

Wind Resource Summary for Olga Site

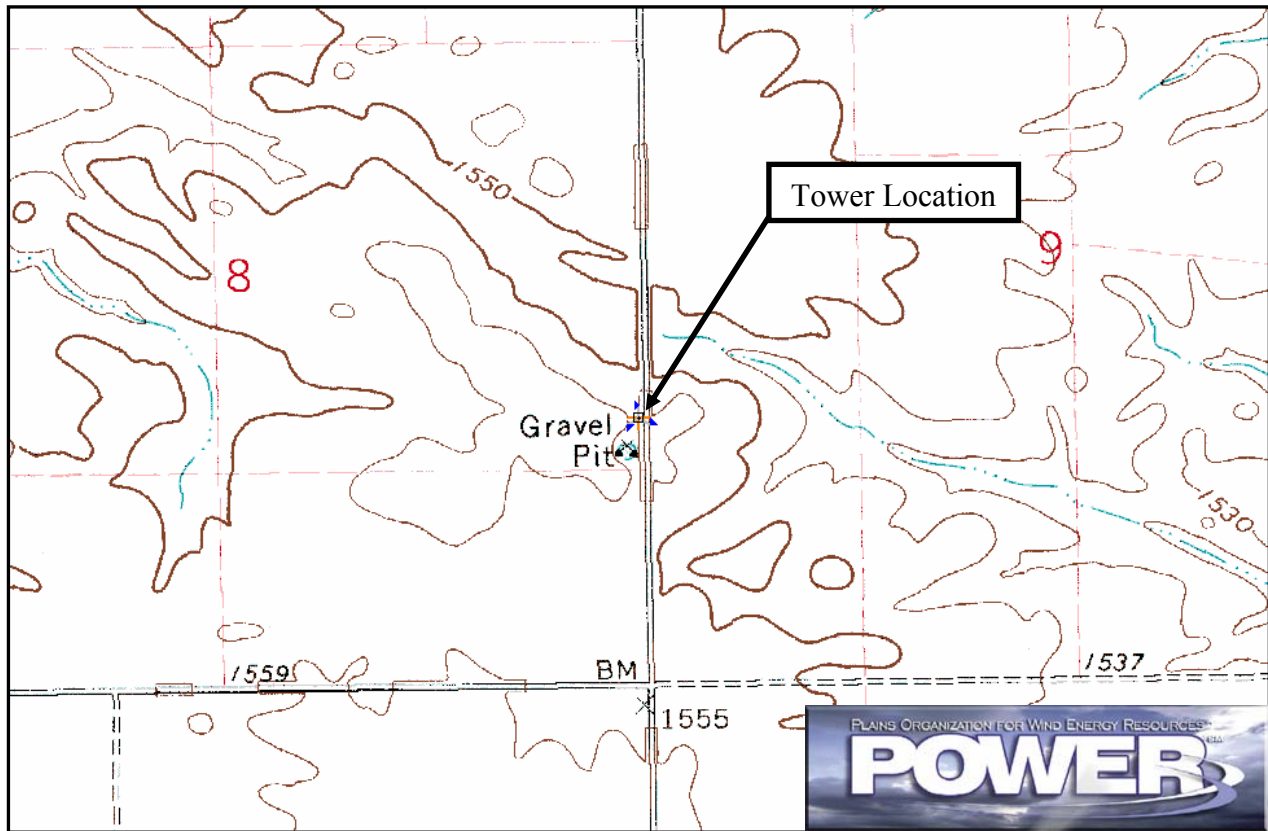
North Dakota Utility Study

Winters^a 1994, 1995, 1996, 1997, 1998, 1999, 2000 & 2001

Site Description:

Latitude: N 48° 46' 48"	Township: 161 N
Longitude: W 98° 2' 16"	Range: 57 W
Elevation: 1555 feet	Section: 9
Tower Type: Utility Tower	Tower Height: 300 feet

The monitoring site was 9.1 miles northeast of the town of Osnabrock, North Dakota. The tower was instrumented at four levels: 33 feet (10 m), 82 feet (25 m), 131 feet (40 m), and 180 feet (55 m). A gravel pit is located 200 feet due south of the site, as well as a windbreak roughly 0.3 miles south and southwest.



Summary Wind Data:	33 ft AGL ^b	82 ft AGL	131 ft AGL	180 ft AGL
Mean Wind Speed (mph)	12.2 mph	15.1 mph	17.0 mph	17.9 mph
Maximum, 60-min Mean Wind Speed	59.6 mph at 180 ft AGL – 12/5/1995 2:00 a.m.			
Estimated Wind Power Class ^c	Class 4 (501 W/m ² at 180 ft AGL)			

^a Winter is defined as the months of December, January and February. Winter 1994 begins with December 1994. Data recovery rates at 33, 82, 131 and 180 feet were 46%, 44%, 43% and 54%, respectively.

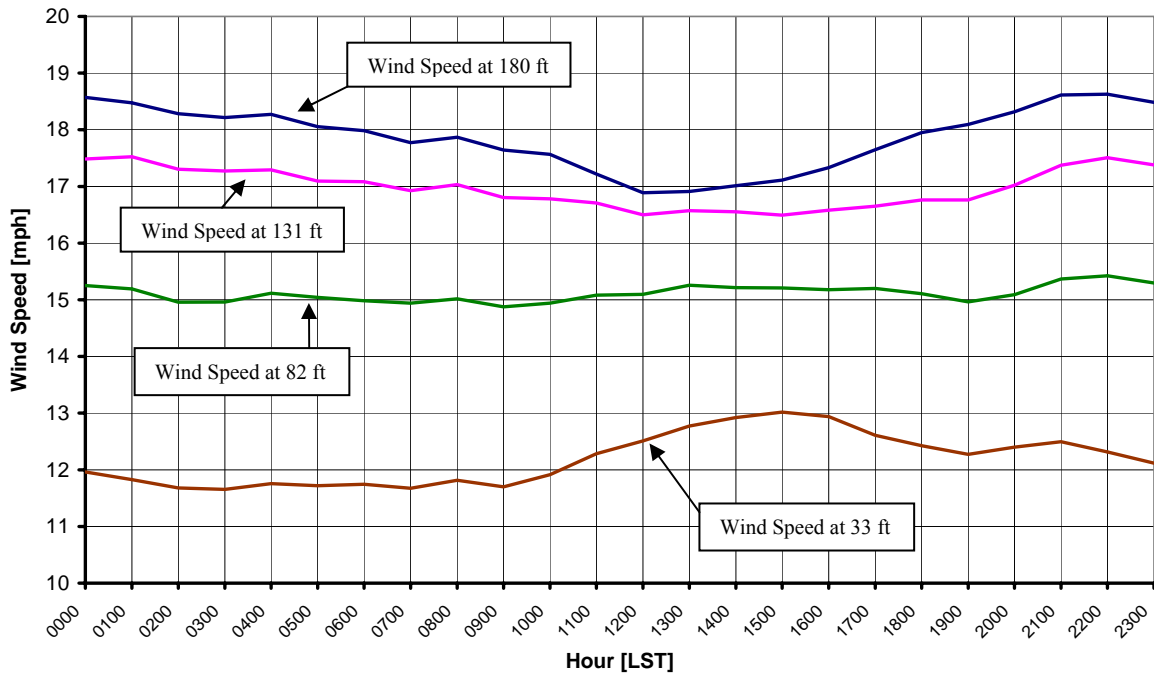
^b Above ground level.

^c Air temperature was not factored into calculations.

Average Hourly Wind Speeds

LST ^d	180 ft AGL		131 ft AGL		82 ft AGL		33 ft AGL	
	mph	m/s	mph	m/s	mph	m/s	mph	m/s
0000	18.6	8.30	17.5	7.82	15.3	6.82	12.0	5.35
0100	18.5	8.26	17.5	7.83	15.2	6.79	11.8	5.29
0200	18.3	8.17	17.3	7.73	15.0	6.69	11.7	5.22
0300	18.2	8.14	17.3	7.72	15.0	6.69	11.7	5.21
0400	18.3	8.17	17.3	7.73	15.1	6.76	11.8	5.25
0500	18.1	8.07	17.1	7.64	15.0	6.72	11.7	5.24
0600	18.0	8.04	17.1	7.64	15.0	6.70	11.7	5.25
0700	17.8	7.95	16.9	7.57	14.9	6.68	11.7	5.22
0800	17.9	7.99	17.0	7.61	15.0	6.71	11.8	5.28
0900	17.6	7.89	16.8	7.51	14.9	6.65	11.7	5.23
1000	17.6	7.85	16.8	7.50	14.9	6.68	11.9	5.33
1100	17.2	7.70	16.7	7.47	15.1	6.74	12.3	5.49
1200	16.9	7.55	16.5	7.38	15.1	6.75	12.5	5.59
1300	16.9	7.56	16.6	7.41	15.3	6.82	12.8	5.71
1400	17.0	7.61	16.5	7.40	15.2	6.80	12.9	5.78
1500	17.1	7.65	16.5	7.37	15.2	6.80	13.0	5.82
1600	17.3	7.75	16.6	7.41	15.2	6.78	12.9	5.78
1700	17.6	7.89	16.7	7.44	15.2	6.80	12.6	5.64
1800	18.0	8.02	16.8	7.49	15.1	6.75	12.4	5.55
1900	18.1	8.09	16.8	7.49	15.0	6.69	12.3	5.49
2000	18.3	8.19	17.0	7.61	15.1	6.75	12.4	5.54
2100	18.6	8.32	17.4	7.77	15.4	6.87	12.5	5.59
2200	18.6	8.33	17.5	7.83	15.4	6.89	12.3	5.50
2300	18.5	8.26	17.4	7.77	15.3	6.84	12.1	5.42

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^d Local standard time.



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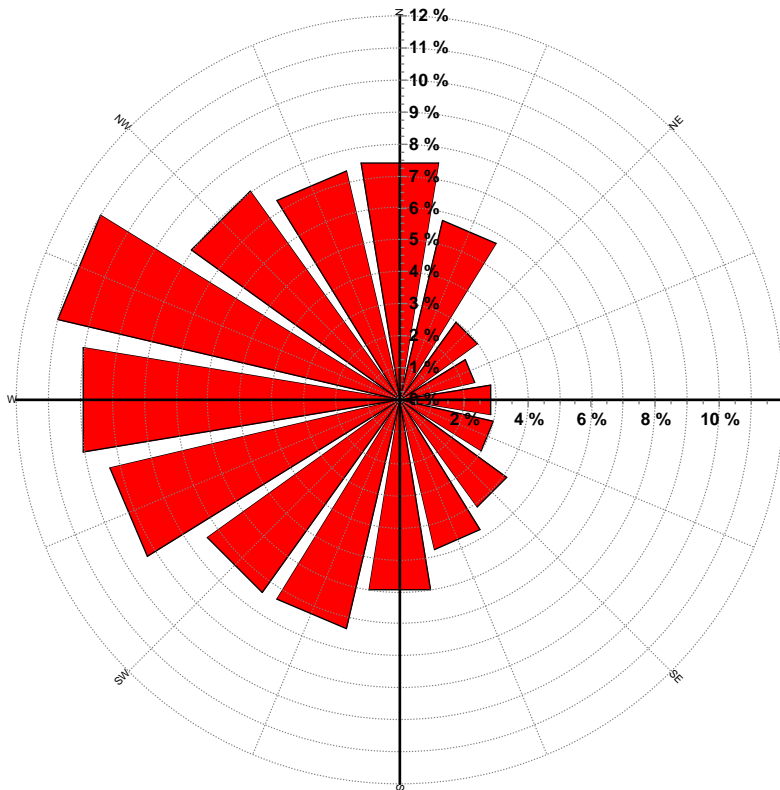
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Wind Directional Frequency

Winds from the... Frequency (%)

NNW	7.3
NW	8.0
WNW	11.0
W	10.1
WSW	9.3
SW	7.4
SSW	7.3
S	6.0
SSE	4.8
SE	4.1
ESE	3.0
E	2.9
ENE	2.4
NE	3.0
NNE	5.8
N	7.5

North Dakota Utility Study – Olga Site
 Wind Rose for 180 ft AGL
 Winters 1994, 1995, 1996, 1997, 1998, 1999, 2000 & 2001



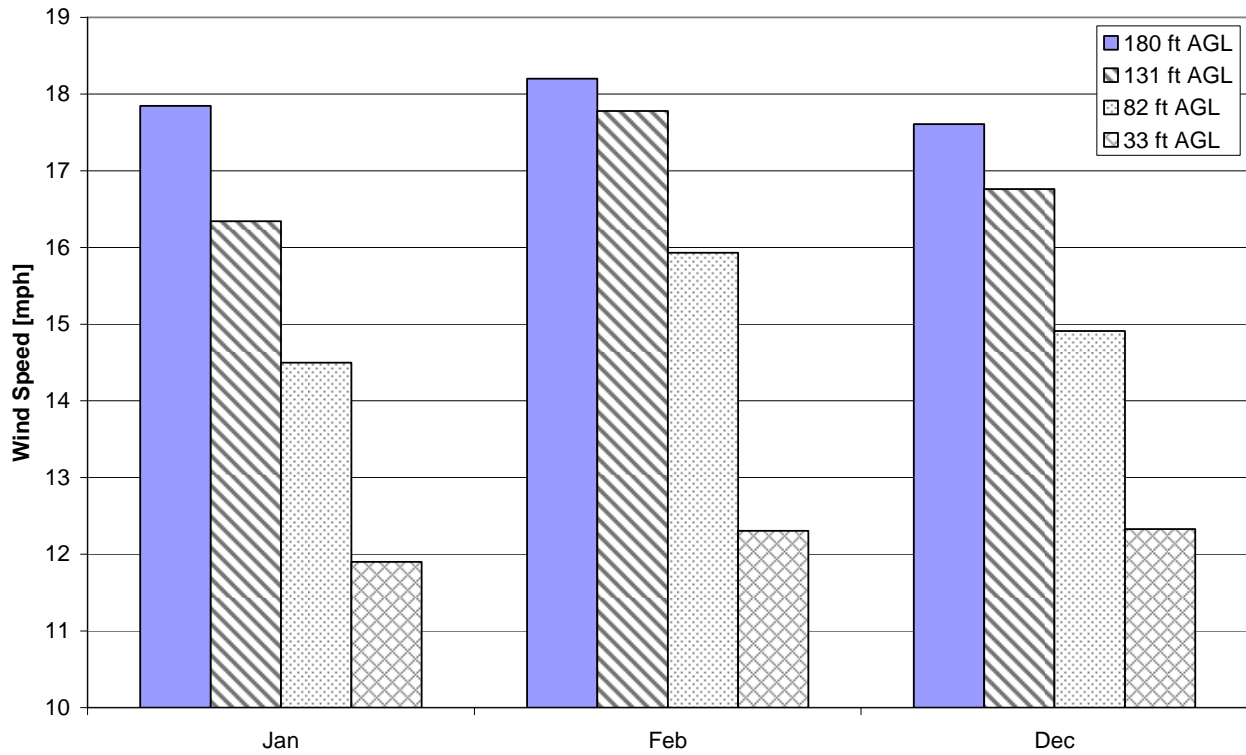
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Monthly Wind Speed Averages

Month	180 ft AGL		131 ft AGL		82 ft AGL		33 ft AGL	
	mph	m/s	mph	m/s	mph	m/s	mph	m/s
Jan	17.8	7.98	16.3	7.31	14.5	6.48	11.9	5.32
Feb	18.2	8.14	17.8	7.95	15.9	7.12	12.3	5.50
Dec	17.6	7.87	16.8	7.49	14.9	6.66	12.3	5.51

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