

**TINTINA RESOURCES, INC.  
BLACK BUTTE COPPER  
PROJECT AMBIENT AIR  
MONITORING PROGRAM  
Quarterly Data Report  
Fourth Quarter 2014**

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## CERTIFICATION OF DATA INTEGRITY

Bison Engineering, Inc., certifies the data in this report is an accurate summary of the air quality conditions measured at the Black Butte Copper Project air monitoring site. Every effort was made to obtain accurate and representative data and to comply with the procedures set forth in the project-specific *Quality Assurance Project Plan*, the *State of Montana Ambient Air Monitoring Program Quality Assurance Project Plan (April 2013)*, and the Environmental Protection Agency's *Quality Assurance Handbook for Air Pollution Measurement Systems: Volume I, A Field Guide to Environmental Quality Assurance (April 1994)*, *Volume II, Ambient Air Quality Program (May 2013)*, and *Volume IV, Meteorological Measurements (March 2008)*.

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Date: 1/13/15

Reviewer: Rebecca L. Picchioni, P.E.

Signature: 

Title: Project Engineer

Date: 1/28/15

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## **APPENDICES**

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- Appendix A: Meteorological Data
- Appendix B: Performance Audit Reports

## 1.0 INTRODUCTION

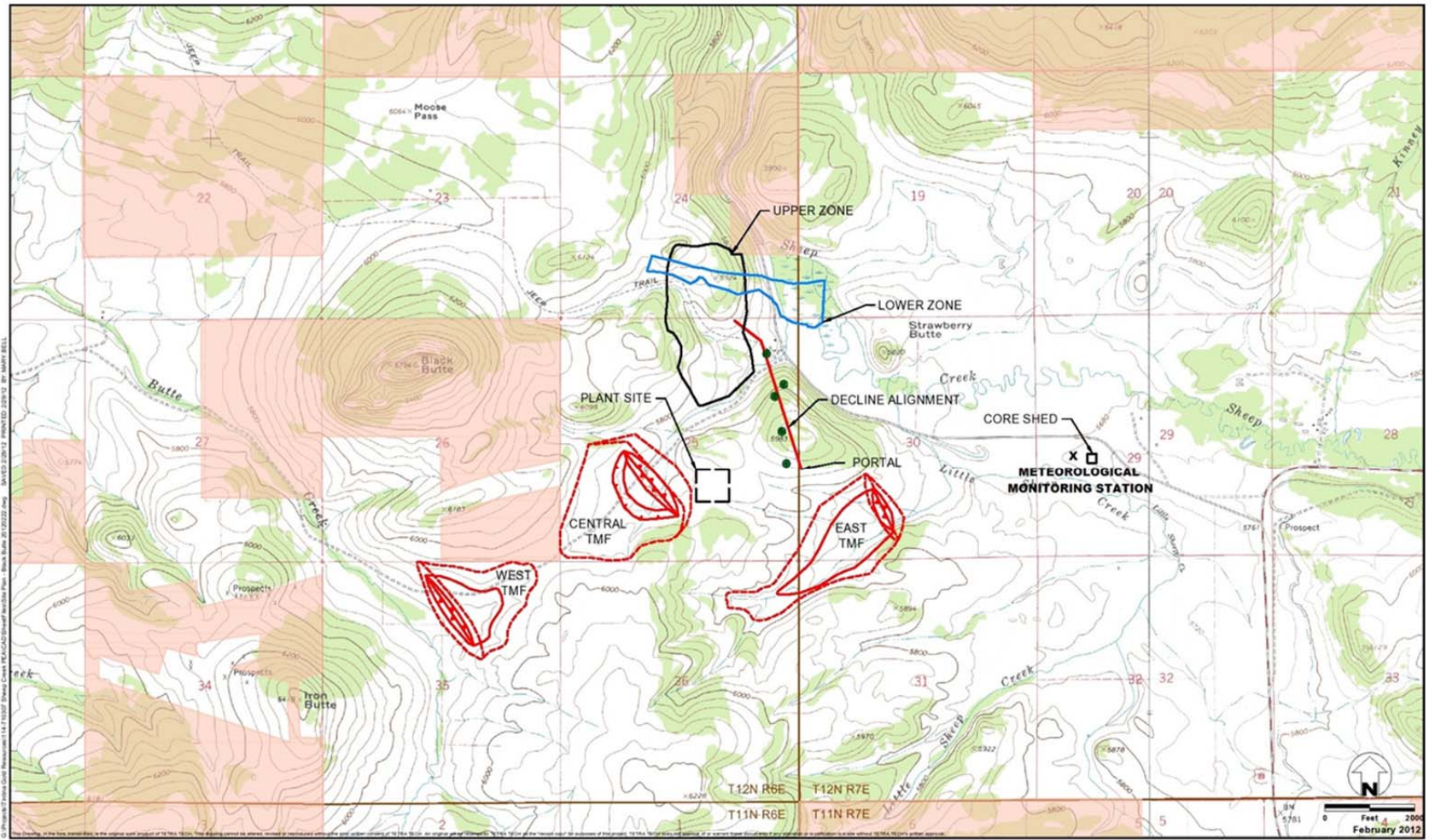
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Tintina Resources, Inc. established an ambient air monitoring site to measure wind speed, wind direction, standard deviation of wind direction, temperature at 9 meters and 2 meters, delta temperature, solar radiation, barometric pressure, and precipitation. The station was established to accurately characterize the local meteorology and collect baseline data in support of an operating permit application and various environmental studies.

The meteorological monitoring system was installed in April 2012. The site is operated by Bison Engineering, Inc., of Helena and Billings. Figure 1 shows the location of the monitoring site.

This report presents the data collected during the fourth quarter (October through December) of 2014. In addition, a description of the monitoring system operations is presented, together with summaries of quality assurance activities, including calibrations and performance audits. Tabular summaries of the data completeness achieved and the periods of missing data also are presented. Appendix A presents hourly meteorological data collected.

**Figure 1. Monitoring Site Location**



- ADIT ALIGNMENT HOLES
- TAILINGS MANAGEMENT FACILITY
- USFS PROPERTY

Site Plan  
 Black Butte Copper Project  
 Meagher County, Montana  
 FIGURE 1



## **2.0 MONITORING SYSTEM OPERATIONS**

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The installation of the monitoring meteorological system equipment took place in April 2012, soon after the equipment was received from the manufacturers. The installation and calibration of the equipment required about two weeks to complete. All meteorological parameters were in full operation and producing valid data by April 30, 2012.

The scheduled third quarter audits were not performed until October 7; those results were documented in the third quarter report. Jeff Bell of Bison Engineering, Inc. (Bison) conducted the scheduled fourth quarter performance audits of the meteorological system on December 19. The relative humidity audit could not be done because below-freezing temperatures prevented the collection of accurate wet-bulb temperature measurements at the time of the audit. In general the audits produced results within the recommended tolerance limits, as discussed in Section 4.0. The Bison report of the audits is presented in Appendix B.

The hourly precipitation data from November 27 onward is considered suspect due to a malfunctioning sensor heater discovered during the December 19 audit. This caused frozen precipitation to accumulate in the gauge, and not trickle into the tipping bucket assembly until ambient temperatures rose above freezing. Those hourly data were invalidated. However, the hourly data were totalized to provide an approximate lower boundary for total monthly precipitation in November (1.20 inches) and December (0.75 inches).

### **3.0 CALIBRATION DATA**

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As discussed in Section 4.0, the system's as-found condition was audited on December 19. No calibration adjustments were made based on those results.

## 4.0 PERFORMANCE AUDIT DATA

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Jeff Bell of Bison conducted performance audits of the meteorological system on December 19. Results were satisfactory with the following caveats:

- The relative humidity sensor could not be audited due to very low temperatures, but appears to be working properly based on regular online data reviews.
- It was discovered at the time of the audit that the precipitation gauge's heater was not working. However, the precipitation gauge's calibration was found to be satisfactory.
- The individual temperature sensor audit results were both within the +/- 0.50 °C audit criterion. The delta temperature audit results exceeded the +/- 0.10 °C audit criterion, but likely reflect difficulty in maintaining stable, homogeneous test conditions during cold, windy weather. Remote data reviews have consistently shown reasonable delta temperature readings.

The Bison report of the audits is presented in Appendix B.



## 5.0 DATA COMPLETENESS

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The meteorological percentages of data recovery achieved during the fourth quarter of 2014 are given in Tables 1 and 2. In these tables, the number of possible data values during each month of the quarter is given, together with the number of valid readings and the number of hours spent on quality assurance activities (such as calibrations, performance audits, and maintenance on the sensors). The quality assurance hours are added to the number of hours of valid data to compute the net percentage data recovery.

During the fourth quarter the net percentage data recovery was 97.5 for wind speed, and 97.2 for wind direction and standard deviation. The loss of data was due to freezing of the sensor cups and/or vanes during cold, wet conditions. The net percentage data recovery was 62.0 percent for precipitation. The loss of data was due to failure of the heater which caused hourly values to be unreliable after November 26. The net percentage data recovery was 98.1 percent for all other parameters at the site. The loss of data was due to a power failure at the site.

**Table 1. Monthly Data Completeness**

<b>October 2014</b>					
<b>Parameter</b>	<b>Readings Possible</b>	<b>Valid Readings</b>	<b>Percentage Recovery</b>	<b>Quality Assurance Hours</b>	<b>Net Percentage Recovery</b>
<b>Black Butte Copper Project Met Tower</b>					
Wind Speed	744	740	99.5	4	100.0
Wind Direction	744	740	99.5	4	100.0
Standard Deviation	744	740	99.5	4	100.0
Temperature 9 Meters	744	740	99.5	4	100.0
Temperature 2 Meters	744	740	99.5	4	100.0
Temperature Delta T	744	740	99.5	4	100.0
Solar Radiation	744	740	99.5	4	100.0
Barometric Pressure	744	740	99.5	4	100.0
Relative Humidity	744	740	99.5	4	100.0
Precipitation	744	742	99.7	2	100.0
<b>Total</b>	<b>7,440</b>	<b>7,402</b>	<b>99.5</b>	<b>38</b>	<b>100.0</b>

**Table 1. Monthly Data Completeness (Continued)**

<b>November 2014</b>					
Parameter	Readings Possible	Valid Readings	Percentage Recovery	Quality Assurance Hours	Net Percentage Recovery
<b>Black Butte Copper Project Met Tower</b>					
Wind Speed	720	720	100.0	0	100.0
Wind Direction	720	713	99.0	0	99.0
Standard Deviation	720	713	99.0	0	99.0
Temperature Meters 9	720	720	100.0	0	100.0
Temperature Meters 2	720	720	100.0	0	100.0
Temperature Delta T	720	720	100.0	0	100.0
Solar Radiation	720	720	100.0	0	100.0
Barometric Pressure	720	720	100.0	0	100.0
Relative Humidity	720	720	100.0	0	100.0
Precipitation	720	624	86.7	0	86.7
<b>Total</b>	<b>7,200</b>	<b>7,090</b>	<b>98.5</b>	<b>0</b>	<b>98.5</b>

**Table 1. Monthly Data Completeness (Continued)**

<b>December 2014</b>					
<b>Parameter</b>	<b>Readings Possible</b>	<b>Valid Readings</b>	<b>Percentage Recovery</b>	<b>Quality Assurance Hours</b>	<b>Net Percentage Recovery</b>
<b>Black Butte Copper Project Met Tower</b>					
Wind Speed	744	685	92.1	4	92.6
Wind Direction	744	685	92.1	4	92.6
Standard Deviation	744	685	92.1	4	92.6
Temperature 9 Meters	744	698	93.8	4	94.4
Temperature 2 Meters	744	698	93.8	4	94.4
Temperature Delta T	744	698	93.8	4	94.4
Solar Radiation	744	698	93.8	4	94.4
Barometric Pressure	744	698	93.8	4	94.4
Relative Humidity	744	698	93.8	4	94.4
Precipitation	744	0	0.0	0	0.0
<b>Total</b>	<b>7,440</b>	<b>6,243</b>	<b>83.9</b>	<b>36</b>	<b>84.4</b>

**Table 2. Quarterly Data Completeness**

<b>Fourth Quarter 2014</b>					
Parameter	Readings Possible	Valid Readings	Percentage Recovery	Quality Assurance Hours	Net Percentage Recovery
<b>Black Butte Copper Project Met Tower</b>					
Wind Speed	2,208	2,145	97.1	8	97.5
Wind Direction	2,208	2,138	96.8	8	97.2
Standard Deviation	2,208	2,138	96.8	8	97.2
Temperature 9 Meters	2,208	2,158	97.7	8	98.1
Temperature 2 Meters	2,208	2,158	97.7	8	98.1
Temperature Delta T	2,208	2,158	97.7	8	98.1
Solar Radiation	2,208	2,158	97.7	8	98.1
Barometric Pressure	2,208	2,158	97.7	8	98.1
Relative Humidity	2,208	2,158	97.7	8	98.1
Precipitation	2,208	1,366	61.9	2	62.0
<b>Total</b>	<b>22,080</b>	<b>20,735</b>	<b>93.9</b>	<b>74</b>	<b>94.2</b>

**Table 3. Periods of Missing Data**

<b>Fourth Quarter 2014</b>						
Starting Date/Hour	Ending Date/Hour	Site	Parameter	Total Hours	Percent of Quarter	Circumstance
Nov 26/6	Nov 26/12	Met Tower	Wind Dir, Std Dev	7	0.32	Missing data: Frozen sensor
Nov 27/1	Dec 31/24	Met Tower	Precip	840	38.04	Missing data: Broken heater
Dec 5/22	Dec 6/10	Met Tower	Wind Speed, Wind Dir, Std Dev	13	0.59	Missing data: Frozen sensor
Dec 15/20	Dec 17/13	Met Tower	All	42	2.01	Missing data: Power failure

## 6.0 MONITORING DATA

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The hourly data values collected at the monitoring sites are given in the data tables in Appendix A. Each of these tables presents one month's data for all parameters in the monitoring system. In addition, the average, maximum, and minimum values for each parameter for each day are listed (for wind direction, the prevailing wind direction for the day is given). For those hours with missing data, a code is given that explains the reason the data were missing. These codes are given in Table 4.

Monthly and quarterly wind rose distributions from the monitoring site are presented in Tables 5 through 8. These tables give the percentage frequency of occurrence of winds from 16 cardinal directions and from 22 wind speed ranges. These same data are presented graphically in Figures 2 through 5. In the wind rose figures, the length of each "petal" of the rose is proportional to the percentage of time the wind blew from that direction. On the bottom of each figure is a histogram showing the average wind speed from each of the cardinal wind directions.

**Table 4. Missing Data Codes**

<b>Mnemonic Code</b>	<b>Description</b>	<b>Equivalent EPA Null Value Reason Code</b>
Sc	Scheduled but not collected	9972
Ti	Sample time out of limits	9973
Fi	Filter damage	9976
Op	Voided by operator	9978
ND	Machine malfunction	9980
Wx	Bad weather	9981
Co	Collection error	9983
Lb	Lab error	9984
QA	Poor quality assurance results	9985
Pwr	Power failure	9988
Wi	Wildlife damage	9989
AZ	Automatic zero/span check	9991
ZS	Manual zero/span check	9986
Au	Performance audit	9992
Ma	Routine maintenance/repairs	9993
Ca	Multipoint calibration	9995
PZ	Precision/zero/span	9998



**Table 5. Monthly Wind Rose Summary, Black Butte Copper Project Met Tower**

October 2014																		
Direction>>>	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total	
0.1 - 1.0	0.4	0.8	0.8	1.1	1.1	0.9	1.6	1.4	0.8	0.1	0.3	0.0	0.3	0.1	0.4	0.8	10.9	
1.1 - 2.0	0.3	0.5	1.8	2.4	4.1	6.8	4.5	1.8	0.9	0.4	0.1	0.1	0.3	0.8	0.4	0.4	25.5	
2.1 - 3.0	0.1	0.3	0.3	1.2	3.0	3.4	2.3	1.4	0.5	0.1	0.9	0.8	0.8	2.2	0.7	0.3	18.2	
3.1 - 4.0	0.0	0.0	0.1	0.5	1.2	0.1	0.3	1.4	0.1	0.8	0.9	0.8	1.9	2.3	1.1	0.5	12.2	
4.1 - 5.0	0.1	0.0	0.0	0.0	0.4	0.3	0.1	1.1	0.9	0.7	0.7	1.1	1.5	2.0	0.8	0.1	9.9	
5.1 - 6.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.9	0.8	0.4	0.3	2.7	1.4	0.3	0.3	8.0	
6.1 - 7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.9	0.4	0.3	0.3	0.5	3.5	0.3	0.5	0.3	7.2	
7.1 - 8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.4	0.4	0.5	1.8	0.8	0.0	0.0	4.6	
8.1 - 9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	1.4	0.4	0.1	0.0	2.3	
9.1 - 10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.3	0.3	0.1	0.0	0.8	
10.1 - 11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.4	
11.1 - 12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
12.1 - 13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
13.1 - 14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
14.1 - 15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
15.1 - 16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
16.1 - 17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
17.1 - 18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
18.1 - 19.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
19.1 - 20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
> 20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Calm																	0.0	
Total	1.1	1.6	3.0	5.3	9.7	11.5	9.2	8.9	5.0	4.1	4.1	4.3	14.6	10.5	4.5	2.7	100.0	
Average Speed	2.3	1.2	1.4	1.8	2.1	1.8	1.9	3.4	3.7	5.0	4.0	4.7	5.8	4.4	4.0	2.8	3.4	

**Table 6. Monthly Wind Rose Summary, Black Butte Copper Project Met Tower**

November 2014																		
Direction>>>	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total	
Wind Speed (meters per second)	0.1 - 1.0	1.4	1.1	1.5	1.8	1.7	1.8	3.1	1.4	0.6	0.7	0.3	0.3	0.3	0.6	0.8	1.1	18.5
	1.1 - 2.0	0.6	1.3	0.8	1.5	2.5	3.1	3.9	2.2	0.4	0.6	0.7	0.4	1.0	0.8	0.6	1.1	21.6
	2.1 - 3.0	0.0	0.3	0.6	0.6	0.6	0.8	0.1	0.1	0.7	0.0	0.6	1.7	1.5	1.7	1.4	0.4	11.1
	3.1 - 4.0	0.4	0.1	0.0	0.0	0.1	0.0	0.4	0.6	1.4	0.6	0.1	2.1	2.8	2.1	0.6	1.5	12.9
	4.1 - 5.0	0.4	0.0	0.0	0.0	0.1	0.1	0.1	0.6	0.4	1.4	0.1	0.8	4.2	2.0	0.4	0.3	11.1
	5.1 - 6.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.4	0.4	1.3	1.7	4.6	0.8	0.4	0.1	10.7
	6.1 - 7.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.8	0.4	2.9	1.7	0.1	0.6	7.3
	7.1 - 8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.1	1.4	0.7	0.1	0.0	2.8
	8.1 - 9.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.1	0.0	0.3	1.8
	9.1 - 10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	0.3	0.1	0.0	1.1
	10.1 - 11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.7
	11.1 - 12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.3
	12.1 - 13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
	13.1 - 14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	14.1 - 15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	15.1 - 16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	16.1 - 17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	17.1 - 18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	18.1 - 19.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	19.1 - 20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Calm																		0.0
Total	3.4	3.1	2.9	3.9	5.0	5.9	8.1	5.2	3.9	4.1	4.2	7.9	21.5	10.8	4.6	5.5	100.0	
Average Speed	2.8	1.8	1.2	1.3	1.4	1.5	1.6	2.1	3.1	3.6	4.5	4.1	5.4	4.3	3.1	3.1	3.4	

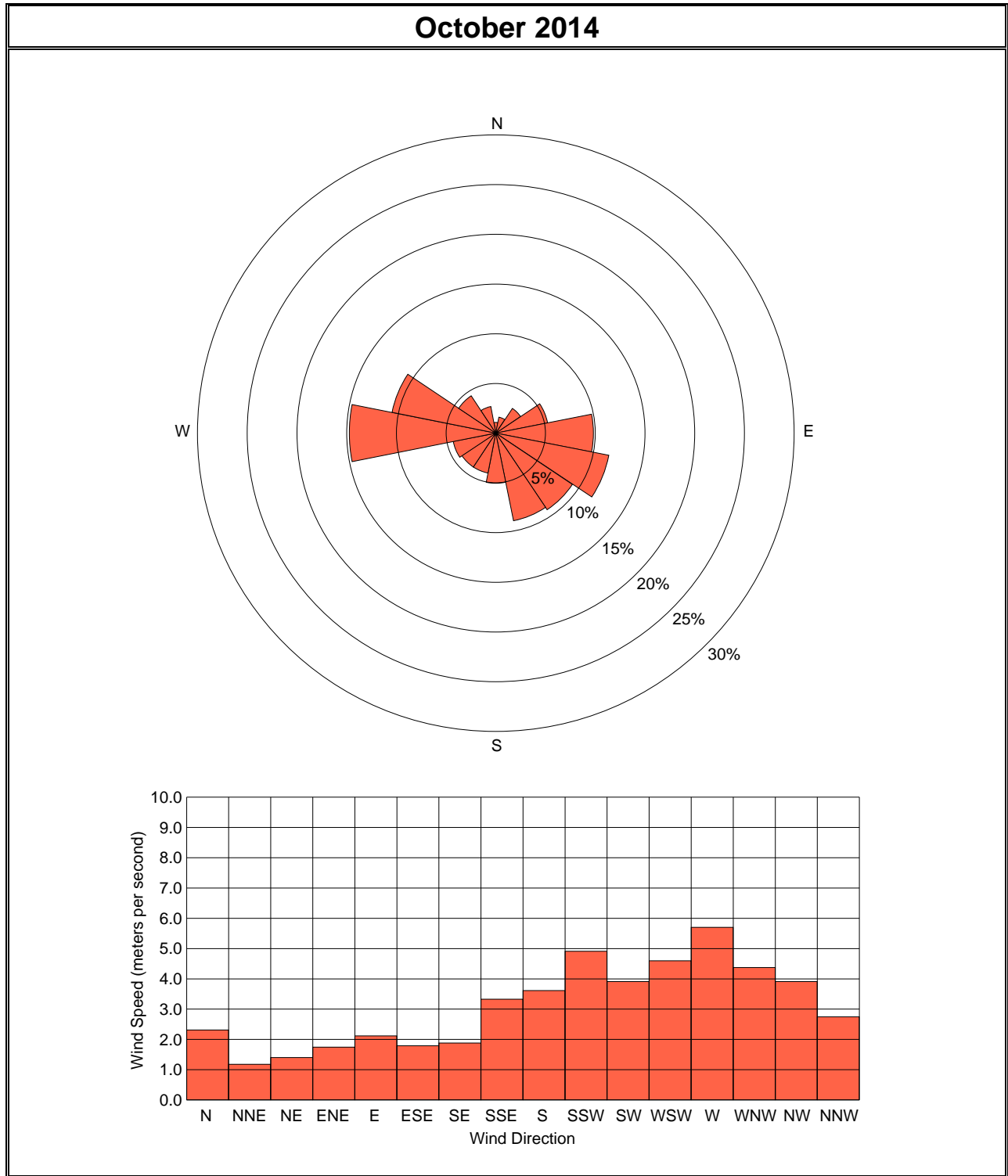
**Table 7. Monthly Wind Rose Summary, Black Butte Copper Project Met Tower**

December 2014																		
Direction>>>	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total	
Wind Speed (meters per second)	0.1 - 1.0	0.6	0.6	1.7	1.5	2.2	2.9	3.6	2.8	2.0	0.7	0.4	0.6	0.7	1.5	1.9	1.6	25.3
	1.1 - 2.0	1.5	0.9	1.2	2.2	4.1	4.1	6.8	3.1	1.0	0.6	0.6	0.9	0.7	1.0	1.0	1.2	30.7
	2.1 - 3.0	0.1	0.4	0.3	1.2	2.3	1.9	1.7	0.7	0.7	0.4	0.3	0.3	1.0	1.2	0.6	0.1	13.4
	3.1 - 4.0	0.1	0.0	0.0	0.3	0.9	0.9	0.7	0.6	0.4	0.1	0.3	0.9	1.7	0.9	0.6	0.7	9.2
	4.1 - 5.0	0.9	0.0	0.0	0.0	1.0	0.1	0.1	0.7	0.1	0.4	0.0	0.0	2.0	1.7	0.7	0.3	8.3
	5.1 - 6.0	0.1	0.0	0.0	0.0	0.6	0.0	0.0	0.1	0.3	0.4	0.0	0.1	1.2	0.9	0.9	0.6	5.2
	6.1 - 7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	1.6	0.9	0.7	0.7	4.2
	7.1 - 8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	1.0	0.0	0.3	0.0	1.9
	8.1 - 9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	0.3	0.0	0.0	1.0
	9.1 - 10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.6
	10.1 - 11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3
	11.1 - 12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	12.1 - 13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	13.1 - 14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	14.1 - 15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	15.1 - 16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	16.1 - 17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	17.1 - 18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	18.1 - 19.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	19.1 - 20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Calm																		0.0
Total	3.3	1.9	3.2	5.1	11.0	9.9	13.1	8.0	4.9	2.9	1.9	3.2	11.0	8.6	6.7	5.2	100.0	
Average Speed	2.4	1.5	1.2	1.6	2.2	1.7	1.5	1.8	2.2	3.0	2.5	3.0	4.9	3.8	3.2	2.8	2.5	

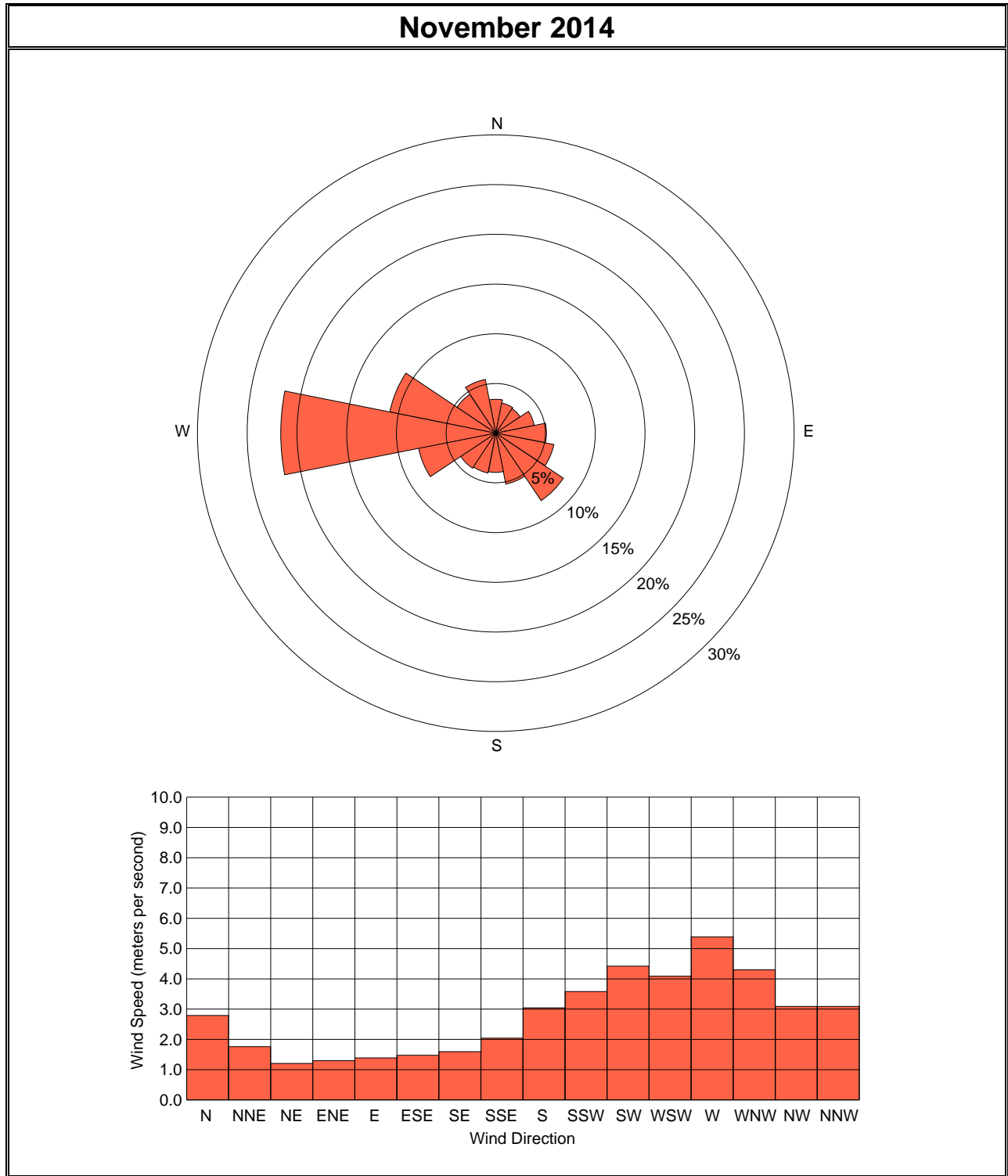
**Table 8. Quarterly Wind Rose Summary, Black Butte Copper Project Met Tower**

Fourth Quarter 2014																		
Direction>>>	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total	
Wind Speed (meters per second)	0.1 - 1.0	0.8	0.8	1.4	1.4	1.6	1.9	2.8	1.8	1.1	0.5	0.3	0.3	0.4	0.7	1.0	1.2	18.1
	1.1 - 2.0	0.7	0.9	1.3	2.1	3.5	4.7	5.0	2.3	0.8	0.5	0.5	0.5	0.7	0.9	0.7	0.9	25.9
	2.1 - 3.0	0.1	0.3	0.4	1.0	2.0	2.1	1.4	0.7	0.7	0.2	0.6	0.9	1.1	1.7	0.9	0.3	14.3
	3.1 - 4.0	0.2	0.0	0.0	0.3	0.7	0.3	0.5	0.8	0.7	0.5	0.5	1.3	2.1	1.8	0.7	0.9	11.4
	4.1 - 5.0	0.5	0.0	0.0	0.0	0.5	0.2	0.1	0.8	0.5	0.8	0.3	0.7	2.6	1.9	0.7	0.2	9.8
	5.1 - 6.0	0.1	0.0	0.0	0.0	0.2	0.0	0.2	0.3	0.6	0.6	0.6	0.7	2.8	1.0	0.5	0.3	8.0
	6.1 - 7.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.2	0.4	0.4	2.7	0.9	0.5	0.5	6.3
	7.1 - 8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.2	0.3	0.3	1.4	0.5	0.1	0.0	3.1
	8.1 - 9.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	0.3	0.0	0.1	1.7
	9.1 - 10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.1	0.0	0.8
	10.1 - 11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.5
	11.1 - 12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	12.1 - 13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	13.1 - 14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	14.1 - 15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	15.1 - 16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	16.1 - 17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	17.1 - 18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	18.1 - 19.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	19.1 - 20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Calm																		0.0
Total	2.6	2.2	3.0	4.8	8.6	9.1	10.1	7.4	4.6	3.7	3.4	5.1	15.7	10.0	5.2	4.4	100.0	
Average Speed	2.6	1.6	1.3	1.6	2.0	1.7	1.7	2.5	3.0	4.0	3.9	4.1	5.4	4.2	3.4	2.9	3.1	

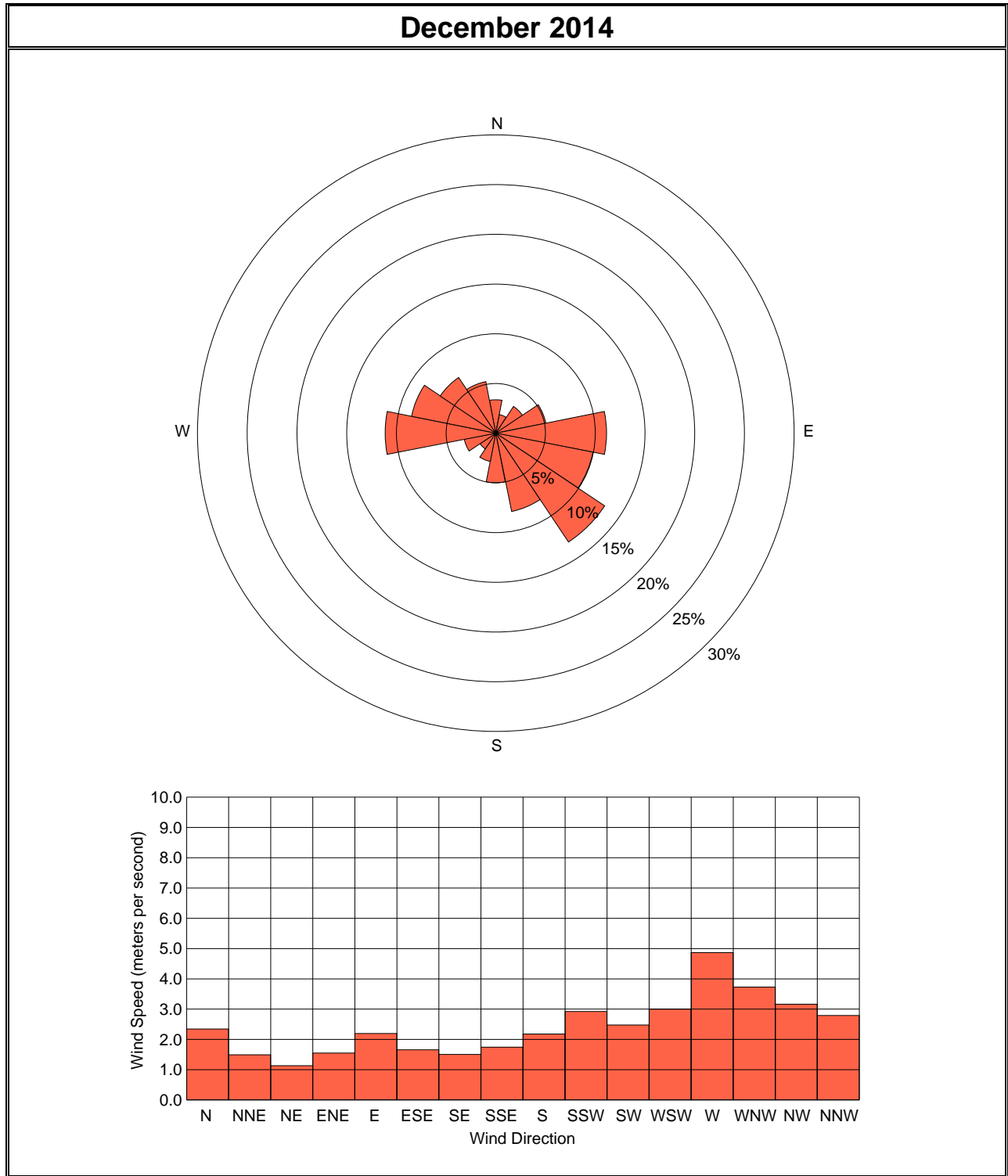
**Figure 2. Monthly Wind Rose, Black Butte Copper Project Met Tower**



**Figure 3. Monthly Wind Rose, Black Butte Copper Project Met Tower**



**Figure 4. Monthly Wind Rose, Black Butte Copper Project Met Tower**



**Figure 5. Quarterly Wind Rose, Black Butte Copper Project Met Tower**

