Runway Feasibility Study
Appendix D

Truckee Tahoe Airport Wind Analysis

This wind analysis documents wind data over the past 20 years (2001 to 2020) at Truckee Tahoe Airport (TRK). The data recorded here includes calm wind percentages and prevailing winds for each month and how these relate to the existing runway alignments.

The data was obtained from the Iowa Environmental Mesonet (IEM). The IEM collects environmental data from various networks and cooperating members, including automated airport weather observation data from Automated Surface Observing System (ASOS) and Automated Weather Observing System (AWOS) sensors. This weather data, obtained from the TRK ASOS through the IEM, includes wind direction, wind speed in knots, and date and time of observation. Wind data is captured approximately every 15 minutes, but this may vary by each weather event.

WIND ROSES

Two sets of wind rose graphs were produced for this Analysis:

- **Historical Wind Data by Month (2001-2020):** The wind roses illustrate prevailing wind direction and calm wind data tables for each month. Each wind rose shows four time periods in five-year increments to illustrate changes in wind patterns since 2001.
- **Daytime Wind Data by Month (2001-2020):** A second set of wind rose graphs shows how wind direction between 6:00 a.m. and 11:00 p.m. at 3-hour intervals. These graphs illustrate how wind direction varies during the day for each month.

Historical Wind Data by Month (2001-2020)

The first set of wind roses (**pages 3 through 5**) illustrates the predominant wind direction for each month over the past 20 years. Each wind rose shows four time periods in five-year increments to illustrate changes to wind patterns since 2001.

- **2001 – 2005 (Orange)**
- **2006 – 2010 (Purple)**
- **2011 – 2015 (Yellow)**
- **2016 – 2020 (Green)**

The wide blue lines represent Runways 11/29 and 2/20. The dashed light blue line represents the conceptual third runway alignment.

The recorded wind data reflects true north headings, and the roses below convey true headings. Runway designations are based on magnetic declination. The magnetic declination at TRK is about 14 degrees east. So, for example, Runway 11's magnetic heading is 106 degrees, which determines the designation, but the true heading is 120 degrees.

Each month's prevailing wind direction can be determined by observing the time period line farthest from the center of each wind rose. The time period lines represent the percentage of observations in that direction, over 3 knots, for each 5-year period. The concentric circles indicate the percentage of observations for wind direction at a heading over the time period. The farther a time period line is from the center of the wind rose, the higher the percentage of observations from that direction.

Calm Wind Conditions

The calm wind data tables show the percentage of time winds were calm (when any observation was between 0 and 3 knots). These observations fall into three categories for each month to show the difference in daytime and nighttime calm wind observations:

- **Calm Wind Full day (24 Hours)**
- **Calm Wind Daytime (6 a.m. – 11 p.m.)**
- **Calm Wind Nighttime (11 p.m. – 6 a.m.)**

Calm wind calculations are based on all observations for a month for the 20-year period.

Daytime Wind Data by Month (2001-2020)

A second set of wind roses were produced to help illustrate how wind direction changes throughout the day. Each graph (**pages 6 through 8**) illustrates wind direction between 6:00 a.m. and 11:00 p.m., at 3-hour intervals (with one 2-hour interval: 6:00 a.m. – 8:00 a.m.) for each month since 2001.

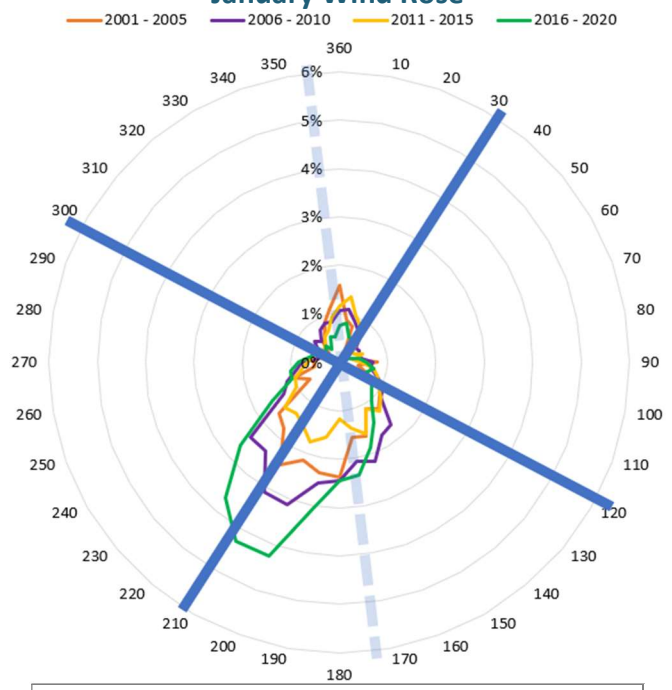
- **6:00 a.m. – 8:00 a.m. (Dark Red)**
- **8:00 a.m. – 11:00 a.m. (Red)**
- **11:00 a.m. – 2:00 p.m. (Orange)**
- **2:00 p.m. – 5:00 p.m. (Gold)**
- **5:00 p.m. – 8:00 p.m. (Light Green)**
- **8:00 p.m. – 11:00 p.m. (Dark Green)**

The Daytime Data also shows each interval's prevailing wind direction as indicated by the lines farthest from the center of each wind rose. The lines represent the percentage of observations in that direction, over 3 knots, for each 3-hour interval. The concentric circles indicate the percentage of observations for wind direction at a heading over the interval. The farther an interval line is from the center of the wind rose, the higher the percentage of observations from that direction. To maintain data integrity, the same scale is used for each month. This helps illustrate that winds are greater in the warmer months and calmer in winter.

The Daytime Data also includes calm wind data tables that detail the percentage of time winds were calm (between 0 and 3 knots) for each interval.

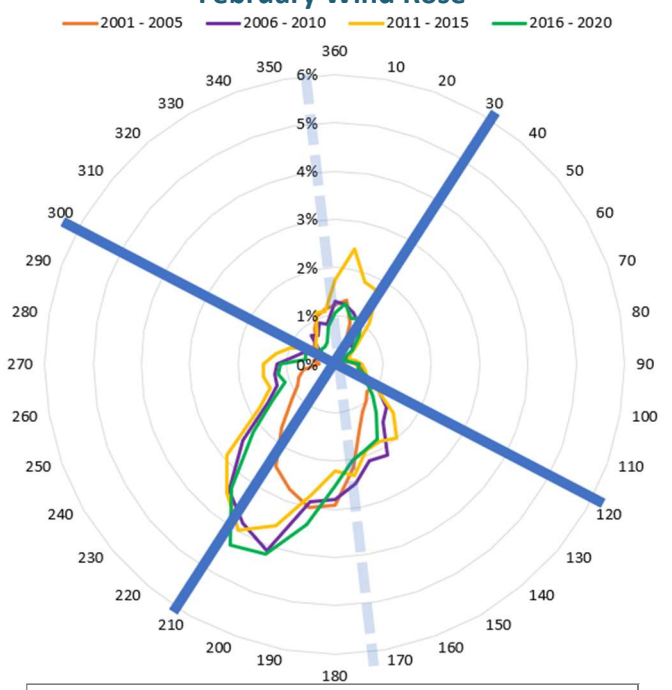
Historical Wind Data by Month (2001-2020)

January Wind Rose



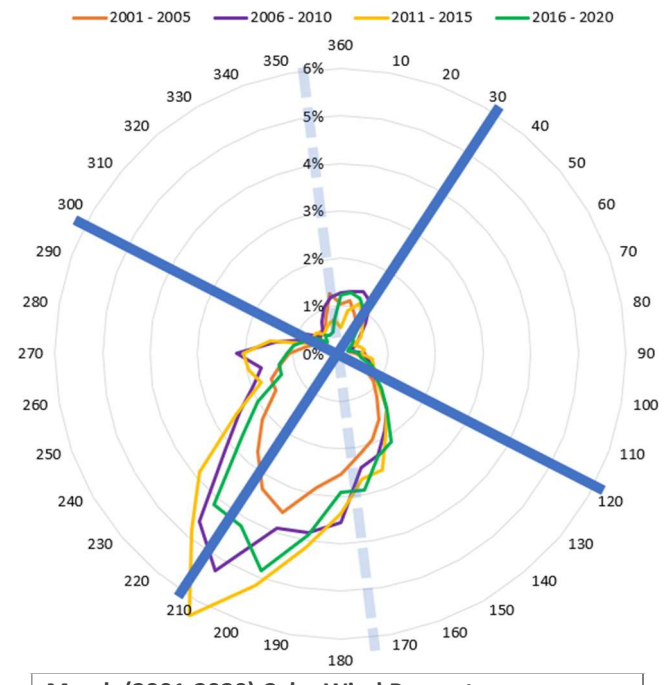
January (2001-2020) Calm Wind Percentages	
Full Day (24 Hour)	72.4%
Daytime (6 A.M. – 11 P.M.)	69.1%
Nighttime (11 P.M. – 6 A.M.)	77.4%

February Wind Rose



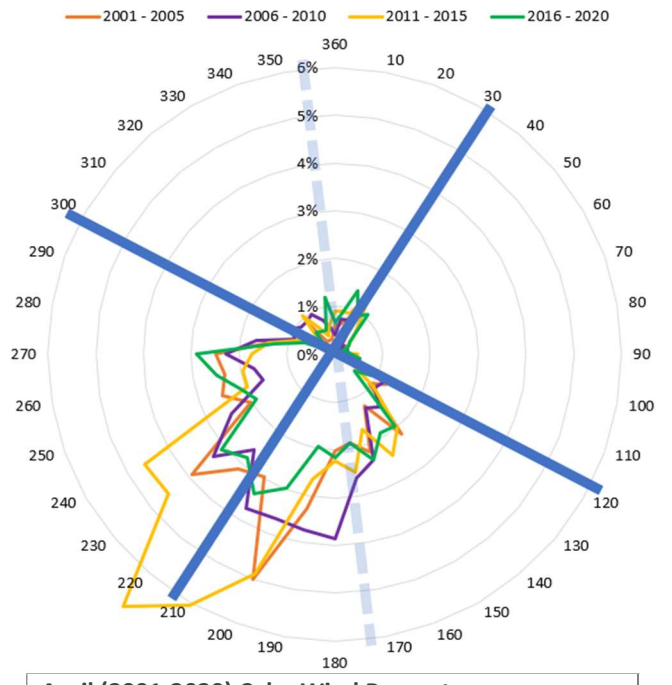
February (2001-2020) Calm Wind Percentages	
Full Day (24 Hour)	64.3%
Daytime (6 A.M. – 11 P.M.)	57.0%
Nighttime (11 P.M. – 6 A.M.)	74.7%

March Wind Rose



March (2001-2020) Calm Wind Percentages	
Full Day (24 Hour)	57.1%
Daytime (6 A.M. – 11 P.M.)	46.5%
Nighttime (11 P.M. – 6 A.M.)	72.4%

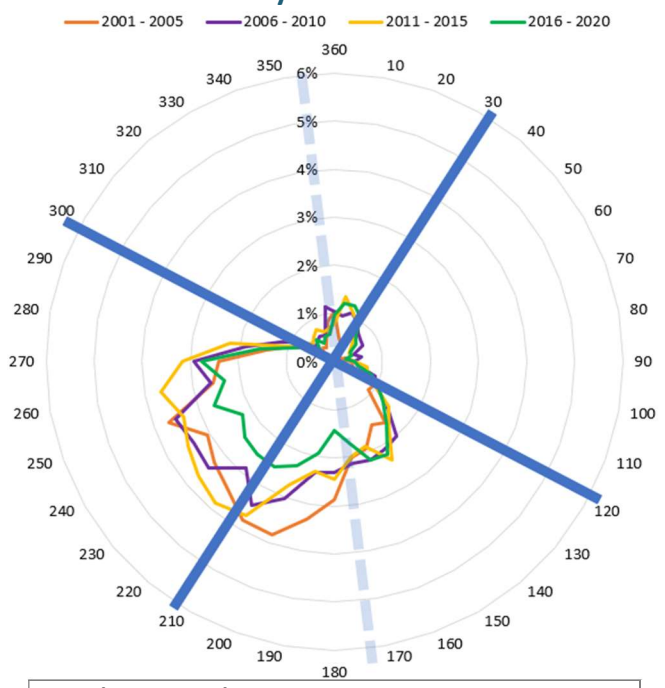
April Wind Rose



April (2001-2020) Calm Wind Percentages	
Full Day (24 Hour)	55.1%
Daytime (6 A.M. – 11 P.M.)	40.3%
Nighttime (11 P.M. – 6 A.M.)	76.4%

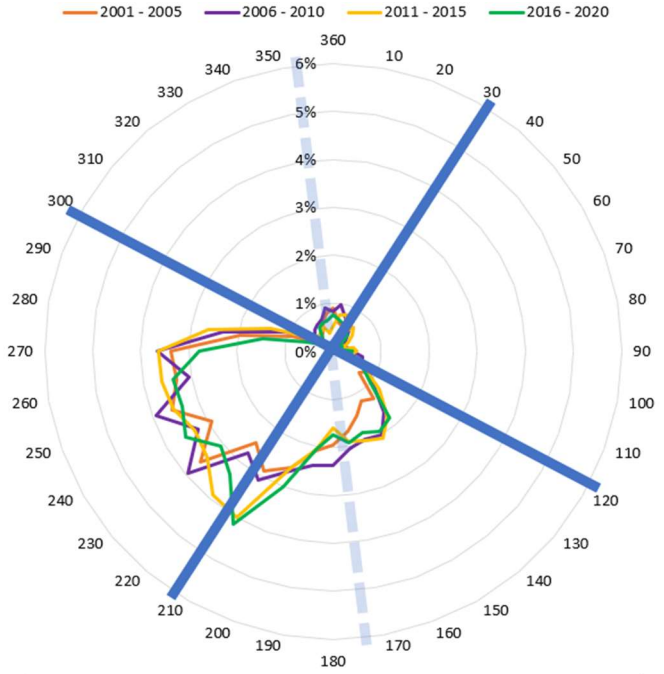
Historical Wind Data by Month (2001-2020)

May Wind Rose



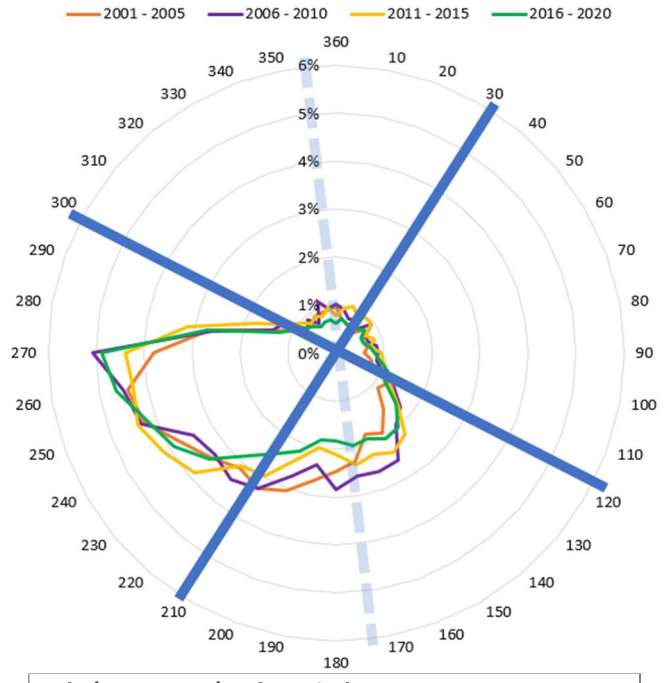
May (2001-2020) Calm Wind Percentages	
Full Day (24 Hour)	57.3%
Daytime (6 A.M. – 11 P.M.)	38.7%
Nighttime (11 P.M. – 6 A.M.)	83.7%

June Wind Rose



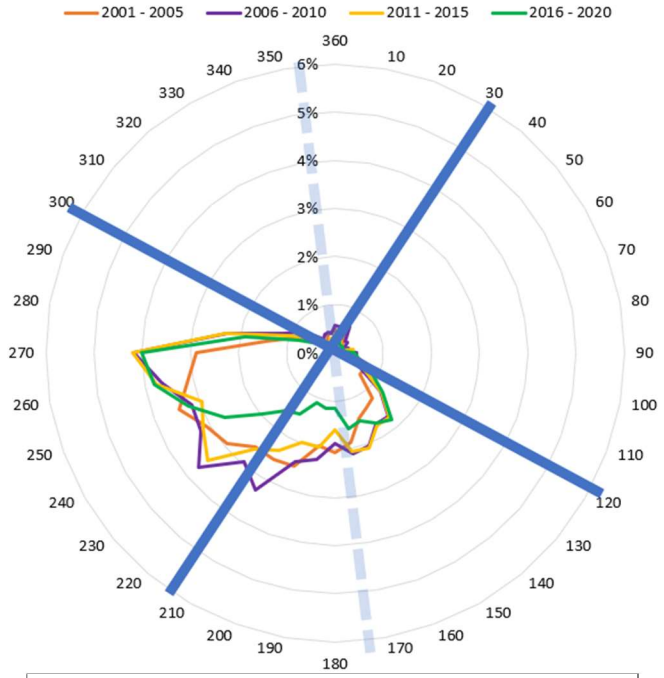
June (2001-2020) Calm Wind Percentages	
Full Day (24 Hour)	58.9%
Daytime (6 A.M. – 11 P.M.)	37.9%
Nighttime (11 P.M. – 6 A.M.)	87.6%

July Wind Rose



July (2001-2020) Calm Wind Percentages	
Full Day (24 Hour)	63.9%
Daytime (6 A.M. – 11 P.M.)	41.9%
Nighttime (11 P.M. – 6 A.M.)	94.0%

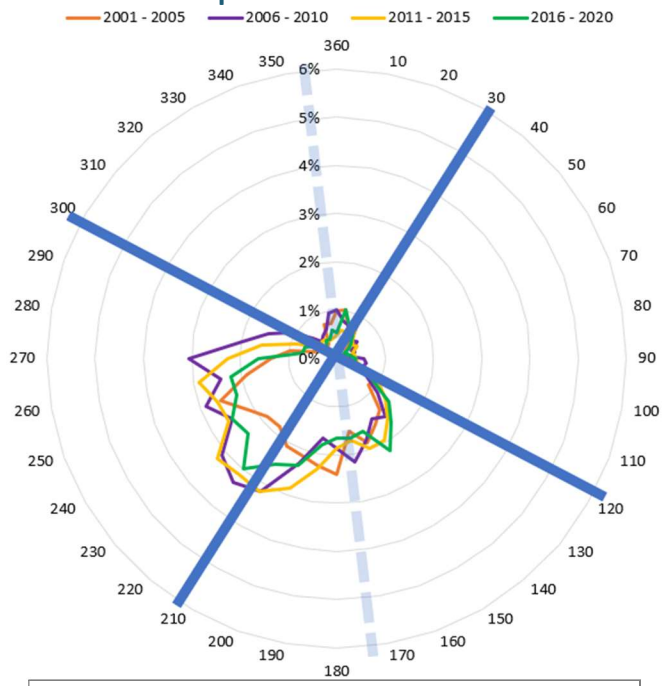
August Wind Rose



August (2001-2020) Calm Wind Percentages	
Full Day (24 Hour)	65.8%
Daytime (6 A.M. – 11 P.M.)	45.2%
Nighttime (11 P.M. – 6 A.M.)	94.9%

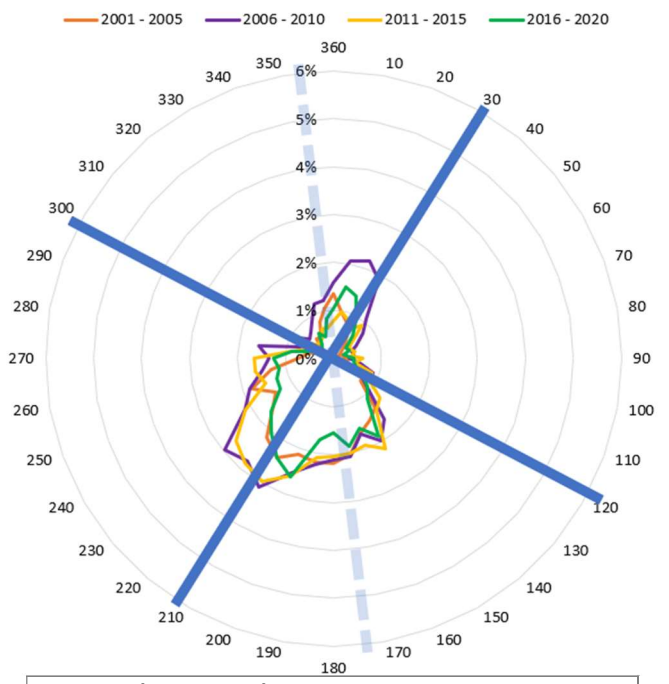
Historical Wind Data by Month (2001-2020)

September Wind Rose



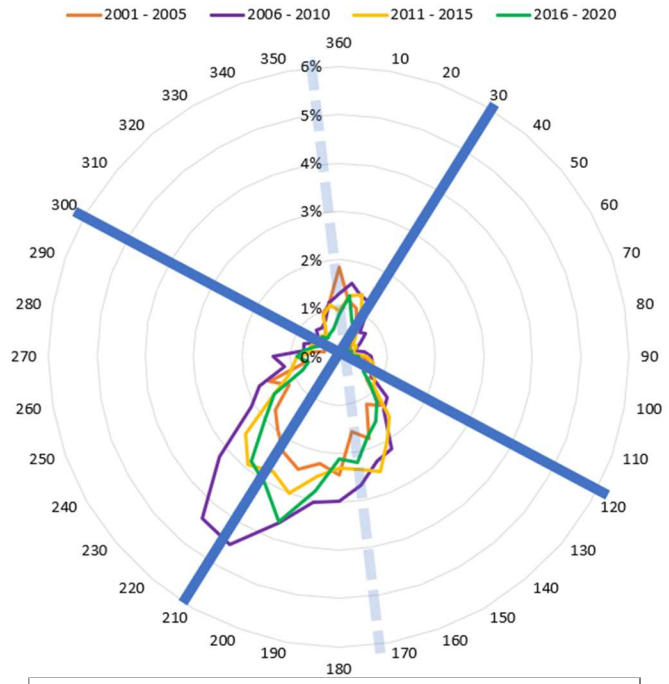
September (2001-2020) Calm Wind Percentages	
Full Day (24 Hour)	66.0%
Daytime (6 A.M. – 11 P.M.)	50.0%
Nighttime (11 P.M. – 6 A.M.)	89.9%

October Wind Rose



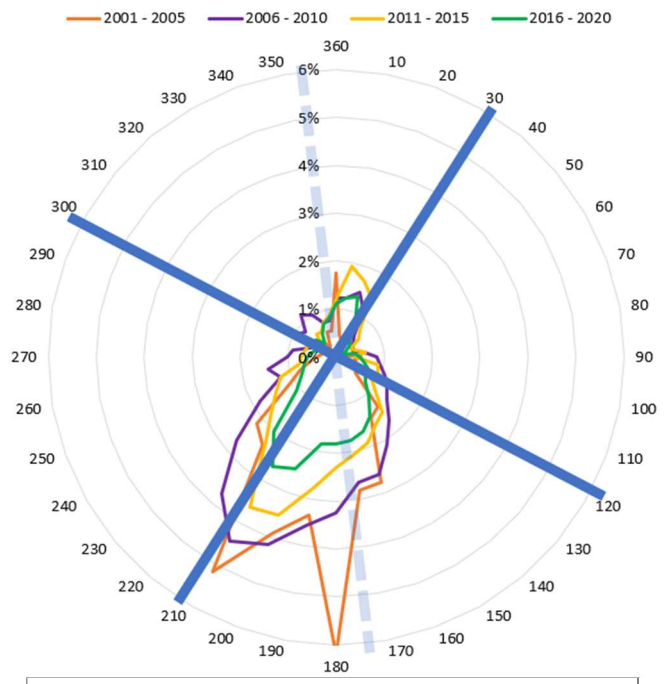
October (2001-2020) Calm Wind Percentages	
Full Day (24 Hour)	68.7%
Daytime (6 A.M. – 11 P.M.)	57.8%
Nighttime (11 P.M. – 6 A.M.)	84.8%

November Wind Rose



November (2001-2020) Calm Wind Percentages	
Full Day (24 Hour)	68.0%
Daytime (6 A.M. – 11 P.M.)	62.3%
Nighttime (11 P.M. – 6 A.M.)	76.7%

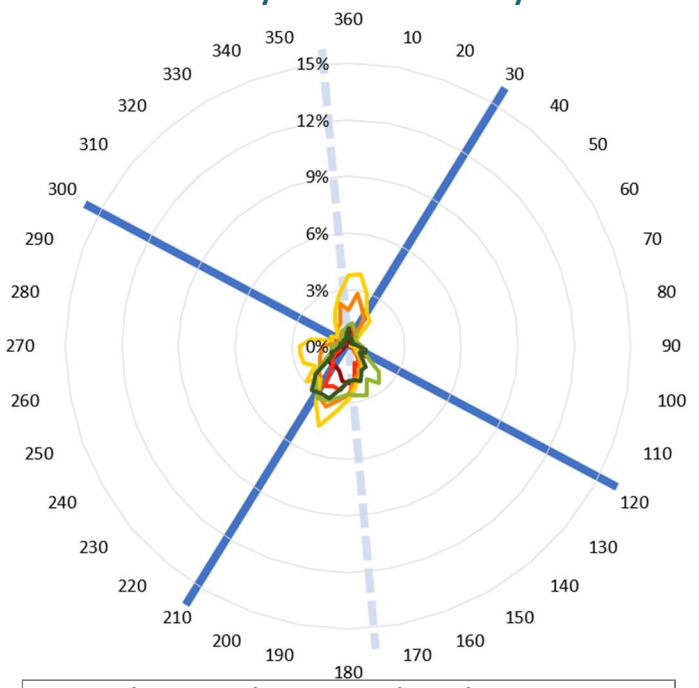
December Wind Rose



December (2001-2020) Calm Wind Percentages	
Full Day (24 Hour)	67.3%
Daytime (6 A.M. – 11 P.M.)	63.1%
Nighttime (11 P.M. – 6 A.M.)	73.5%

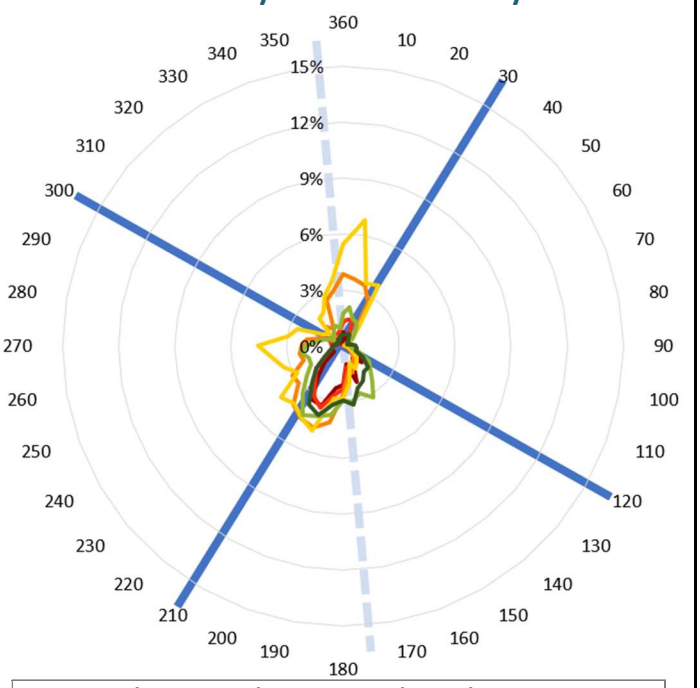
Daytime Wind Data by Month (2001-2020)

January Wind: Time of Day



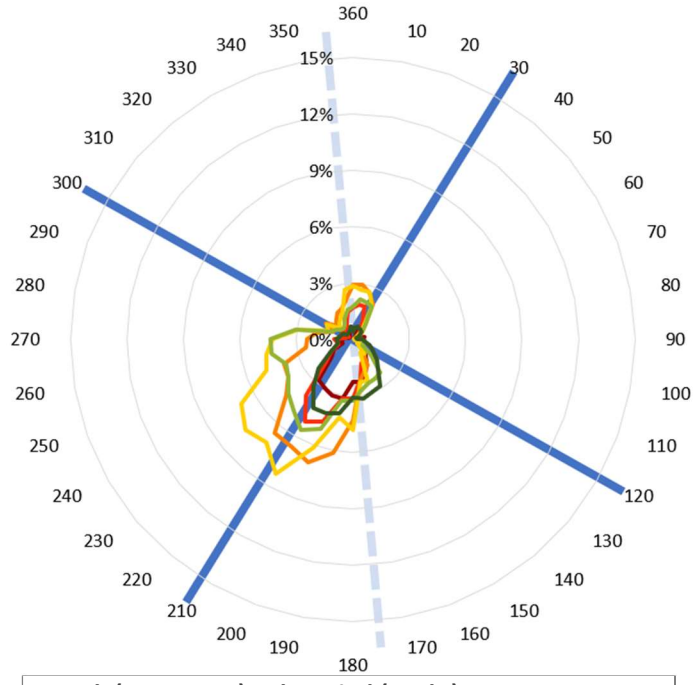
January (2001-2020) Calm Wind (0-3 kt) Percentages			
6 AM - 8 AM	74%	2 PM - 5 PM	34%
8 AM - 11 AM	71%	5 PM - 8 PM	53%
11 AM - 2 PM	52%	8 PM - 11 PM	64%

February Wind: Time of Day



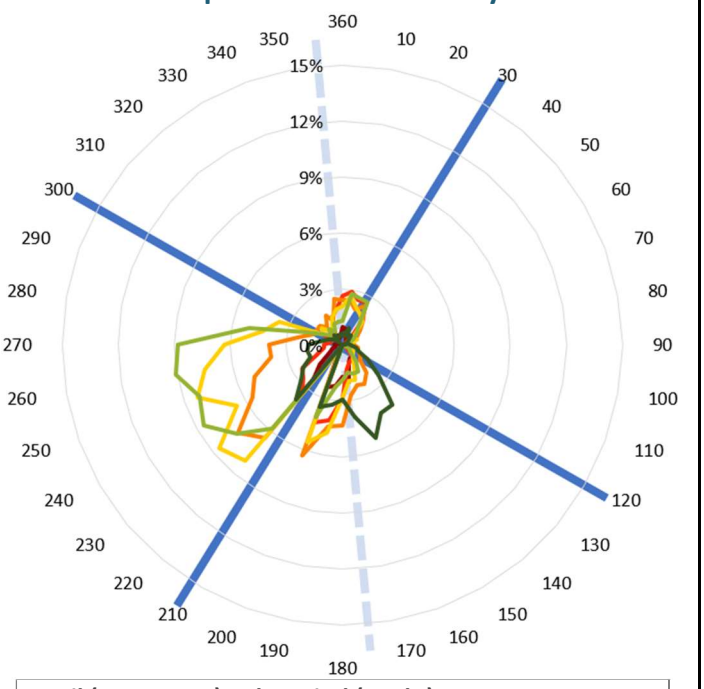
February (2001-2020) Calm Wind (0-3 kt) Percentages			
6 AM - 8 AM	68%	2 PM - 5 PM	14%
8 AM - 11 AM	64%	5 PM - 8 PM	38%
11 AM - 2 PM	31%	8 PM - 11 PM	57%

March Wind: Time of Day



March (2001-2020) Calm Wind (0-3 kt) Percentages			
6 AM - 8 AM	64%	2 PM - 5 PM	8%
8 AM - 11 AM	53%	5 PM - 8 PM	22%
11 AM - 2 PM	18%	8 PM - 11 PM	50%

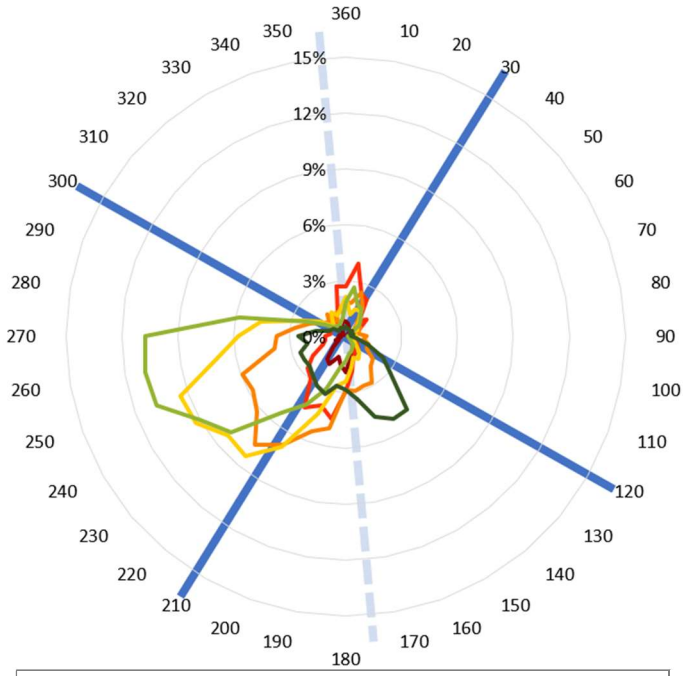
April Wind: Time of Day



April (2001-2020) Calm Wind (0-3 kt) Percentages			
6 AM - 8 AM	73%	2 PM - 5 PM	4%
8 AM - 11 AM	48%	5 PM - 8 PM	10%
11 AM - 2 PM	10%	8 PM - 11 PM	42%

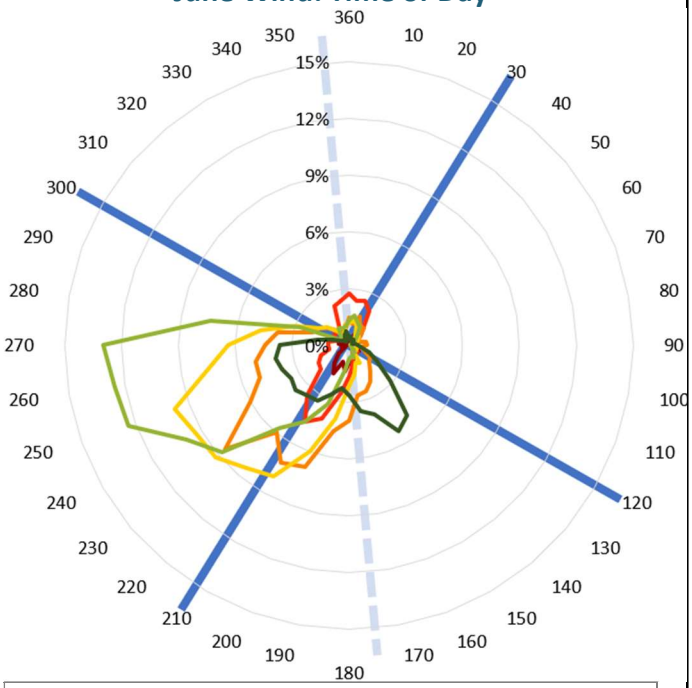
Daytime Wind Data by Month (2001-2020)

May Wind: Time of Day



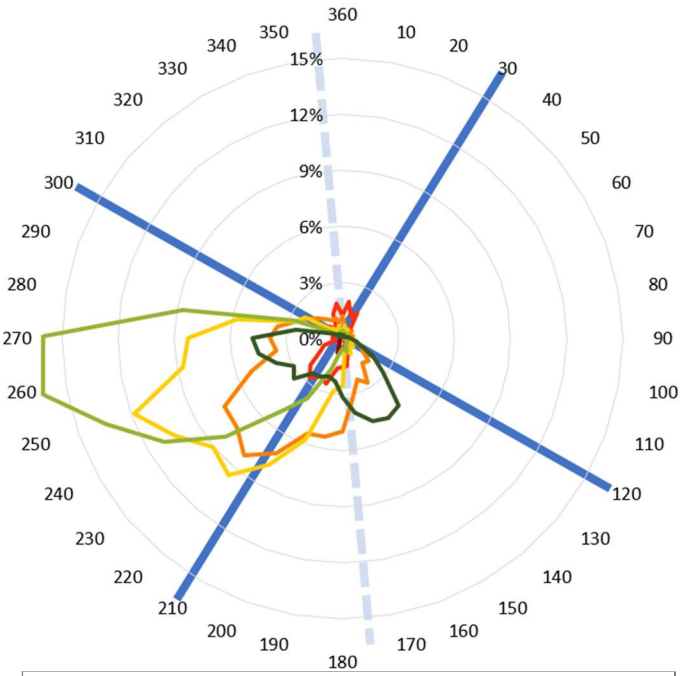
May (2001-2020) Calm Wind (0-3 kt) Percentages			
6 AM - 8 AM	77%	2 PM - 5 PM	3%
8 AM - 11 AM	41%	5 PM - 8 PM	7%
11 AM - 2 PM	5%	8 PM - 11 PM	38%

June Wind: Time of Day



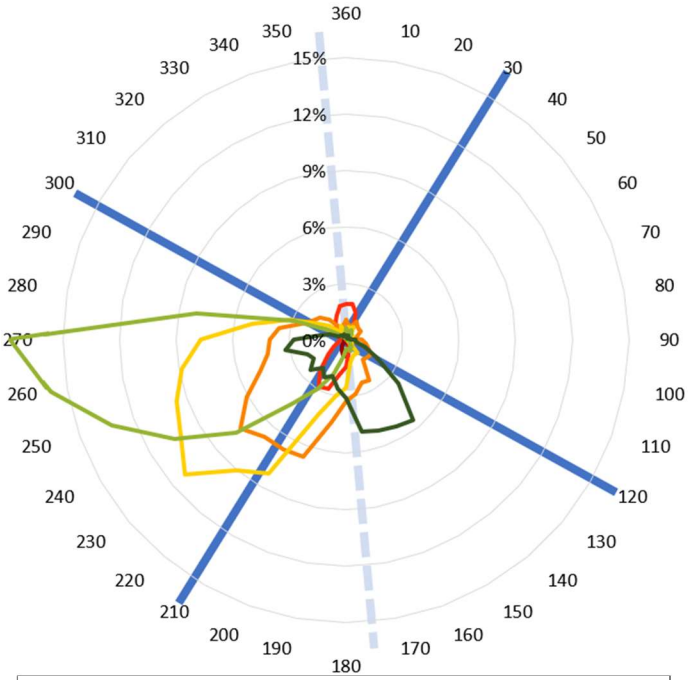
June (2001-2020) Calm Wind (0-3 kt) Percentages			
6 AM - 8 AM	83%	2 PM - 5 PM	2%
8 AM - 11 AM	49%	5 PM - 8 PM	3%
11 AM - 2 PM	6%	8 PM - 11 PM	34%

July Wind: Time of Day



July (2001-2020) Calm Wind (0-3 kt) Percentages			
6 AM - 8 AM	93%	2 PM - 5 PM	2%
8 AM - 11 AM	65%	5 PM - 8 PM	4%
11 AM - 2 PM	7%	8 PM - 11 PM	36%

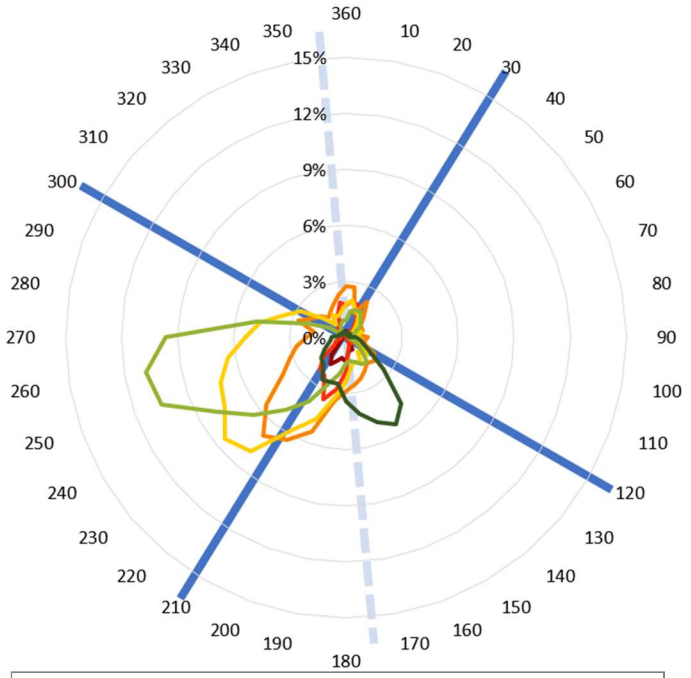
August Wind: Time of Day



August (2001-2020) Calm Wind (0-3 kt) Percentages			
6 AM - 8 AM	92%	2 PM - 5 PM	3%
8 AM - 11 AM	68%	5 PM - 8 PM	5%
11 AM - 2 PM	9%	8 PM - 11 PM	41%

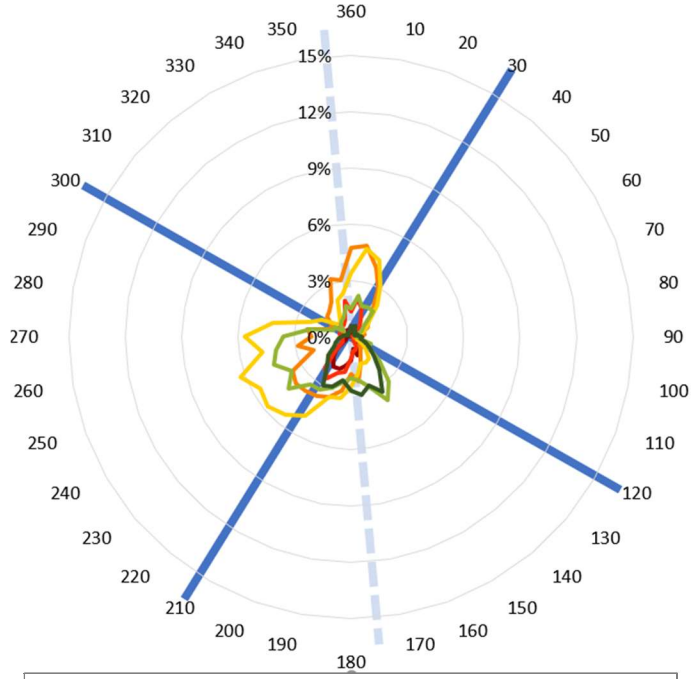
Daytime Wind Data by Month (2001-2020)

September Wind: Time of Day



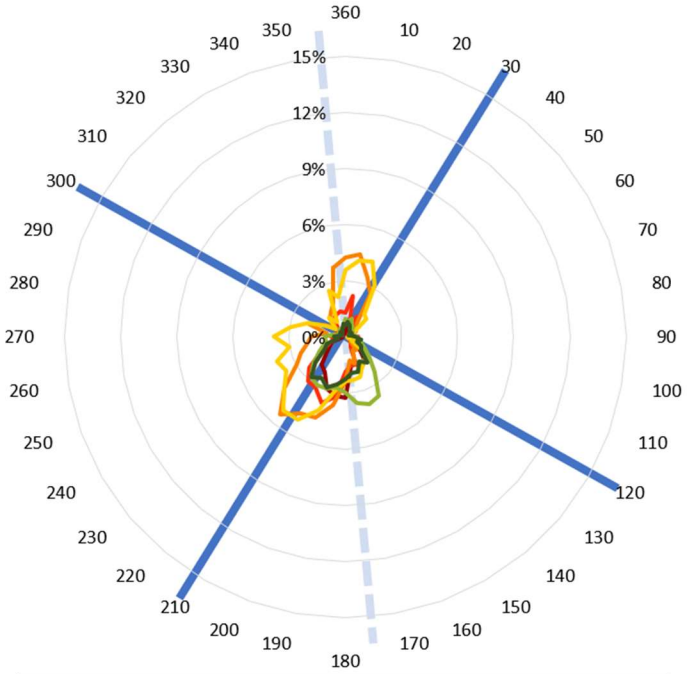
September (2001-2020) Calm Wind (0-3 kt) Percentages			
6 AM - 8 AM	86%	2 PM - 5 PM	4%
8 AM - 11 AM	67%	5 PM - 8 PM	11%
11 AM - 2 PM	12%	8 PM - 11 PM	52%

October Wind: Time of Day



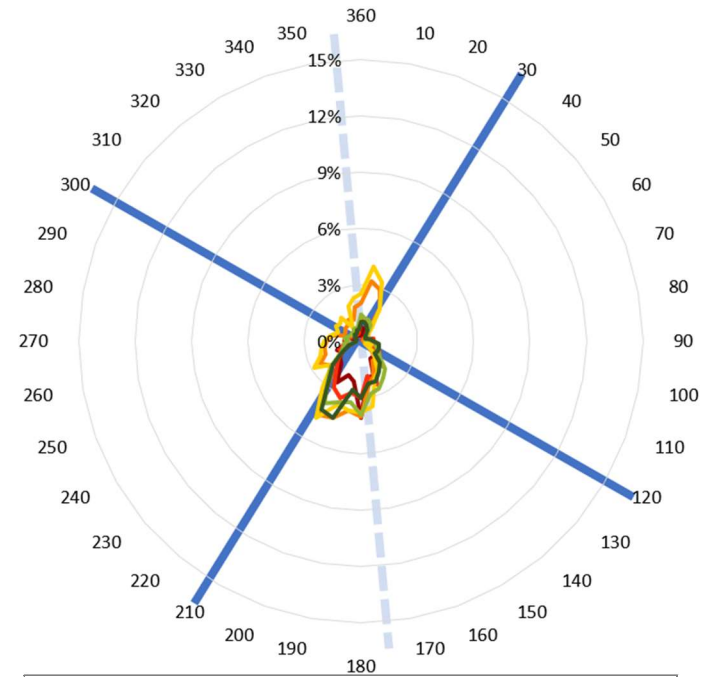
October (2001-2020) Calm Wind (0-3 kt) Percentages			
6 AM - 8 AM	79%	2 PM - 5 PM	6%
8 AM - 11 AM	69%	5 PM - 8 PM	28%
11 AM - 2 PM	23%	8 PM - 11 PM	60%

November Wind: Time of Day



November (2001-2020) Calm Wind (0-3 kt) Percentages			
6 AM - 8 AM	66%	2 PM - 5 PM	18%
8 AM - 11 AM	59%	5 PM - 8 PM	50%
11 AM - 2 PM	29%	8 PM - 11 PM	63%

December Wind: Time of Day



December (2001-2020) Calm Wind (0-3 kt) Percentages			
6 AM - 8 AM	65%	2 PM - 5 PM	32%
8 AM - 11 AM	60%	5 PM - 8 PM	50%
11 AM - 2 PM	40%	8 PM - 11 PM	57%

CONCLUSIONS

Historical Wind Data by Month (2001-2020)

Wind data for the last 20 years at TRK shows these trends:

- With the exception of the late spring and summer months, prevailing winds are out of the southwest, ranging from 190- to 220-degrees true north. These winds favor operations on Runway 20.
- From May through August, winds shift to the west-southwest. During these months, the wind direction is more variable and is out of a larger range, 170- to 270-degrees true north. These winds favor operations on Runways 20 and 29.
- Calm wind (0 to 3 knots) conditions are more common during nighttime hours (11 p.m. – 6 a.m.) than daytime hours. Nighttime calm wind observations range from 72 percent of nighttime observations in March to 95 percent of nighttime observations in August.
- Conversely, calm wind conditions are less common in daytime than nighttime. Daytime calm wind conditions are more common in the winter months, with 69 percent of daytime observations in January. The month with the least amount of calm wind daytime observations is June with 38 percent.
- For the December wind rose, the dataset shows a spike of observations in the 180-degree heading in 2002. Other sources of weather data for that specific month show strong winds and two significant weather events; however, we believe the specific readings in the 180-degree heading are an error and may be attributed to equipment malfunction.

Daytime Wind Data by Month (2001-2020)

- During winter months (December through February), winds are most frequent in the 2:00 p.m. – 5:00 p.m. interval, when winds are out of the north-northeast.
- Throughout March and April, winds are most common in the 2:00 p.m. – 5:00 p.m. interval, when winds are out of the southwest.
- Between May and September, winds are most prevalent in the 5:00 p.m. – 8:00 p.m. interval, when winds are out of the west. Winds also shift from the south-southwest to the west from the late morning to the evening during these warm months.
- Calm wind conditions are prevalent in the cold weather months (November through February).