

## **Weather Analysis For Berthold Indian Reservation**

With consideration of a demonstration flight during the September to January timeframe, an overall analysis and summary, using the charts provided below, is as follows:

### **September:**

- Favorable temperatures average range of 52F to 72F
- Favorable Average dry days of 26
- Average wind at 10mph at surface
- Favorable visibility with average cloud coverage of 26%
- Highest average precipitation amounts during test window
- Highest convective activity chances (thunderstorms/windshear/turbulence)
- Highest hours of sunlight at 258 hours

### **October:**

- Favorable temperatures average 38F to 54F
- Favorable average dry days of 26
- Average wind of 11mph at surface
- Visibility average cloud coverage of 28%
- Moderate convective activity chances
- Second highest hours of sunlight at 206 hours

### **November:**

- Acceptable temperatures average range 24F to 38F
- Acceptable average dry days of 23
- Average wind at 10mph at surface
- Acceptable visibility with average cloud coverage of 45%
- Favorable precipitation amounts, minimal convective activity
- Drop in hours of sunlight of 175 hours

### **December:**

- Unfavorable temperatures average 10F to 23F
- Nominal average dry days of 22
- Average wind at 10mph at surface
- Nominal visibility with average cloud coverage of 58%
- Favorable precipitation amounts, nominal convective activity
- Nominal hours of sunlight of 119 hours

## January:

- Unfavorable temperatures average 6F to 21F
- Nominal average dry days of 22
- Average wind at 10mph at surface
- Unfavorable visibility with average cloud coverage of 60%
- Favorable precipitation amounts, nominal convective activity
- Unfavorable hours of sunlight of 112 hours

## Other pertinent weather information for test flight:

At 30, 40, and 50 meters altitude, mean wind is most favorable to least favorable in the following order of months: January, September, December, October, November. Mean winds increase on average of 1mph per 10 meters of altitude from surface to 50 meters. Refer to charts below for daily means.

Prevailing wind shifts with weather patterns, but is most predominant from the north/northwest between 250 and 360 degrees at an average between 9-15 mph. During seasonal shifts, there is also predominant winds from the south between 150 to 210 degrees at an average of 6-8 mph.

*The following is an annual, 12-month, climate average product for the Fort Berthold Indian Reservation. The averages are based on historical weather data collected over the past 10 years from 2014-Present. Information was obtained from weatherwx.com*

Fort Berthold Indian Reservation Monthly Climate Averages					
12 Month Climate Scroll12 Month Climate Scroll					
Month	January	February	March	April	May
Avg. Temperatures	Hi 21°F Lo 6°F	Hi 22°F Lo 6°F	Hi 36°F Lo 20°F	Hi 49°F Lo 31°F	Hi 64°F Lo 45°F
Avg. Wind Speed	10 mph	10 mph	10 mph	11 mph	10 mph
Avg. Precipitation	0.5 in	0.5 in	0.8 in	1.8 in	3.1 in
Average Humidity	89%	87%	80%	67%	60%
Avg. Cloud Cover	60%	62%	58%	49%	40%
Pressure Average	30.1 in	30.2 in	30.1 in	30.0 in	29.9 in
Average Dry Days	22	21	23	22	25
Avg. Precip. Days	6	5	5	6	6
Avg. Snow Days	3	2	3	2	0
Average Fog Days	1	1	1	0	0
Average UV Index	1	1	2	3	4
Avg. Hours of Sun	112	86	114	146	202
Averages are based on historical weather data from the past 10 years. <a href="#">Click and drag this table...</a> <a href="#">Click and drag this table...</a>					

## Fort Berthold Indian Reservation Monthly Climate Averages

12 Month Climate Scroll12 Month Climate Scroll

°F

Month	June	July	August	September	October
Avg. Temperatures	Hi 75°F Lo 55°F	Hi 82°F Lo 60°F	Hi 81°F Lo 59°F	Hi 72°F Lo 52°F	Hi 54°F Lo 38°F
Avg. Wind Speed	9 mph	9 mph	9 mph	10 mph	11 mph
Avg. Precipitation	3 in	2.8 in	2.1 in	2.7 in	1.5 in
Average Humidity	63%	57%	52%	52%	61%
Avg. Cloud Cover	33%	25%	25%	26%	38%
Pressure Average	29.8 in	29.9 in	29.9 in	29.9 in	30.0 in
Average Dry Days	23	26	25	26	26
Avg. Precip. Days	7	5	6	4	4
Avg. Snow Days	0	0	0	0	1
Average Fog Days	0	0	0	0	0
Average UV Index	5	6	5	4	2
Avg. Hours of Sun	226	276	274	258	206

Averages are based on historical weather data from the past 10 years. [Click and drag this table...](#) [Click and drag this table...](#)

Month	November	December
Avg. Temperatures	Hi 38°F Lo 24°F	Hi 23°F Lo 10°F
Avg. Wind Speed	10 mph	10 mph
Avg. Precipitation	0.6 in	0.8 in
Average Humidity	73%	86%
Avg. Cloud Cover	45%	58%
Pressure Average	30.0 in	30.1 in
Average Dry Days	23	22
Avg. Precip. Days	4	6
Avg. Snow Days	2	3
Average Fog Days	1	0
Average UV Index	1	1
Avg. Hours of Sun	175	119

The below meteorological data was obtained by a published Tribal Renewable Energy Technical Report collected and analyzed by Disgen, contracted with Western EcoSystems Technology Inc, during an on-site monitoring program that captured daily average wind speeds at 30/40/50 meters, wind shear, meteorological hazards, turbulence intensity, prevailing wind, and local climatology that will be useful in the planning and risk mitigation/management during the prototype demonstration of the MHA grant. The full report can be reviewed at, [Three Affiliated Tribes](#)

[Renewable Energy Feasibility Study,](https://www.energy.gov/sites/default/files/2016/02/f29/3tribes06final.pdf)  
[https://www.energy.gov/sites/default/files/2016/02/f29/3tribes06final.pdf.](https://www.energy.gov/sites/default/files/2016/02/f29/3tribes06final.pdf)

**Table 2 - Mean Hourly Wind Speed at 30 Meters (Ch 1)**

### MEAN HOURLY WIND SPEEDS

FORT BERTHOLD INDIAN RESERVATION  
30M WIND SPEED (MPH)

10/01/04 - 01/31/06

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	13.1	13.4	16.7	17.6	16.5	16.8	15.3	15.5	14.4	14.7	16.0	15.7	15.5
02	14.0	13.2	16.5	17.9	16.7	17.1	15.3	15.3	14.2	14.5	15.7	15.2	15.4
03	13.7	13.3	16.2	17.7	16.3	16.0	15.3	15.6	13.7	14.2	15.0	15.6	15.2
04	14.1	12.4	16.0	16.2	15.6	15.8	13.7	15.2	13.5	15.2	15.7	15.8	15.0
05	13.0	12.1	15.8	15.8	16.4	14.6	14.6	15.4	13.4	14.3	15.3	15.3	14.7
06	12.7	11.4	15.9	17.4	16.4	14.2	14.5	14.8	13.0	15.0	15.1	16.0	14.8
07	13.5	11.2	14.9	17.4	15.7	13.6	14.1	14.5	13.4	14.8	15.5	15.2	14.6
08	13.6	11.4	16.4	17.9	14.6	13.3	13.3	14.7	14.3	14.8	14.7	15.0	14.6
09	13.6	12.3	17.0	17.4	15.1	13.4	12.4	13.8	13.1	14.4	14.6	14.4	14.3
10	13.3	12.9	16.9	17.6	16.6	13.1	13.0	13.6	12.2	14.9	14.2	14.3	14.4
11	14.1	12.8	17.0	18.9	18.0	12.9	13.4	14.8	12.6	14.6	14.9	13.7	14.7
12	13.8	13.5	16.6	20.0	18.6	13.3	14.4	15.7	14.4	14.9	14.7	14.0	15.2
13	13.5	14.1	18.4	20.2	18.5	14.3	14.2	16.4	15.4	15.5	16.1	14.8	15.8
14	13.6	14.3	18.9	20.9	19.8	14.3	14.1	16.3	15.3	16.8	16.3	15.2	16.2
15	13.9	15.8	18.9	20.7	19.8	14.5	15.4	16.5	15.7	17.3	17.2	15.5	16.7
16	14.1	16.8	18.6	21.7	19.9	14.1	15.2	16.9	15.7	16.9	17.2	15.4	16.8
17	14.0	16.8	18.1	21.5	19.4	15.1	14.7	16.2	15.8	17.1	17.0	16.0	16.7
18	12.9	16.4	17.8	21.3	20.4	15.4	14.3	16.8	15.1	16.7	15.6	15.7	16.4
19	13.8	15.8	17.0	20.9	19.5	16.5	14.4	16.7	15.5	15.7	15.4	15.9	16.3
20	15.4	14.5	16.3	20.0	19.0	15.8	14.4	15.3	15.2	14.7	15.7	15.7	15.9
21	15.0	14.1	15.7	19.4	17.5	14.9	14.0	14.9	14.4	15.8	16.4	15.4	15.7
22	14.2	13.6	15.5	20.3	16.6	14.1	15.8	15.0	15.5	15.9	16.5	15.1	15.7
23	14.2	13.4	16.5	19.9	16.1	15.5	17.1	15.7	14.8	15.6	16.3	16.0	15.9
24	13.9	13.6	16.3	19.2	16.3	16.3	16.3	16.4	14.8	15.2	16.7	15.8	15.9
Mean	13.8	13.7	16.8	19.1	17.5	14.8	14.6	15.5	14.4	15.4	15.7	15.3	15.5

## Good Hours

949 672 744 720 744 720 744 744 720 1115 1435 1449

## Missing Hours

[illegible]

10,756 Hours of Good Data      956 Hours Missing      91.8% Data Recovery

**Table 3 - Mean Hourly Wind Speed at 40 Meters (Ch3)**

MEAN HOURLY WIND SPEEDS

FORT BERTHOLD INDIAN RESERVATION  
40M WIND SPEED (CH3) (MPH)

10/01/04 - 01/31/06

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	13.7	13.9	17.6	18.7	17.4	17.9	16.6	16.6	15.5	15.5	16.8	16.5	16.3
02	14.5	14.1	17.4	18.8	17.5	18.3	16.6	16.2	15.3	15.2	16.7	16.0	16.3
03	14.3	14.2	17.1	18.6	17.2	16.9	16.6	16.7	14.8	14.8	15.9	16.4	16.0
04	14.7	13.1	17.0	17.2	16.5	16.7	14.8	16.1	14.5	15.9	16.4	16.6	15.9
05	13.5	13.0	16.7	17.0	17.4	15.5	15.7	16.4	14.4	15.2	15.9	16.1	15.6
06	13.3	12.1	16.8	18.3	17.3	15.0	15.6	15.8	13.9	15.9	15.7	16.7	15.6
07	14.3	11.8	15.6	18.4	16.5	14.4	15.1	15.4	14.4	15.5	16.4	16.0	15.4
08	14.3	12.0	17.3	18.9	15.3	14.1	14.2	15.8	15.2	15.6	15.3	15.7	15.3
09	14.1	13.1	17.7	18.4	15.6	14.1	13.3	14.8	13.9	15.2	15.3	15.1	15.1
10	13.8	13.6	17.6	18.3	17.0	13.5	13.5	14.0	12.9	15.6	15.0	14.9	15.0
11	14.6	13.2	17.5	19.2	18.4	13.1	13.7	14.9	12.9	15.1	15.6	14.3	15.2
12	14.3	13.8	17.0	20.3	18.8	13.4	14.7	15.7	14.6	15.2	15.1	14.5	15.5
13	13.8	14.2	18.6	20.5	18.8	14.5	14.5	16.5	15.6	15.8	16.3	15.1	16.1
14	13.6	14.5	19.1	21.2	20.1	14.5	14.3	16.4	15.5	17.1	16.5	15.4	16.4
15	13.9	16.0	19.1	21.0	20.1	14.7	15.7	16.7	15.9	17.6	17.3	15.7	16.9
16	14.1	17.1	18.9	22.1	20.2	14.3	15.5	17.0	15.9	17.2	17.4	15.7	17.0
17	14.3	17.1	18.5	21.9	19.7	15.4	15.0	16.2	15.9	17.1	17.3	16.4	17.0
18	13.4	16.8	18.3	21.7	20.8	15.6	14.7	16.9	15.2	16.9	16.0	16.3	16.7
19	14.5	16.4	17.5	21.4	19.9	16.8	14.9	17.0	15.8	16.0	16.2	16.4	16.7
20	15.9	15.3	17.0	20.7	19.4	16.2	15.0	15.6	15.8	15.3	16.6	16.4	16.5
21	15.8	15.0	16.5	20.2	18.1	15.6	14.9	15.5	15.4	16.3	17.2	16.0	16.4
22	15.1	14.5	16.4	21.3	17.4	14.8	17.0	15.9	16.5	16.6	17.4	15.7	16.5
23	14.9	14.2	17.3	21.1	16.9	16.2	18.4	16.6	15.7	16.3	17.3	16.7	16.8
24	14.6	14.3	17.0	20.4	17.2	17.3	17.7	17.4	16.0	16.1	17.7	16.5	16.8
Mean	14.3	14.3	17.5	19.8	18.1	15.4	15.3	16.1	15.1	16.0	16.4	15.9	16.1

Good Hours

975 672 744 720 744 720 744 744 720 1115 1439 1449

Missing Hours

513 0 0 0 0 0 0 0 0 373 1 39

10,786 Hours of Good Data

926 Hours Missing

92.1% Data Recovery

**Table 5 – Mean Hourly Wind Speed at 50-Meters (Ch 1)**

MEAN HOURLY WIND SPEEDS

FORT BERTHOLD INDIAN RESERVATION  
50M WIND SPEED (CH1) (MPH)

10/01/04 - 01/31/06

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	14.5	14.6	18.5	19.8	18.2	18.8	17.7	17.9	16.7	16.4	17.8	17.2	17.3
02	15.6	14.8	18.3	19.9	18.3	19.3	18.0	17.1	16.5	16.0	17.8	16.6	17.3
03	15.3	15.1	18.3	19.7	18.0	17.8	18.0	17.6	15.9	15.7	16.9	17.2	17.0
04	15.6	13.9	18.0	18.2	17.2	17.6	16.0	17.0	15.3	16.8	17.3	17.2	16.8
05	14.4	13.9	17.6	18.0	18.1	16.4	16.9	17.7	15.4	16.3	16.9	16.9	16.6
06	14.3	13.0	17.8	19.2	18.3	15.9	16.7	16.8	14.7	16.9	16.5	17.5	16.5
07	15.2	12.5	16.6	19.5	17.2	15.3	16.2	16.4	15.2	16.3	17.1	16.6	16.3
08	15.1	12.9	18.3	19.9	16.0	15.1	15.2	16.8	16.0	16.4	16.2	16.4	16.2
09	14.9	13.9	18.6	19.5	16.2	14.8	14.3	15.7	14.8	16.1	16.4	15.9	15.9
10	14.4	14.4	18.4	19.0	17.3	14.0	14.0	14.2	13.9	16.3	15.8	15.5	15.6
11	15.1	13.7	18.0	19.5	18.5	13.3	14.0	14.9	13.2	15.8	16.6	14.9	15.7
12	15.0	14.3	17.4	20.5	19.0	13.7	14.9	15.9	14.9	15.6	15.7	15.0	15.9
13	14.3	14.6	18.8	20.8	18.8	14.7	14.8	16.8	15.8	16.0	16.6	15.7	16.4
14	14.2	14.8	19.3	21.5	20.2	14.8	14.6	16.6	15.9	17.5	16.7	15.8	16.7
15	14.3	16.1	19.3	21.3	20.3	15.0	15.9	17.0	16.2	18.1	17.5	15.9	17.2
16	14.3	17.1	19.1	22.2	20.4	14.5	15.8	17.3	16.1	17.6	17.6	16.1	17.2
17	14.3	17.1	18.7	22.1	20.0	15.8	15.3	16.4	16.3	17.6	17.6	16.8	17.3
18	13.4	16.8	18.4	21.8	21.1	15.8	14.9	17.2	15.6	17.6	16.4	16.9	17.0
19	15.1	16.7	17.8	21.7	20.3	17.1	15.2	17.2	16.3	16.8	16.8	17.1	17.2
20	16.2	16.0	17.5	21.2	19.9	16.6	15.6	15.9	16.4	16.4	17.2	17.0	17.1
21	16.2	15.8	17.1	21.0	18.7	16.1	15.9	16.3	16.5	17.5	18.0	16.7	17.2
22	15.4	15.2	17.3	22.3	18.2	15.5	18.0	16.8	17.5	17.8	18.4	16.3	17.4
23	15.9	14.9	18.2	22.4	17.6	17.0	19.8	17.7	16.7	17.4	18.4	17.4	17.7
24	15.1	14.9	17.7	21.5	18.0	18.3	19.0	18.4	17.3	17.0	18.7	17.1	17.7
Mean	14.9	14.9	18.1	20.5	18.6	16.0	16.1	16.7	15.8	16.8	17.1	16.5	16.8

Good Hours

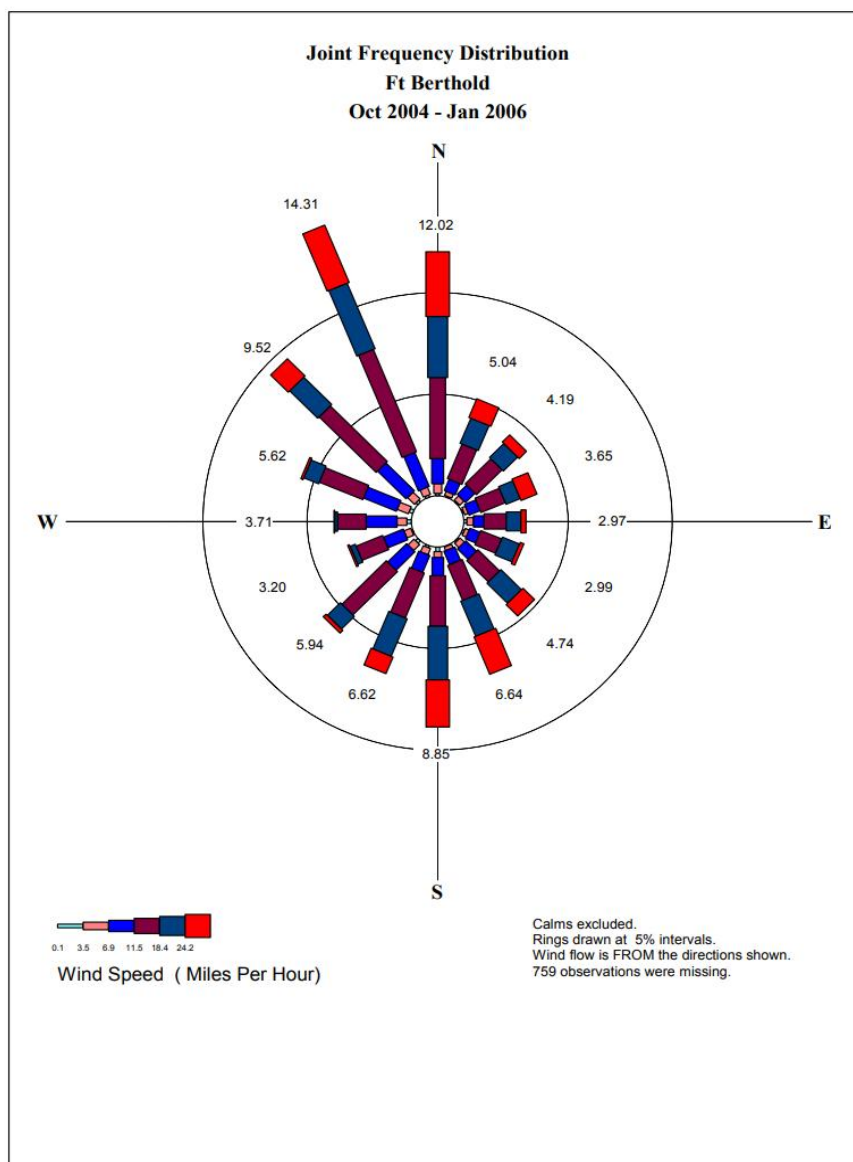
944 672 744 720 744 720 744 744 720 1115 1440 1446

Missing Hours

544 0 0 0 0 0 0 0 0 373 0 42

10,753 Hours of Good Data 959 Hours Missing 91.8% Data Recovery

**Figure 2- Wind Rose for the 50-Meter Level, Ft. Berthold, Three Affiliated Tribes**



Other information, such as turbulence and meteorological hazards can be referenced from this report.