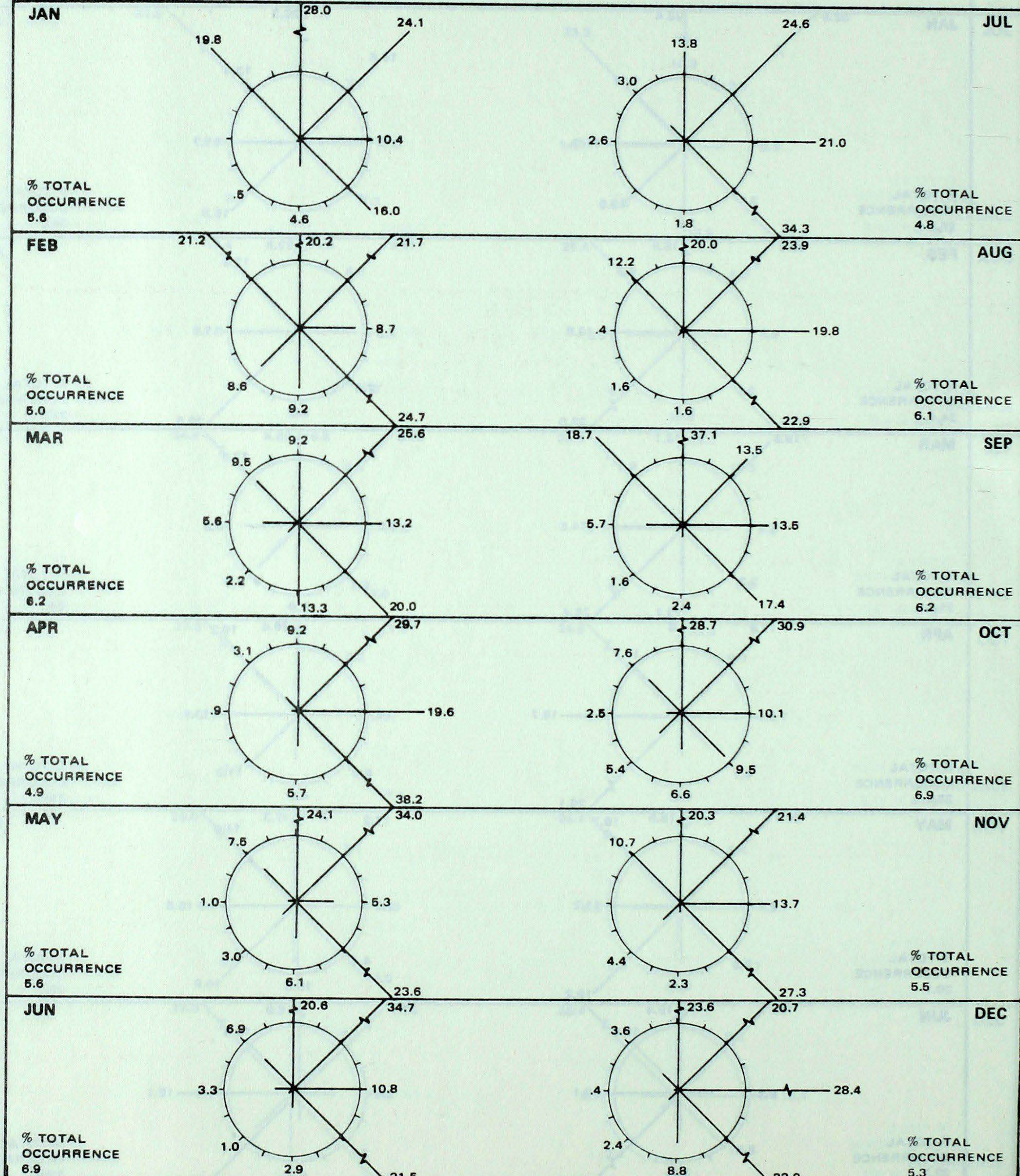


Figure 21:
ESTIMATED SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED 32–46 M.P.H.
RESOLUTE, N.W.T. (PROPOSED TOWNSITE)

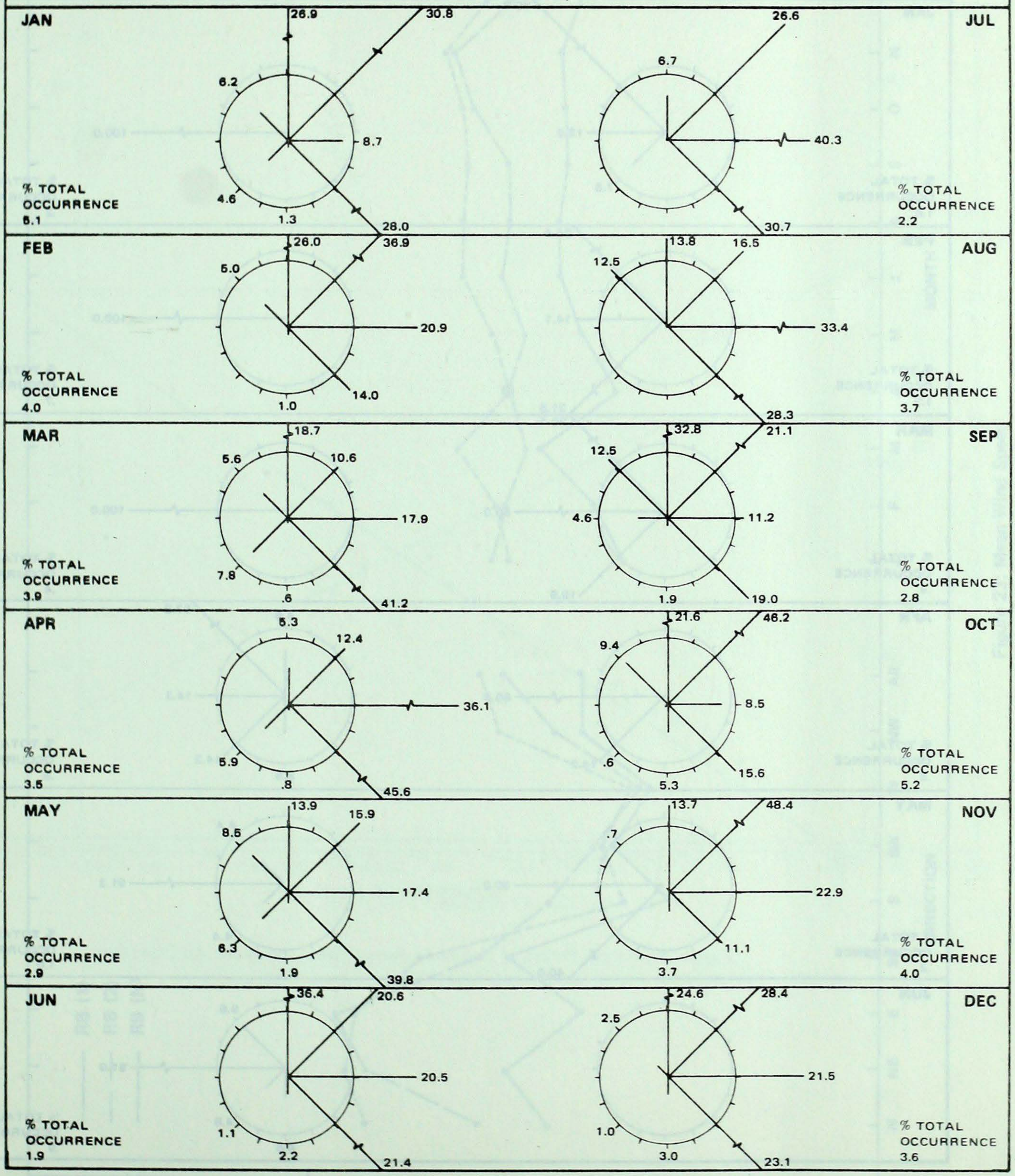
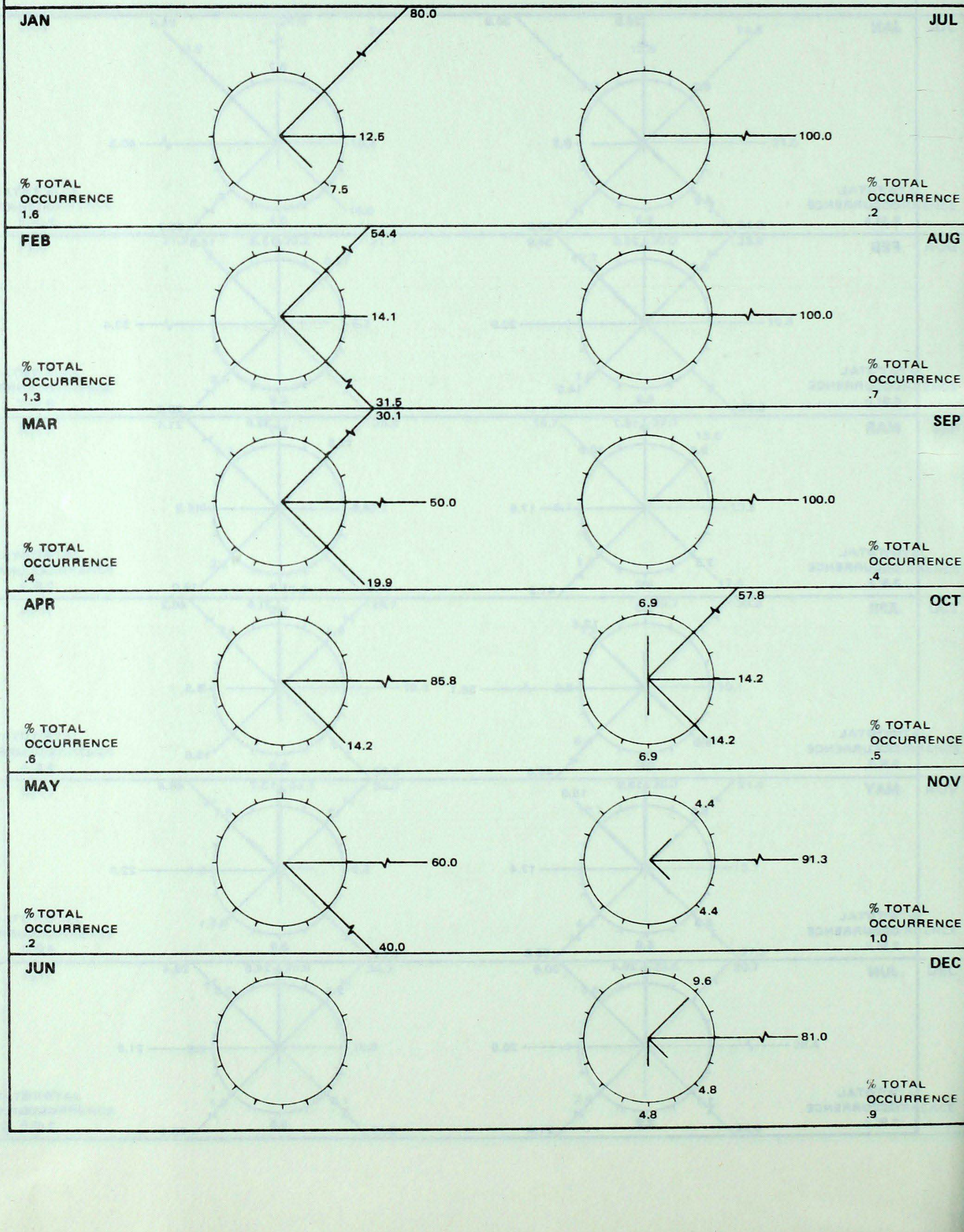


Figure 22:
ESTIMATED SURFACE WIND DIRECTION FREQUENCIES (%)
WITH SPEED > 46 M.P.H.
RESOLUTE, N.W.T. (PRORPOSED TOWNSITE)



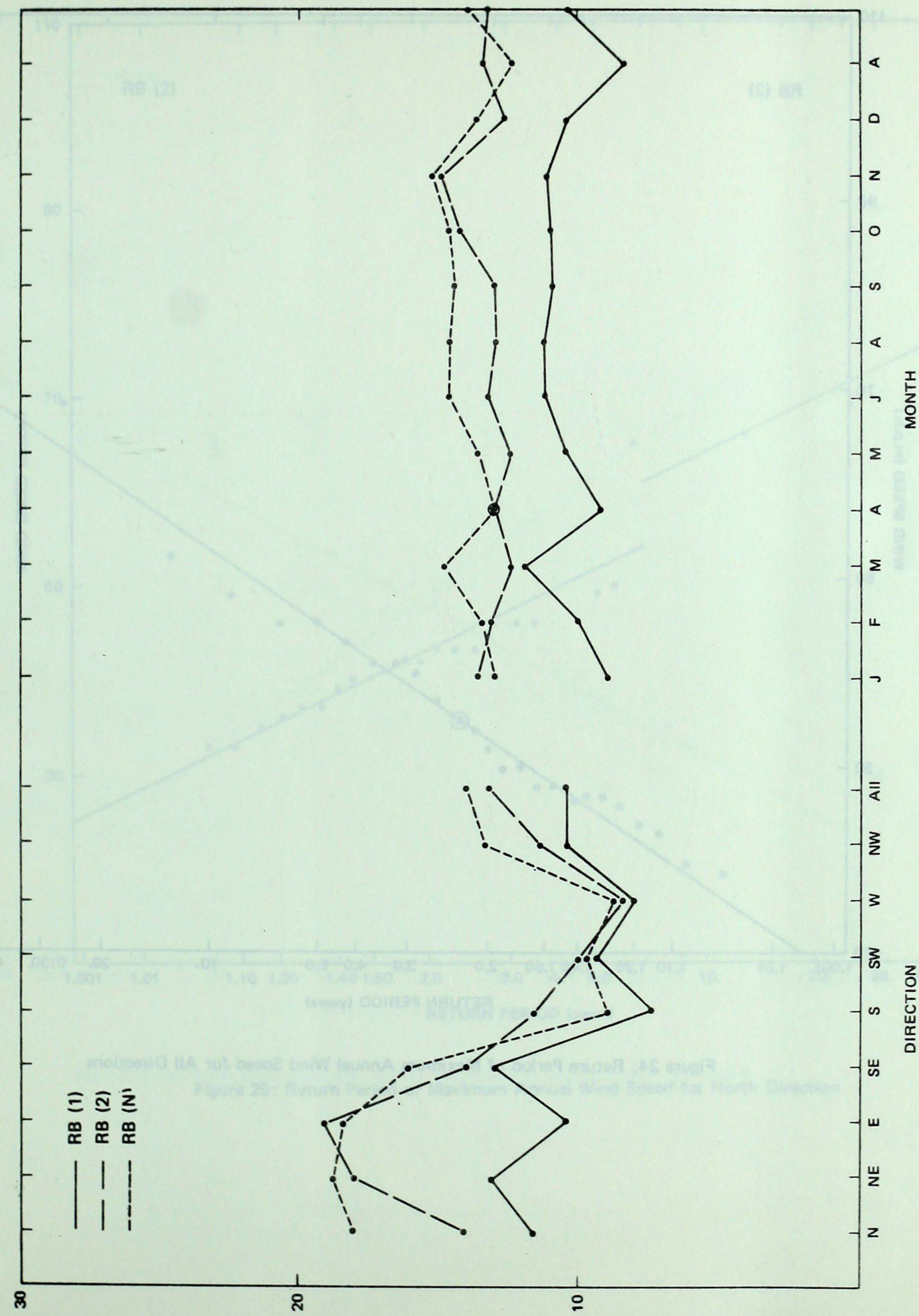


Figure 23: Mean Wind Speed

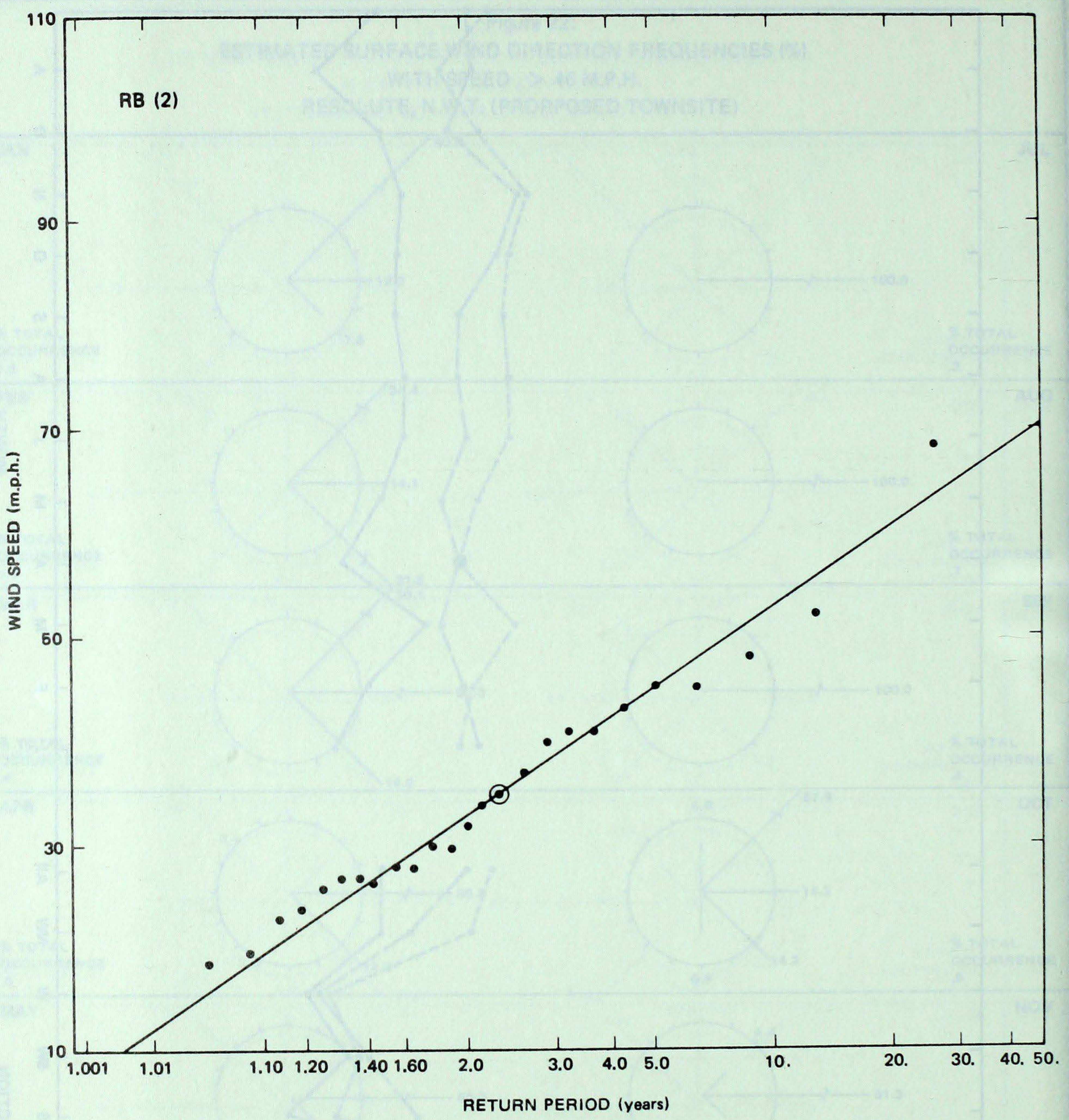


Figure 24: Return Period of Maximum Annual Wind Speed for All Directions

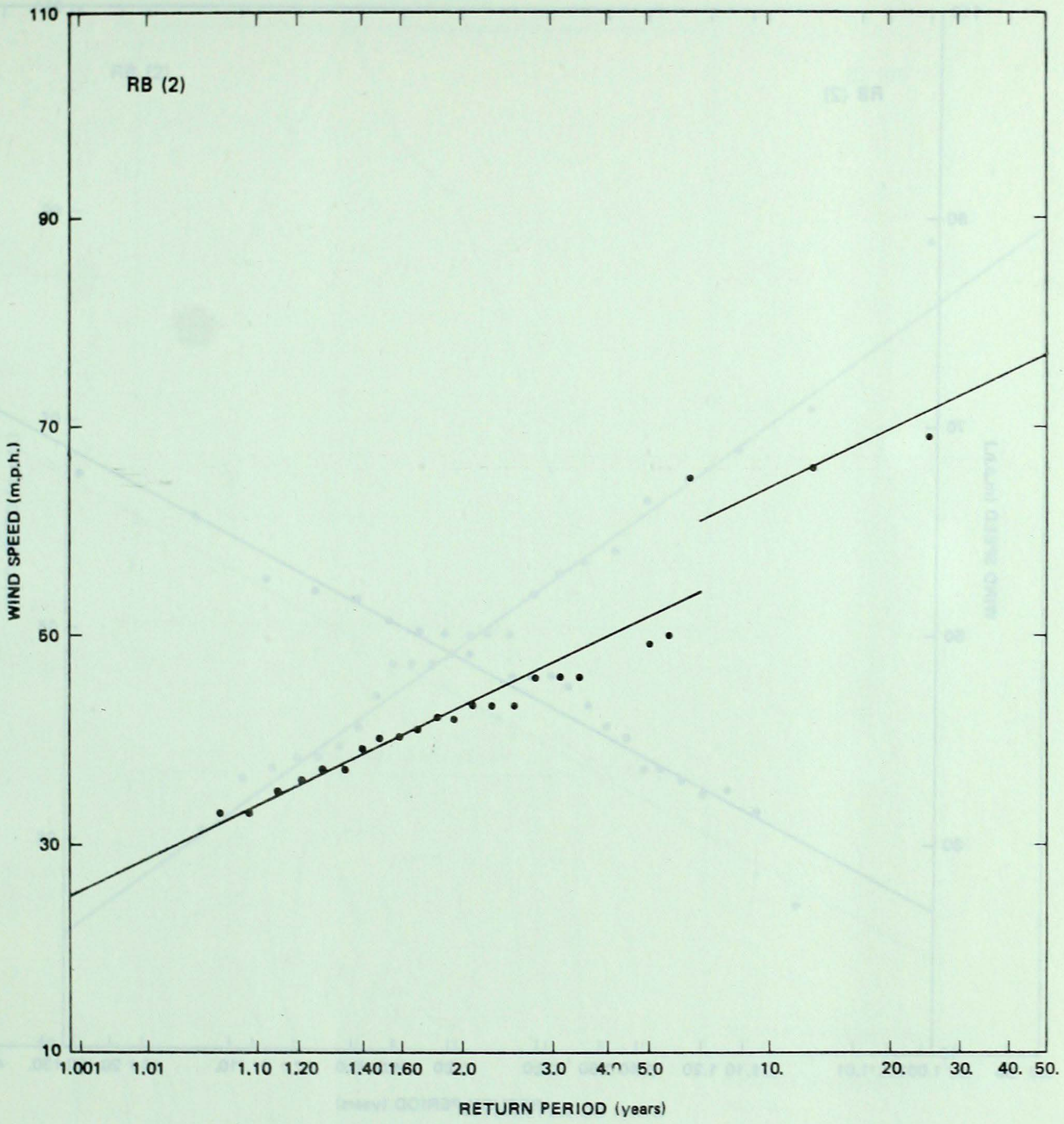


Figure 25: Return Period of Maximum Annual Wind Speed for North Direction

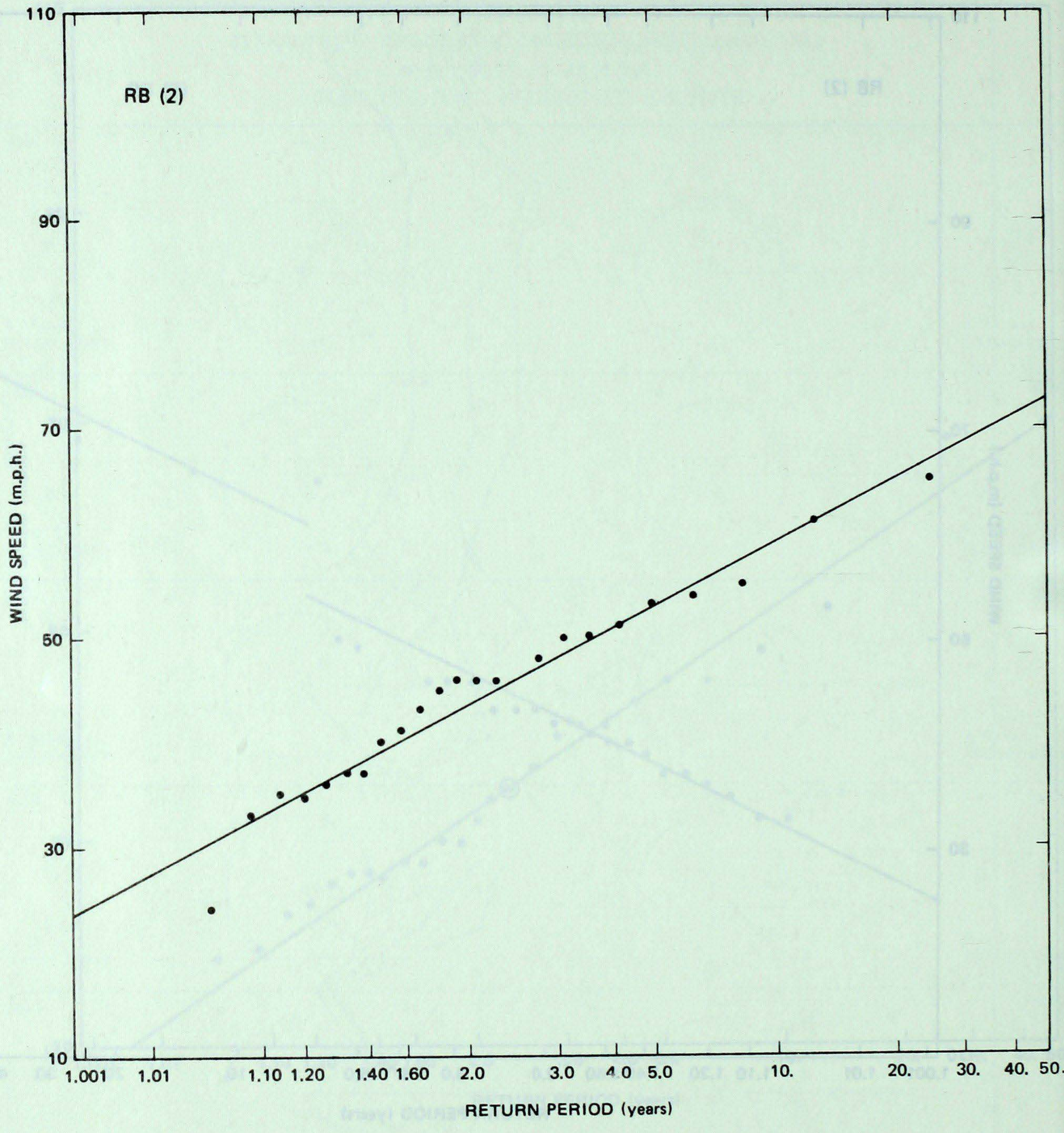


Figure 26: Return Period of Maximum Annual Wind Speed for Northeast Direction

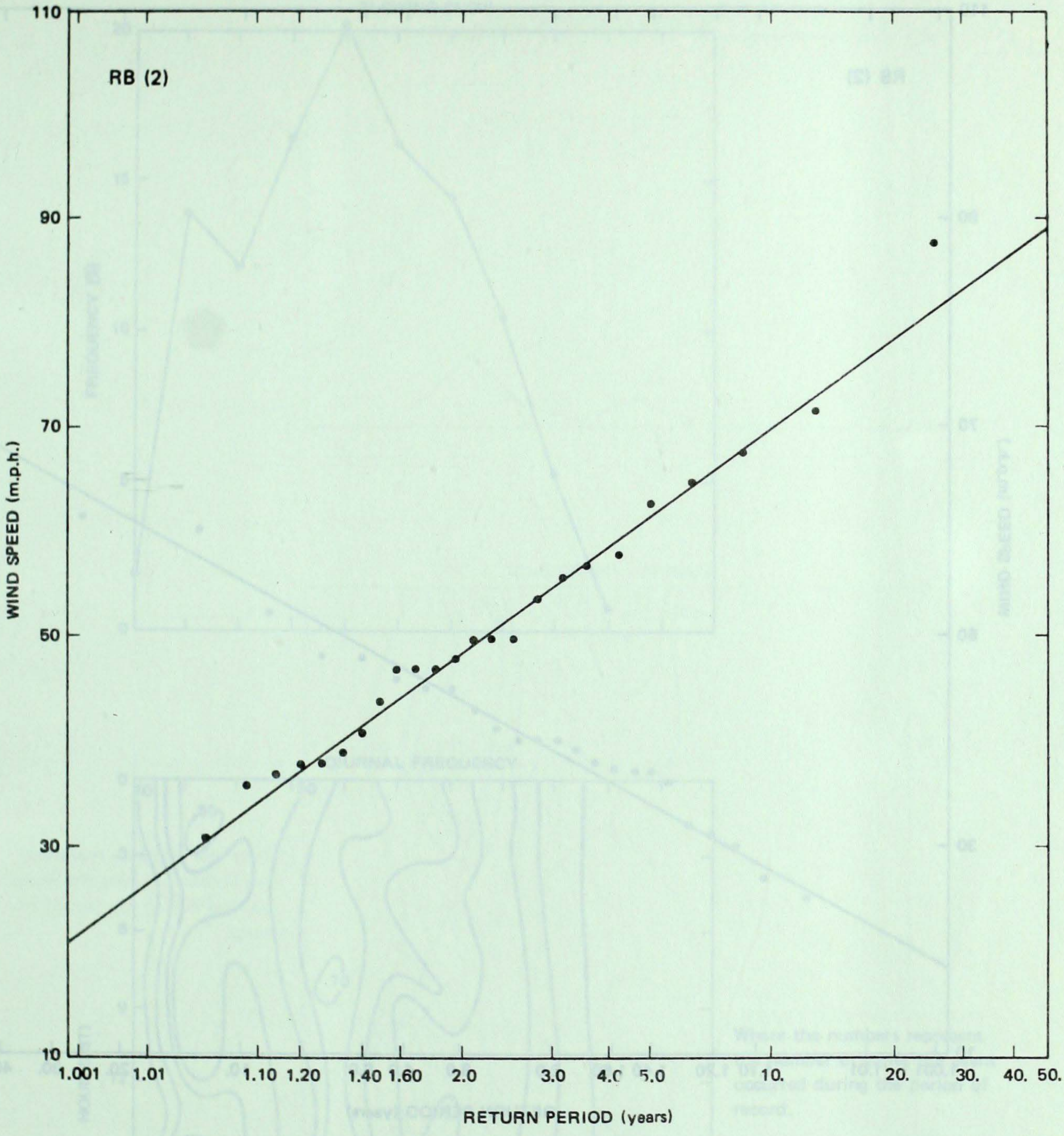


Figure 27: Return Period of Maximum Annual Wind Speed for East Direction

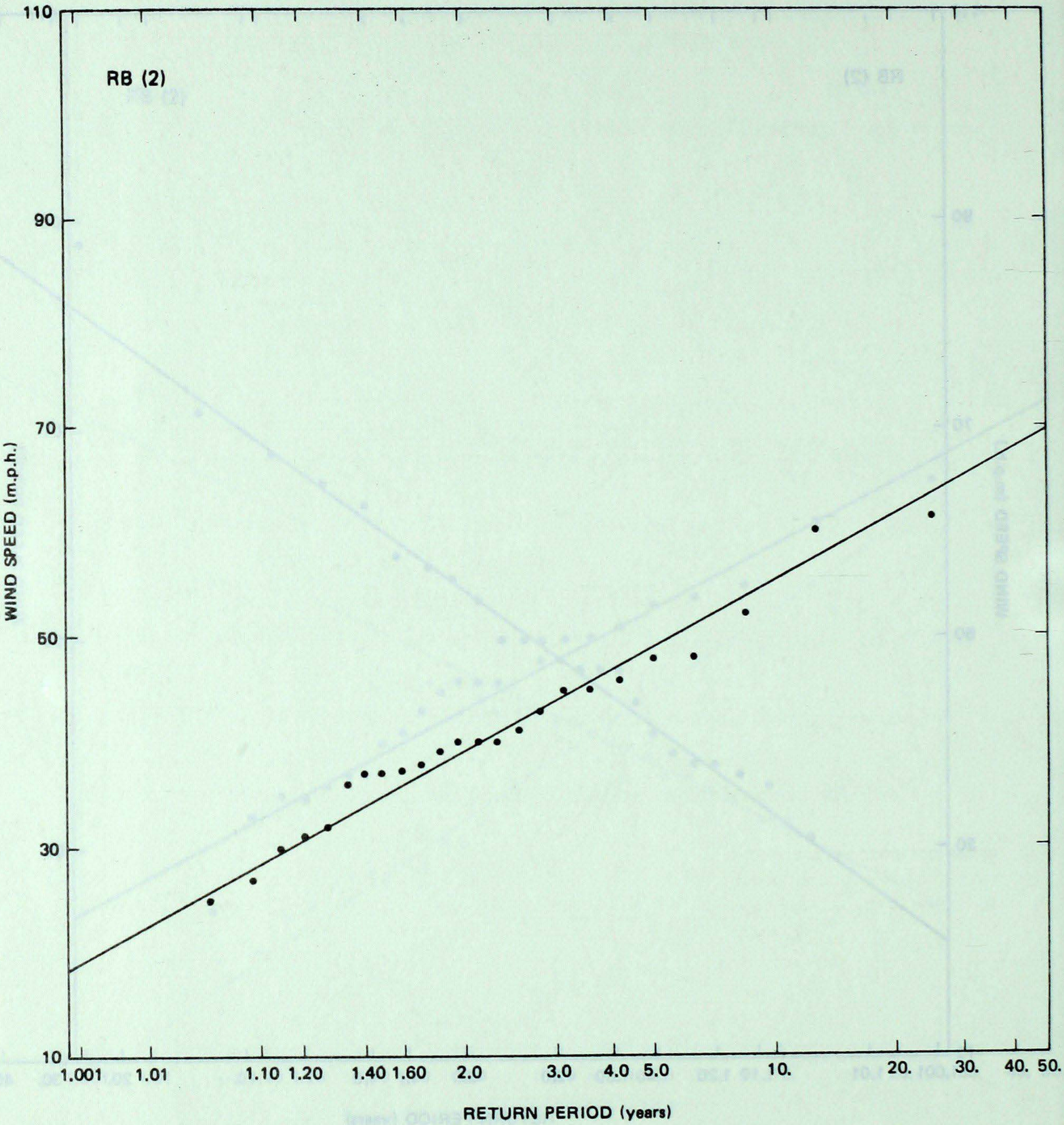
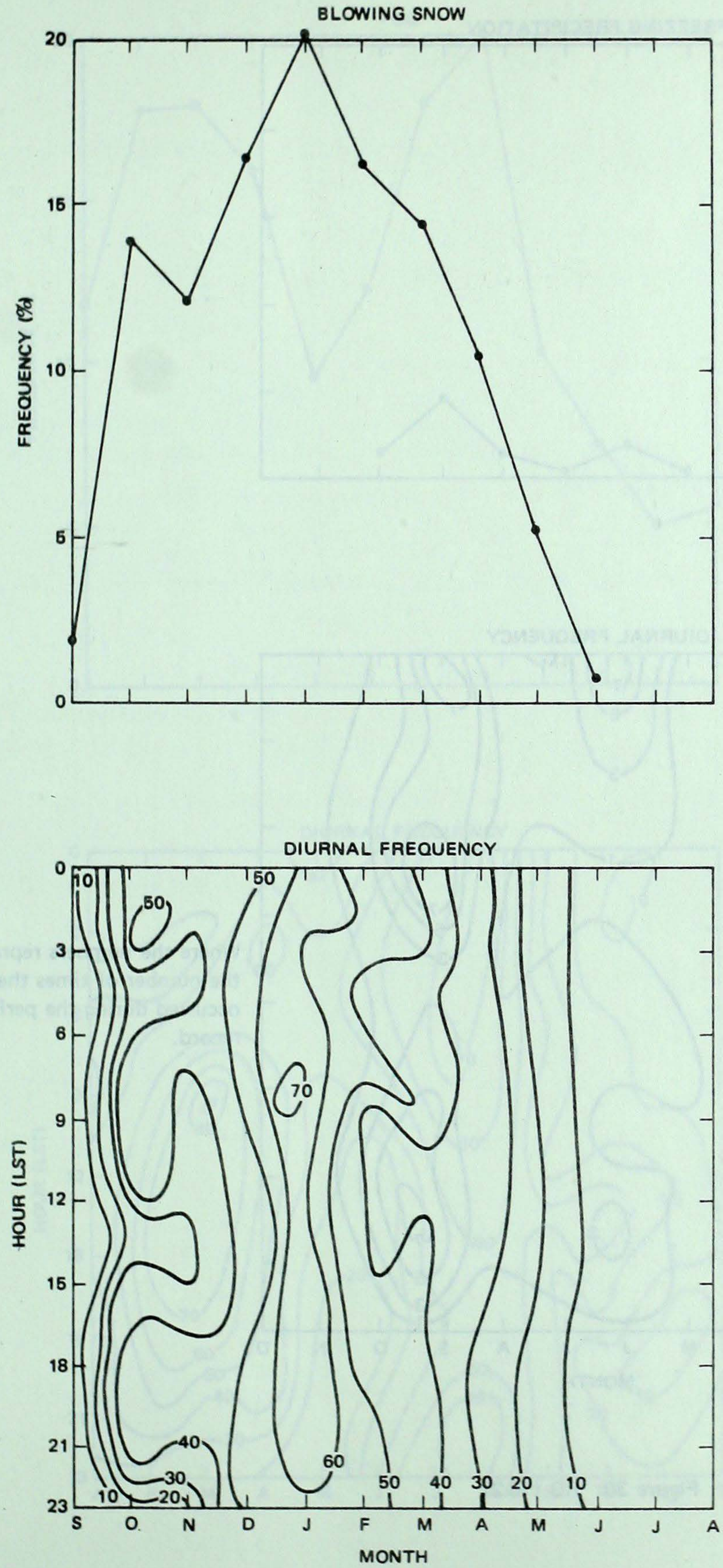
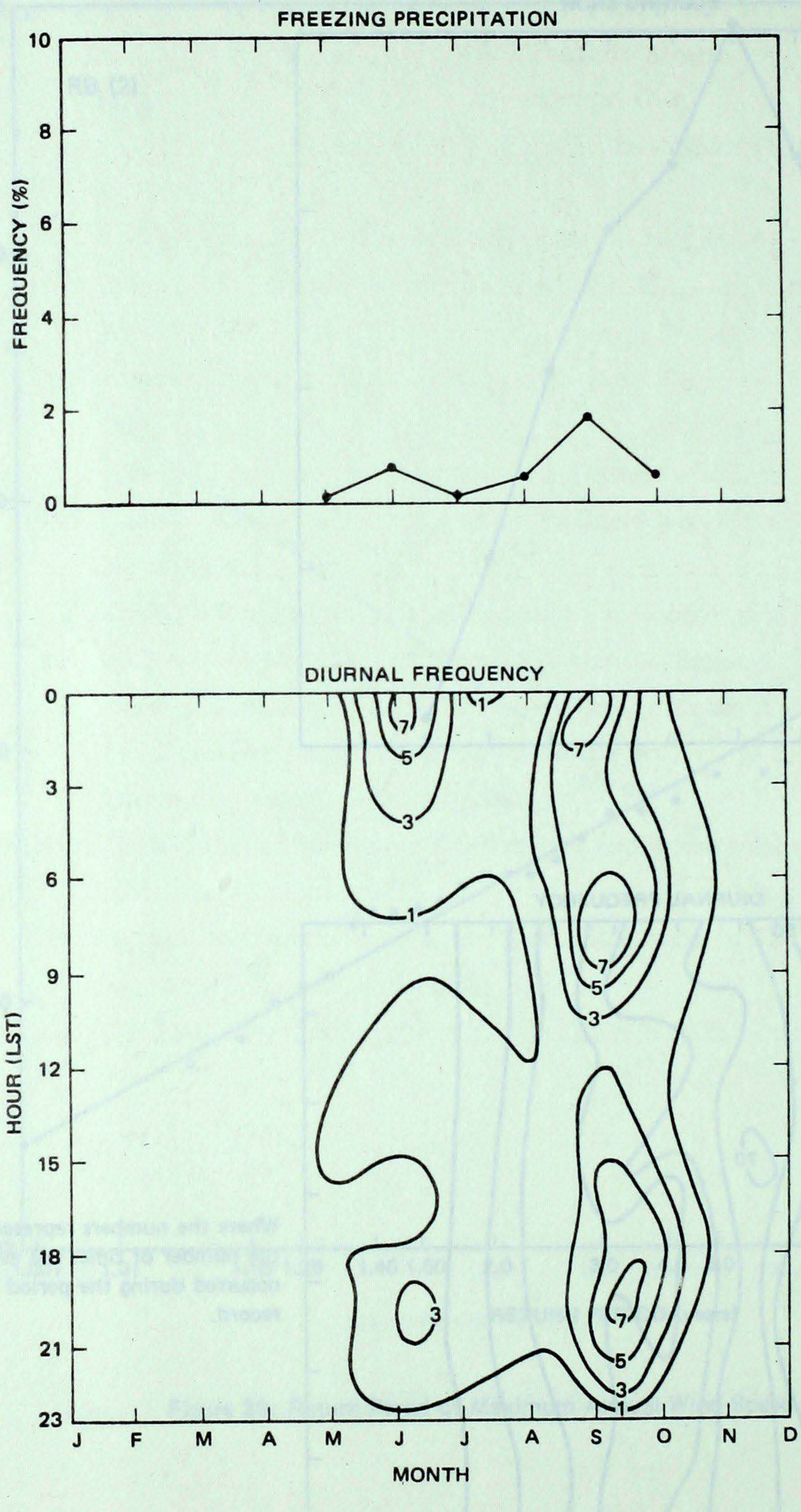


Figure 28: Return Perod of Maximum Annual Wind Speed for Southeast Direction



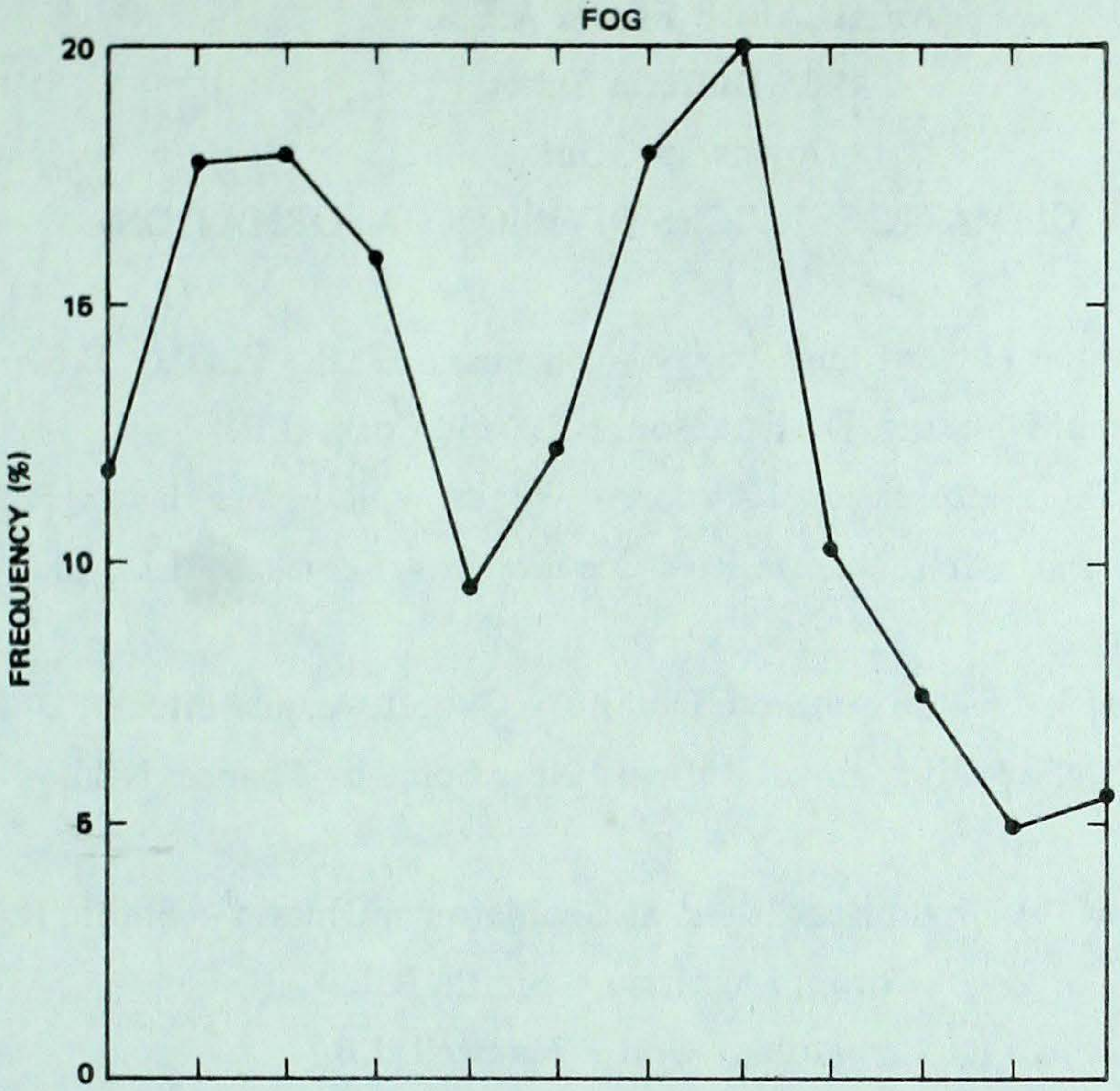
Where the numbers represent the number of times the event occurred during the period of record.

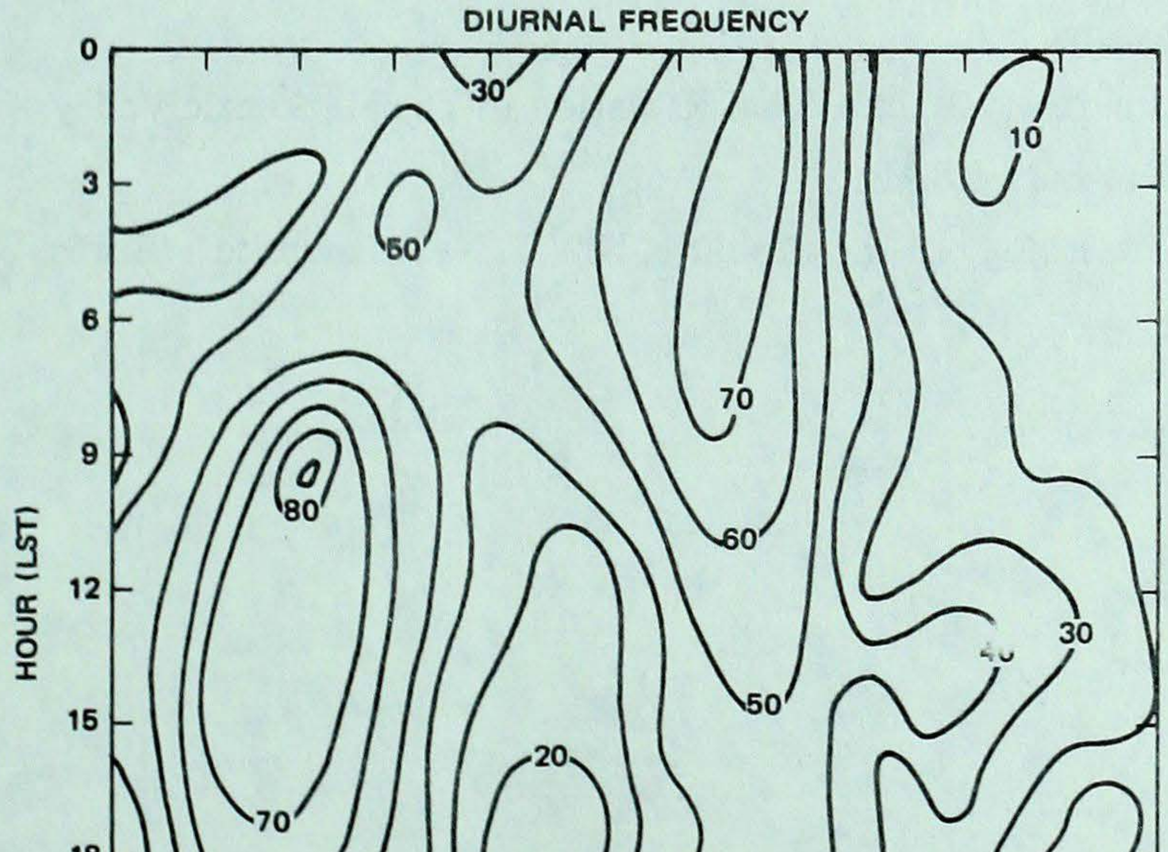
Figure 29: RB (1&2)



Where the numbers represent the number of times the event occurred during the period of record.

Figure 30: RB (1&2)





Where the numbers represent the number of times the event occurred during the period of record.

Figure 31: RB (1&2)

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2. Bowen Ratio Graphs – Storr, D., Ferguson, H.L., and Cork, H.F.
3. Wind Survey: Halifax International Airport – Woodrow, R.J., and Hawks, R.L.
4. Progress Report on the IHD Niagara River Ice Project – Ferguson, H.L., and Cork, H.F.
5. A Brief Survey of Ice Fall in Southern Ontario – Gilbert, A., and Pitcher, D.
6. Climatic Aspects of Locating an Oil Refinery Near Come by Chance, Nfld. – Verge, R.W.
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10. The Development of a Prediction Equation for Transit System Line Frost at Edmonton, Alberta – Burns, B.M.
11. The Synthetic Climatologies of Ivugivik and Wolstenholme, Quebec – Burns, B.M., and Richardson, F.A.
12. Applied Regression Analysis On Global Radiation In The Mackenzie Valley – Swyszez, O.O., and Burns, B.M.
13. The Synthetic Climatology of the Resolute, N.W.T. New Townsite – Burns, B.M.