REPORT

SITE C CLIMATE & AIR QUALITY MONITORING

FORT ST. JOHN, BC

2017 ANNUAL REPORT

RWDI #1601625

March 12, 2018

SUBMITTED TO

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1 INTRODUCTION

BC Hydro's Site C Clean Energy Project (the Project) in British Columbia's Peace region will create a new hydroelectric dam and generating station on the Peace River in the vicinity of the city of Fort St. John. Approval of the Project by the Canadian Environmental Assessment Agency was contingent on BC Hydro satisfying a number of conditions (CEAA, 2014). Section 12 of the Federal Decision Statement (FDS) is concerned with the health of aboriginal peoples as it relates to air quality. This section mandates proper management, monitoring and reporting of air quality to minimize the potential effects on aboriginal health. Section 12.6 of the FDS requires BC Hydro to "implement the [management] plan and provide to the Agency an analysis and summary of the implementation of the plan, as well as any amendments made to the plan in response to the results, on an annual basis during construction and the first year of operation." In 2017, there were four ambient air quality monitoring stations in operation and each provided continuous measurements that were used to monitor effects of the Project on aboriginal and public health, and to inform construction activities.

To characterize the microclimate and to provide a baseline against which to compare future changes brought on as a result of the Project, BC Hydro installed a network of climate and air quality monitoring stations in the Peace River Valley. This network has been active since 2011. A technical data report (TDR) (RWDI AIR Inc. 2012) containing a section discussing the area's microclimate was released in December 2012. Therein, results from the network's first year of observations, from January 16, 2011 to January 15, 2012, were discussed. As required by Condition 31 of the provincial Environmental Assessment Certificate (EAC), microclimate monitoring is being conducted to support an understanding of how the Project might affect agricultural activities. Examples include changes to humidity levels that could affect crop drying as well as other climatic factors to estimate moisture deficits.

Five subsequent annual monitoring reports describing the state of the climate and air quality for the years of observations, coinciding with the 2012 through 2016 calendar years were released since then (RWDI AIR Inc. 2015a, 2015b, 2015c, 2016, 2017). The initial monitoring established baseline conditions which were in effect until the summer of 2015 when construction activities began. The network has remained in operation and has continued to collect valuable climate and air quality data in the Peace region. This document serves to describe the state of the climate and air quality for the seventh year of observations and the third year of Project construction, coinciding with the 2017 calendar year. This current report allows for comparisons to the previous data collected by the network and to 30-year climate normals from the Environment Canada station at Fort St John Airport (EC, 2016). Climate parameters such as temperature, precipitation, wind speed and direction, soil temperature and soil volumetric water content as well as air quality parameters such as concentrations of particulate matter (PM), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and carbon monoxide (CO) are presented.

Condition 57 of the provincial EAC cites the management plans that were created for the Project to minimise air emissions, monitor the ambient air quality and provide these readings to the BC MOE to notify sensitive populations if air quality thresholds are exceeded. A summary of the the applicable FDS conditions and the provincial EAC conditions and their status in relation to complying with the Air Quality Management Plan for the calendar year are presented in Appendix A.

1.1 Managing Air Quality

To avoid or minimize exceedances of air quality objectives (FDS, Section 12.1) BC Hydro developed a Construction Environmental Management Plan (CEMP), (BC Hydro 2016), which includes a component Air Quality Management Plan (Section 4.1) and a description of the Air Quality Monitoring Program (Appendix B). The development of the CEMP satisfies Section 12.2 of the FDS. Section 4.1 of the CEMP details the management practices that will be implemented to minimize emissions of criteria air contaminants. Contractors are required to produce site-specific Environmental Protection Plans (EPPs) that explain how the Contractor will meet the CEMP requirements. Construction activities, particularly the Main Civil Works, are well underway involving elements of the majority of activities listed in Section 4.1 of the CEMP. As of December 31, 2017 and cumulatively, over 300 EPP's (including revisions) have been reviewed by BC Hydro, many of which include measures to minimize emissions as per Section 4.1 of the CEMP, where applicable.

These measures include:

- Application of dust suppressant (water on non-paved roads and other select areas such as laydown areas;
- Application of other products, such as liquid calcium chloride, on roads for cold weather dust suppression;
- Dust suppression systems on drilling equipment; and
- Vehicle inspection and maintenance programs.

BC Hydro conducts environmental audits during construction to verify implementation of EPPs, including implementation of appropriate mitigation measures in response to air quality alerts. As of June 28, 2017, BC Hydro implemented the Active Compliance Management Tool (ACMT), which is a database to house environmental inspection data. Of the 946 inspections conducted by BC Hydro (between June 28, 2017 and December 31, 2017) against air quality commitments in contractor EPPs, 89% were demonstrated to be fully compliant, 3% were partially compliant, and 8% were not compliant. For any instances of non-compliance, a Field Advice Memo is issued by BC Hydro to the contractor, if warranted.

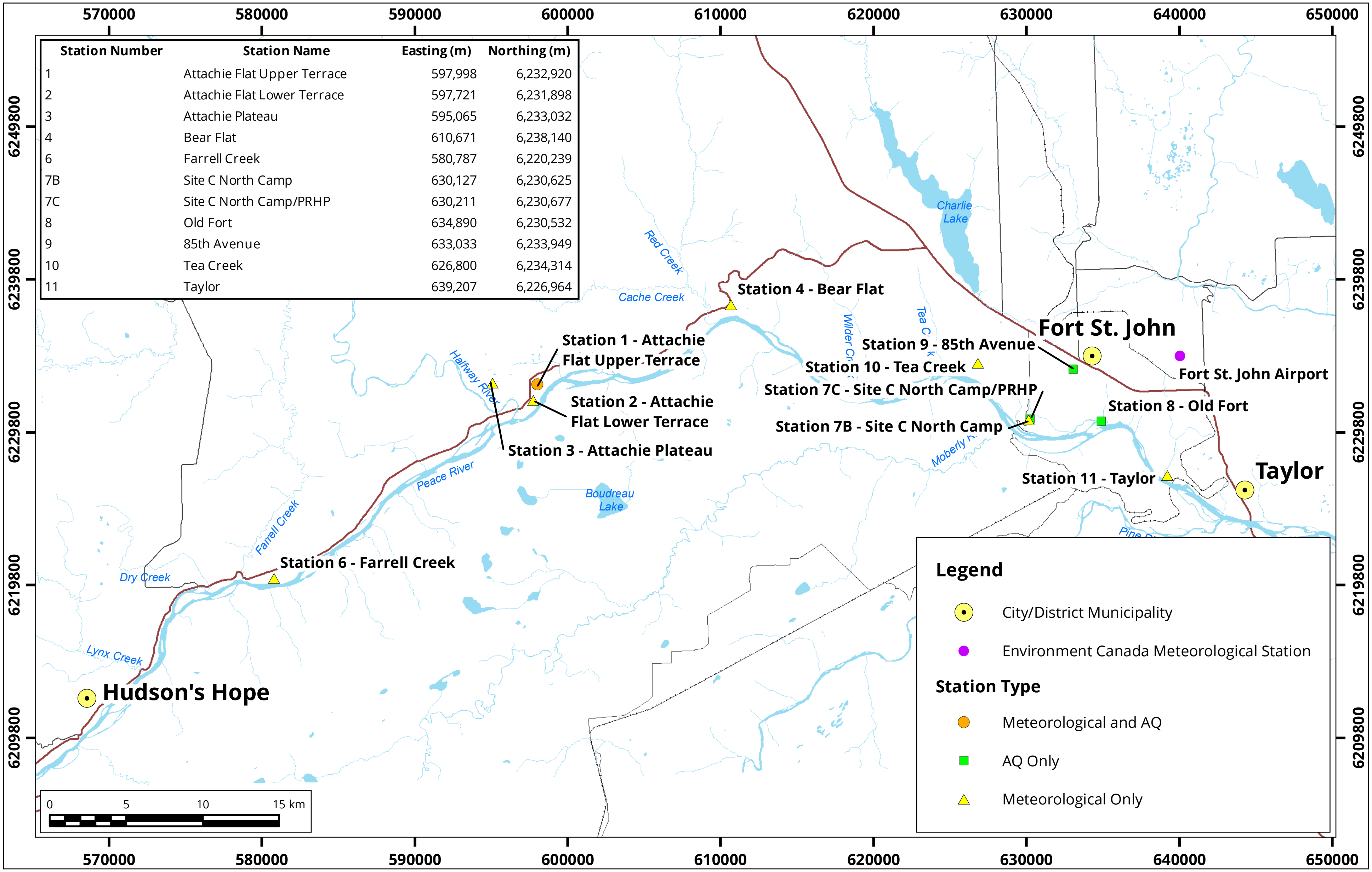
BC Hydro has also developed a Smoke Management Plan (BC Hydro 2015), which is another component of the CEMP (Appendix A), and which satisfies Section 12.3.2 of the FDS conditions and Condition 57 of the provincial EAC.

2 MONITORING NETWORK

Figure 2-1 shows the location of the network stations in relation to local communities and the Peace River. Table 2-1 and Table 2-2 show locations and parameters measured at these stations. There were several upgrades and changes made to the network in 2017. Station 2 (Attachie Flat Lower Terrace) was decommissioned on September 6, 2017 as it was located within the future reservoir inundation zone, and Stations 10 and 11 (Tea Creek and Taylor) were installed and commissioned on September 14 and 15, 2017, respectively, to meet the requirements of the Agricultural Monitoring and Follow-up Program. This program requires a data collection period of at least five years prior to reservoir filling.

Of the four stations monitoring air quality parameters in the network, three of the stations' shelters were upgraded in 2017. The main objective of this reconfiguration was to move the air quality monitors into 8' by 20'office-style trailers with sufficient heating and air conditioning to minimize indoor temperature fluctuations and allow better access to the equipment for routine maintenance and audits. The shelters were upgraded in Station 1 (Attachie Flat Upper Terrace), Station 7B/C (Site C North Camp/Fort St John Camp C) and Station 9 (85th Avenue). These shelter upgrades were completed on December 19-22, August 17 and August 18, respectively. The Station 1 and Station 9 air quality monitors and trailers were installed within a few meters of their original locations in the same compound; hence, the measurements are expected to remain representative of their original placements. Station 7B/C was created when the air quality monitors and new structure were relocated approximately 275 m (similar in elevation) to the north-northeast due to physical constraints (compound area was too small) that prevented relocation into a trailer at the original 7B location, and to avoid encroaching construction activities (left bank excavation). As a result of this move, this station was renamed Station 7B/C. Station 7B, which includes the meteorological sensors, did not move from its original placement.

Photos of the upgraded station configurations are shown in Figures 2-2 through 2-4.



Station Number	Station Name	Easting (m)	Northing (m)
1	Attachie Flat Upper Terrace	597,998	6,232,920
2	Attachie Flat Lower Terrace	597,721	6,231,898
3	Attachie Plateau	595,065	6,233,032
4	Bear Flat	610,671	6,238,140
6	Farrell Creek	580,787	6,220,239
7B	Site C North Camp	630,127	6,230,625
7C	Site C North Camp/PRHP	630,211	6,230,677
8	Old Fort	634,890	6,230,532
9	85th Avenue	633,033	6,233,949
10	Tea Creek	626,800	6,234,314
11	Taylor	639,207	6,226,964

BC Hydro - Site C Meteorological and Air Quality Stations

Map Projection: NAD 1983 UTM Zone 10N

True North

Project #: 1601625

Drawn by: DJH	Figure: 2-1
Approx. Scale:	1:350,000
Date Revised:	Feb 5, 2018

Map Document: C:\Users\djh\Desktop\GIS Temp\1601625\1601625 - Confidential BC Hydro Climate_Monitoring Locations_Figure_2-1_Sep2017.mxd

Figure 2-2: Upgraded Station 1 (Attachie Flat Upper Terrace)

Figure 2-3: **Upgraded Station 7B/C (Site C North Camp/Fort St John Camp C)**

Figure 2-4: Upgraded Station 9 (85th Avenue)

Table 2-1: BC Hydro Site C network station locations and elevations

Station Name	UTM NAD 83 (m)	Latitude, Longitude (decimal degrees)	Elevation (m)
Station 1 - Attachie Flat Upper Terrace	597999 E, 6232919 N	56.23N, -121.42W	479
Station 2 – Attachie Flat Lower Terrace(1)	597721 E, 6231898 N	56.22N, -121.42W	441
Station 3 – Attachie Plateau	595065 E, 6233032 N	56.23N, -121.46W	645
Station 4 – Bear Flat	610669 E,6238135 N	56.27N, -121.21W	474
Station 6 – Farrell Creek	580779 E, 6220238 N	56.12N, -121.70W	471
7B/C – Site C North Camp/Fort St. John North Camp C	630127 E, 6230625 N	56.20 N, -120.90W	581
Station 8 – Old Fort	634890 E, 6230532 N	56.20N, -120.82W	423
Station 9 – 85th Avenue	633033 E, 6233949 N	56.23N, -120.85W	686
Station 10 – Tea Creek(2)	626798 E, 6234314 N	56.24 N, -120.95W	653
Station 11 – Taylor(3)	639206 E, 6226964 N	56.17N, -120.76W	411
Fort St. John Airport (Environment Canada)	640053 E, 6234872 N	56.24N, -120.74W	695

Notes: (1): Measurements at Station 2 discontinued as of September 6, 2017
(2): Measurements at Station 10 began on September 14, 2017
(3): Measurements at Station 11 began on September 15, 2017

Table 2-2: BC Hydro Site C network stations and the Fort St. John Airport Environment Canada station with parameters measured

Station	Air Temp. and RH	Wind Speed and Direction	Precipitation	Barometric Pressure	All Radiation Components	Solar Radiation	Net radiation	Turbulent Fluxes	Visibility	Soil Temperature	Soil Moisture	Soil heat Flux	PM_{10} and $PM_{2.5}$	CO, SO_2, NO_2
Station 1 – Attachie Flat Upper Terrace	X	X	X	X	X			X	X	X	X	X	X	
Station 2 – Attachie Flat Lower Terrace(1)	X	X	X	X	X			X		X	X	X		
Station 3 – Attachie Plateau	X	X	X	X		X	X			X	X	X		
Station 4 – Bear Flat	X	X	X	X	X			X		X	X	X		
Station 6 – Farrell Creek	X	X	X	X		X	X			X	X	X		
7B/C – Site C North Camp/Fort St. John North Camp C	X	X	X	X		X	X			X	X	X	X	X
Station 8 – Old Fort													X	
Station 9 – 85th Avenue		X											X	
Station 10 – Tea Creek(2)	X	X	X	X	X		X			X	X	X		
Station 11 – Taylor(3)	X	X	X	X		X	X			X	X	X		
Fort St. John Airport (Environment Canada)	X	X	X	X	X									

Notes: (1): Measurements at Station 2 discontinued as of September 6, 2017
(2): Measurements at Station 10 began on September 14, 2017
(3): Measurements at Station 11 began on September 15, 2017

2.1 Data Collection and Quality Assurance / Quality Control (QA/QC)

Data from the Site C network stations were remotely downloaded to RWDI servers using Campbell Scientific's Loggernet software over cellular and satellite modem connections at the following intervals:

- Stations with AC power (Station 1 – Attachie Flat Upper Terrace, Station 7B/C – Site C North Camp / Fort St. John North Camp C, Station 8 – Old Fort and Station 9 – 85th Avenue) had download intervals of one hour; whereas, solar powered stations (Station 2 – Attachie Flat Lower Terrace, Station 3 – Attachie Plateau, Station 6 – Farrell Creek, the meteorological portion of Station 7B, Station 10 – Tea Creek and Station 11 - Taylor) had their data collected only at specific times during daylight hours to preserve battery charge.
- Station 4 (Bear Flat) was connected to AC power but also used a satellite modem connection until September at which point it was replaced with a cellular modem connection. Downloads from Station 4 until the modem upgrade was conducted once per day to reduce connection charges. Following this upgrade, data was collected hourly.

The first stage of quality assurance applied to the data involved the data logger continually reading in and checking all instrumental diagnostics available from the air quality equipment for signs of an instrumental malfunction. Upon detection of a problem, the data logger can issue commands to the air quality instrument to rectify the problem and notify RWDI personnel of the problem so they can follow-up on it. It was included in the datalogger programs of Station 7B/C (Site C North Camp / Fort St. John North Camp C) and Station 8 (Old Fort) for all of 2017. It was implemented in the data logger programs of Station 1 (Attachie Flat Upper Terrace) and Station 9 (85th Avenue) on December 19, and 18, 2017, respectively.

Manually assisted automated quality control was carried out on the data daily. This involved plotting the data over the past month and the past 14 days to allow for a visual inspection so the operator can detect anomalous trends or data outliers. This frequency of QA was maintained to allow rapid detection and repair of any instrumental malfunctions.

A third QA/QC operation was conducted monthly to invalidate any data from an instrument known to be malfunctioning based on the results of regular checks and calibration visits. Results from both checks performed by RWDI personnel as well as audits performed by the BC Ministry of Environment (BC MOE) were used.

3 METEOROLOGY RESULTS

Table 3-1 provides a summary of some of the parameters discussed in this report as well as 30-year climate normals from Fort St. John Airport for the period from 1981 to 2010 (Environment Canada, 2016). Climate normals were calculated from 30 year records of meteorological observations of wind speeds, temperature, precipitation and other related weather conditions at the location of interest. They were provided by Environment Canada and updated on a 10-year basis. The period from 1981-2010 is the most recent period for which Environment Canada climate normals are available. The 30-year climate normal differ from what is in the published normals, because ECCC takes the daily maximum / daily minimum and averages that over the month for all years. These numbers are the average of the 30 annual maxima/minima in the period so they are more extreme and more comparable to the max temperature at any one site for this year.

Table 3-1: Summary of measured climate parameters during 2017 and comparison with climate normals

Data Record	Mean Temp (°C)	Maximum Temp (°C)	Minimum Temp (°C)	Total Precipitation (mm)	Mean Wind Speed (m/s)
Station 1 – Attachie Flat Upper Terrace	3.2	32.0	-36.9	422	2.3
Station 3 – Attachie Plateau	3.4	30.0	-38.7	432	2.7
Station 4 – Bear Flat	3.1	31.7	-37.5	377	1.5
Station 6 – Farrell Creek	3.6	32.2	-37.2	506	1.5
Station 7B – Site C North Camp	4.0	30.6	-35.9	475	3.0
Station 9 – 85th Avenue	-	-	-	-	3.4
Fort St. John Airport	2.7	30.0	-36.5	589	4.5
30-year climate normals (1981 – 2010)	2.3	30.2(1)	-36.6(2)	445	3.8
Maximum difference between any station and the climate normals	1.7	2.0	2.1	68	2.3

Notes: Station 2 is not included as it was decommissioned on September 6, 2017
Station 10 is not included as it was installed on September 14, 2017
Station 11 is not included as it was installed on September 15 2017
— indicates no data collected
(1) 30-year average of annual maximum hourly temperature
(2) 30-year average of annual minimum hourly temperature

3.1 Air Temperature and Relative Humidity

Figure 3-1 shows a time series plot of the mean daily temperature at all Site C network stations as well as the Fort St. John Airport for 2017. As was noted in the previous monitoring reports (RWDI AIR Inc. 2015a, 2015b, 2015c, 2016, 2017), much greater day to day variability was observed in the winter months (January to March, and November and December) than in the summer months (April to October). This is also observed in the 30-year averaged data from Fort St. John Airport and is attributed to the passage of warm and cold weather fronts in the winter, bringing with them large swings in temperature. In the summer, the cold arctic air masses that dominate in winter are much farther north and there is less frontal activity in the region, resulting in less extreme temperature fluctuations.

The inter-station variation was generally very small compared to the observed diurnal variations. When averaged over the entire year, the largest difference between any two stations was 1.3°C. Temperature differences of 1 to 2°C were found to be reasonable given that there is a maximum horizontal separation of 60 km between Fort St. John Airport and the most distant station in the network (Station 6 – Farrell Creek) and a maximum change in station elevations of 284 m (from 411 m at Station 11 - Taylor to 695 m at Fort St. John Airport).

Annual average temperatures for 2017 at all Site C network stations were greater than those reported at Fort St. John Airport. Fort St. John Airport recorded an annual average temperature that was 0.4°C warmer than the 30-year climate normal for that station.

The monthly average temperatures tabulated in Appendix B (Table B-1) show that all Site C network stations recorded warmer temperatures than Fort St. John Airport from February through to June and in October and November. There were no months during which all Site C network stations recorded colder temperatures than the Fort St. John Airport. Fort St. John Airport recorded below normal temperatures in March, April, July and November. Warmer than normal temperatures were recorded at Fort St. John Airport in January, February, April, May, from August to October and in December.

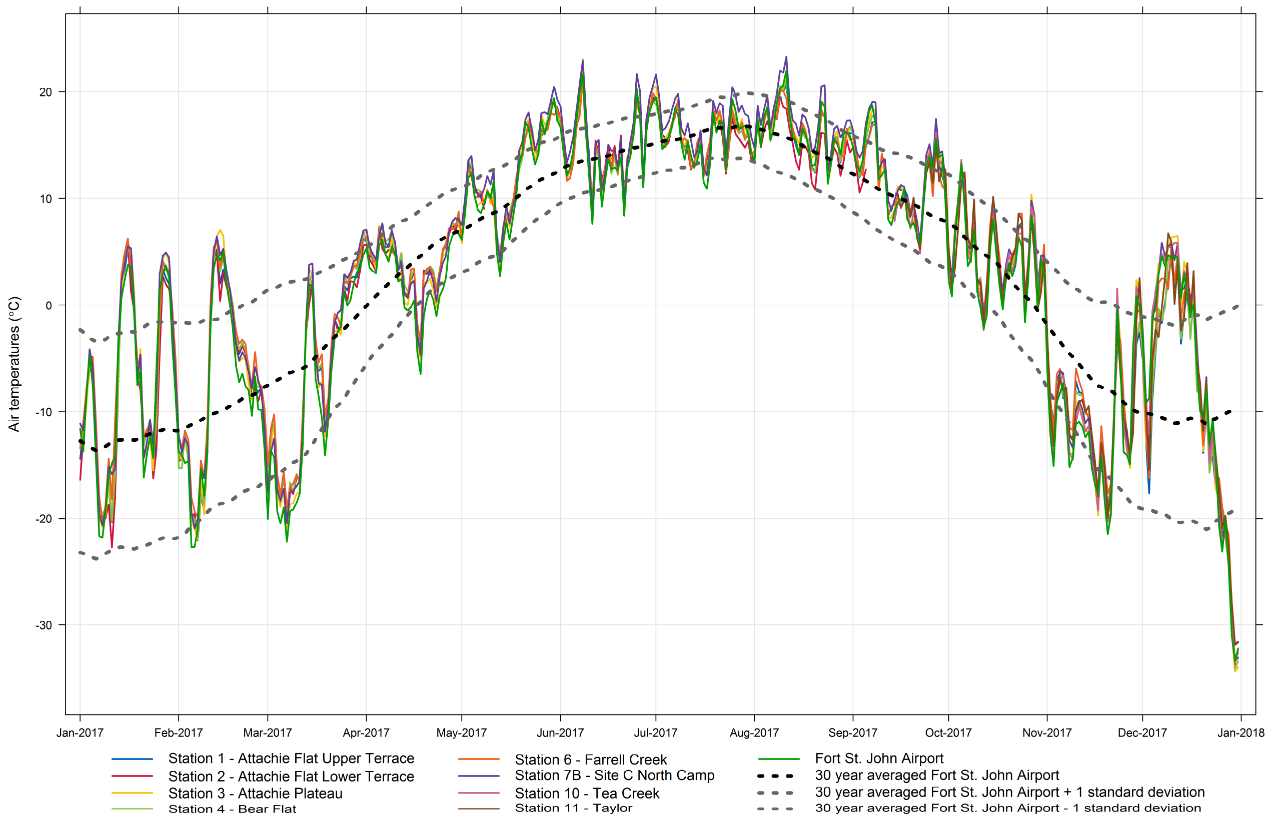


Figure 3-1: Daily average temperatures at all Site C network stations for the year 2017 and comparison with the mean ± 1 standard deviation of 30-year climate normal (based on 21-day centered rolling average) (in °C).

Figure 3-2 shows a time-series of relative humidity (RH) recorded daily at 15:00 Local Standard Time (LST) at each of the stations. This single hour of the day was used instead of a daily average due to the normally large fluctuation in RH over the course of a day and to allow comparisons with climate normals. Relative humidity at Station 2 (Attachie Flat Lower Terrace) most frequently had the highest monthly averaged values over all of the stations (five months) despite the station having been decommissioned on September 6. Station 7B (Site C North Camp) was the station at which the monthly average RH was most frequently the lowest (three months).

When compared to Fort St. John Airport (Appendix B, Table B-2), the annual average RH at all Site C stations were lower. Monthly average RH values over all of the stations were lower than Fort St. John Airport in March, April, June, September and October. Fort St. John Airport recorded lower than normal RH values for May through October and December.

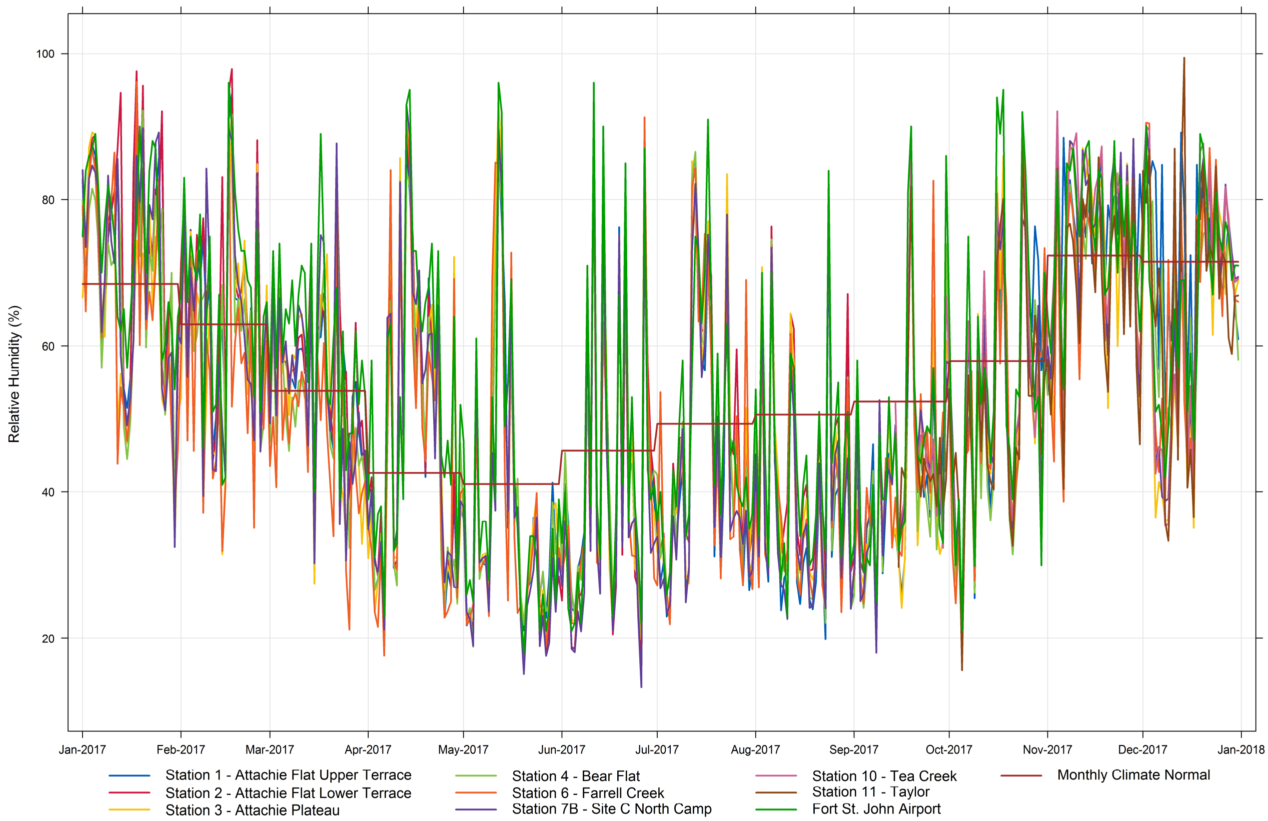


Figure 3-2: Relative humidity at all Site C network stations measured daily at 15:00 LST for the year 2017 (in percent). The monthly climate normal is shown in brown.

3.2 Wind Characteristics

Wind speed and direction were measured at all stations except Station 8 (Old Fort). Figure 3-3 shows wind roses for all stations with a complete year of data including Fort St. John Airport for 2017. Mean annual wind speed for 2017 ranged from 1.5 m/s (Station 4 (Bear Flat) and Station 6 – (Farrell Creek) to 3.4 m/s (Station 9 – 85th Avenue) at the Site C network stations. Fort St. John Airport recorded a mean annual wind speed of 4.5 m/s which was 18% greater than the 30-year climate normal of 3.8 m/s (Table 3-1).

The differences between stations in wind speed and wind direction that are apparent in the wind roses are attributed to small scale surface features such as proximity of trees and local topography to the network stations and location within the meandering Peace River Valley. The higher wind speed at Fort St. John Airport is likely due to this station being on the plateau above the Peace River Valley and its very open location with a large fetch in all directions. There was a wide difference of the proportion of calms as well: ranging from 0.5 % to 26.3% of the 12-month period.

Wind roses split by season from all stations with a complete year of data are included in Appendix C.

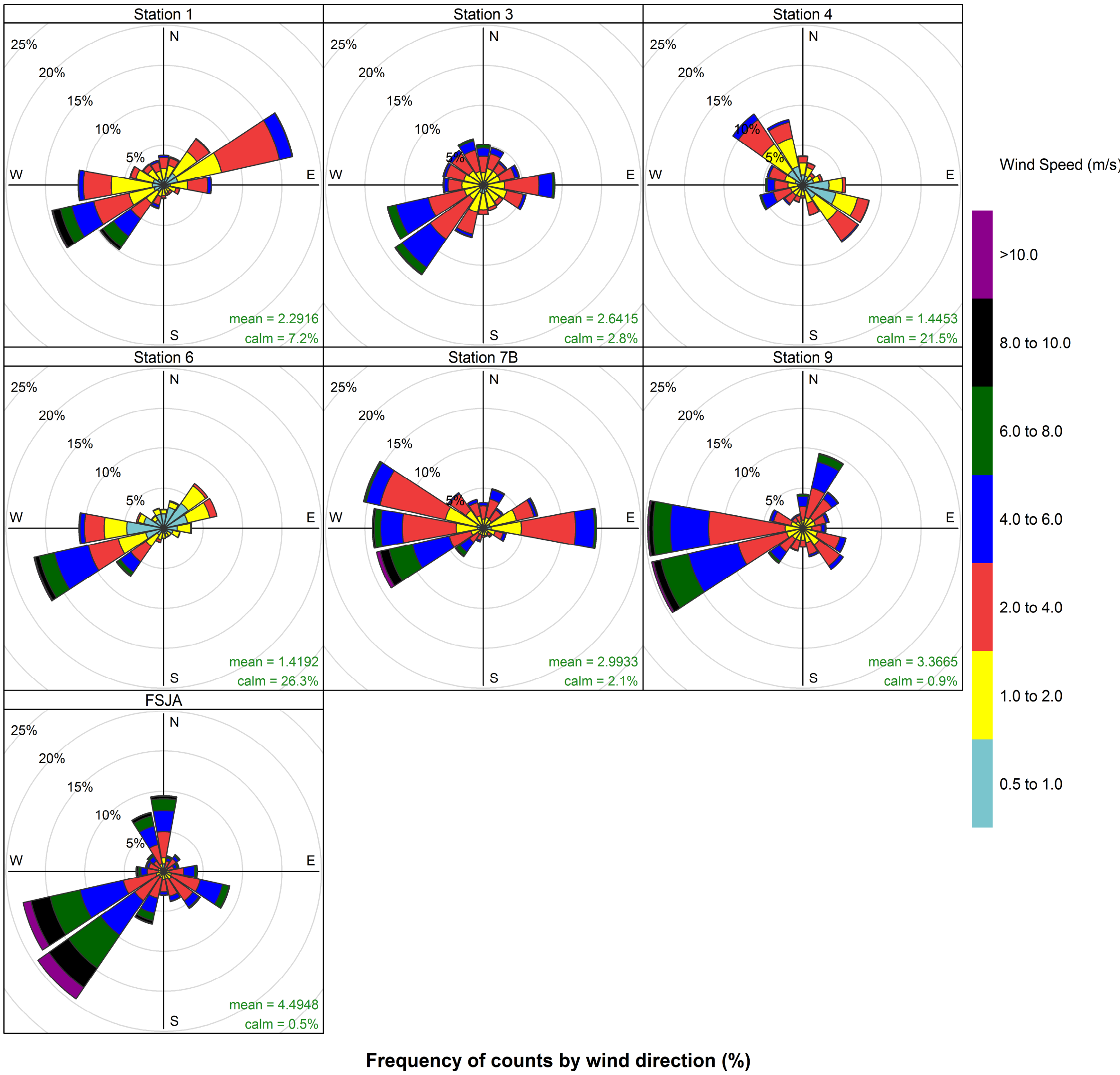


Figure 3-3: Wind roses for all Site C stations with 12 month records and Fort St John Airport for 2017

3.3 Precipitation

Figure 3-4 shows the total monthly precipitation over the course of 2017 for each of the Site C network stations as well as for Fort St. John Airport. Values from this plot are also presented in Appendix B (Table B-3). Monthly precipitation totals have not been presented for Station 4 (Bear Flat) for January and for Station 2 (Attachie Flat Lower Terrace) for January and February due to instrumental problems that caused a large portion of the data during these periods to be invalid. Monthly totals are also not included for Station 2 (Attachie Flat Lower Terrace) in May due to a grass fire that caused loss of data during that month.

Of the Site C network stations, Station 6 (Farrell Creek) recorded the greatest amount of precipitation (506 mm). All of the Site C network stations recorded lower annual cumulative precipitation than the Fort St. John Airport. This is also true for monthly totals for the months of January, March, April, July and October through December. For the remaining months, the monthly totals from at-least one Site C network station were greater than recorded at Fort St. John Airport.

Annual cumulative precipitation recorded at Fort St. John Airport (589 mm) was 144 mm greater than the 30-year climate normal (445 mm). Monthly cumulative precipitation at Fort St. John Airport exceeded the 30-year climate normal for the months of January through May and from September to November.

Precipitation during the growing season (May to September) and how it relates to the energy balance at Station 1, Station 2 (Attachie Flat Upper Terrace), and Station 4 (Bear Flat) is further discussed in Appendix D.

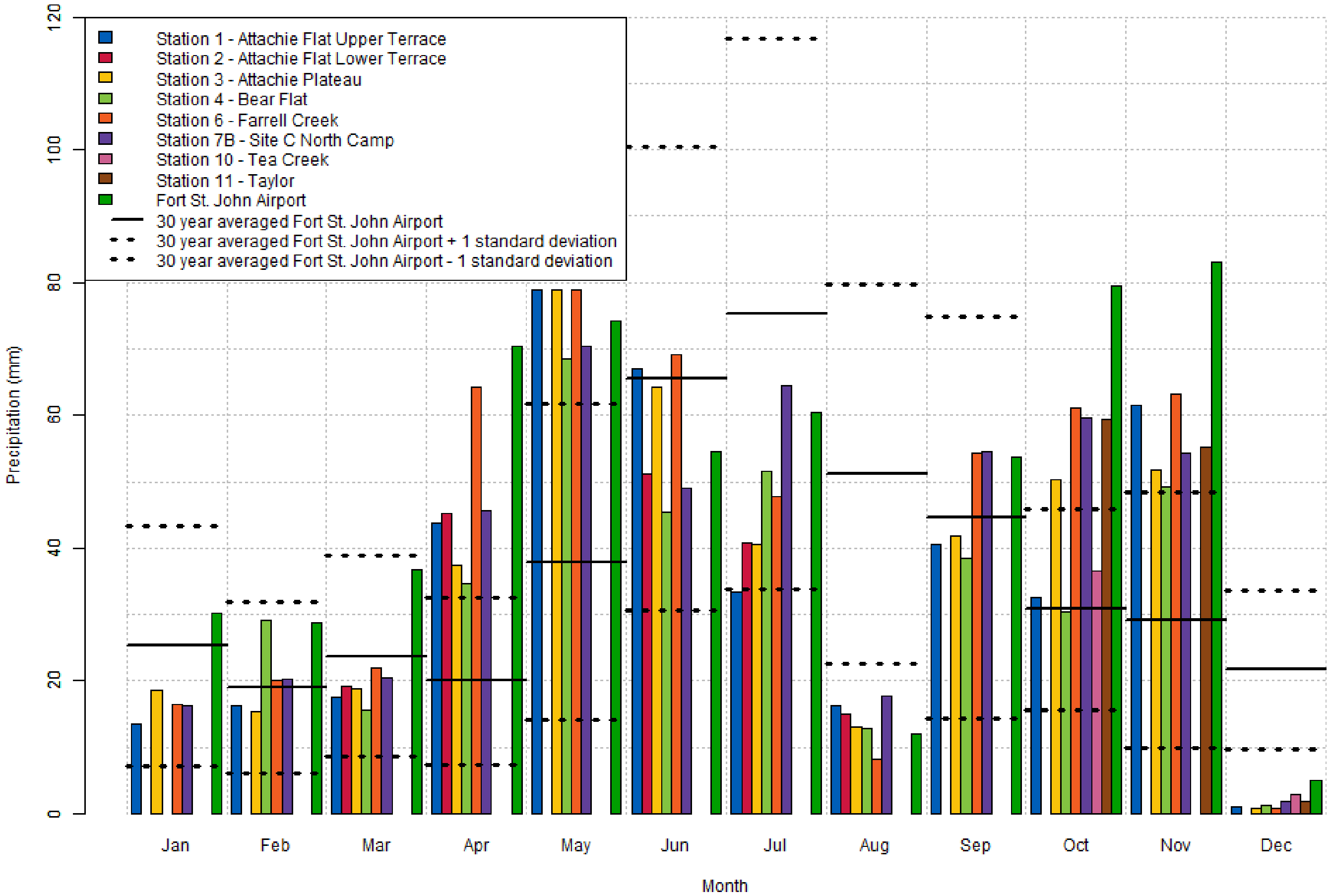


Figure 3-4: **Monthly precipitation at all of the Site C network stations for 2017 and comparison with the mean ± 1 standard deviation of 30-year climate normal.**

Note: Monthly precipitation totals have not been presented for Station 4 for January and for Station 2 for January and February due to instrumental problems that caused a large portion of the data during these periods to be invalid. Monthly totals are also not included for Station 2 in May due to a grass fire that caused loss of data during that month and in September through December due to that station having been decommissioned in early September.

3.4 Soil Moisture and Temperature

Figure 3-5 and Figure 3-6 provide the daily averaged soil temperature and soil moisture respectively. Total daily precipitation recorded at station 1 (Attachie Flat Upper Terrace) is included in this figure to link increases in soil moisture to incoming precipitation and to identify increases that are related to other processes. Station 1 was selected due to its most complete dataset and its location within the Peace River valley. Overall, there is very little difference in soil temperature between the stations.

The soil temperature at all stations was observed to approach 0 °C during distinct warm periods in January through March prior to exceeding 0 °C at the beginning of April. The soil temperature at Station 1 (Attachie Flat Upper Terrace) was the earliest of the three stations to increase above 0 °C in the spring, and Station 6 (Farrell Creek) was the latest to decrease below 0 °C in the fall. The soil temperature at Station 1 (Attachie Flat Upper Terrace), Station 2 (Attachie Flat Lower Terrace) and Station 4 (Bear Flat) rose above 0 °C on April 5, 6 and 7, respectively. Station 1 (Attachie Flat Upper Terrace) reached the highest daily average temperature of 20.9 °C on August 11, 2017. Station 2 reached a maximum much earlier in the year (20.8°C on June 8), shortly after a grass fire that burned away all of the vegetative soil cover.

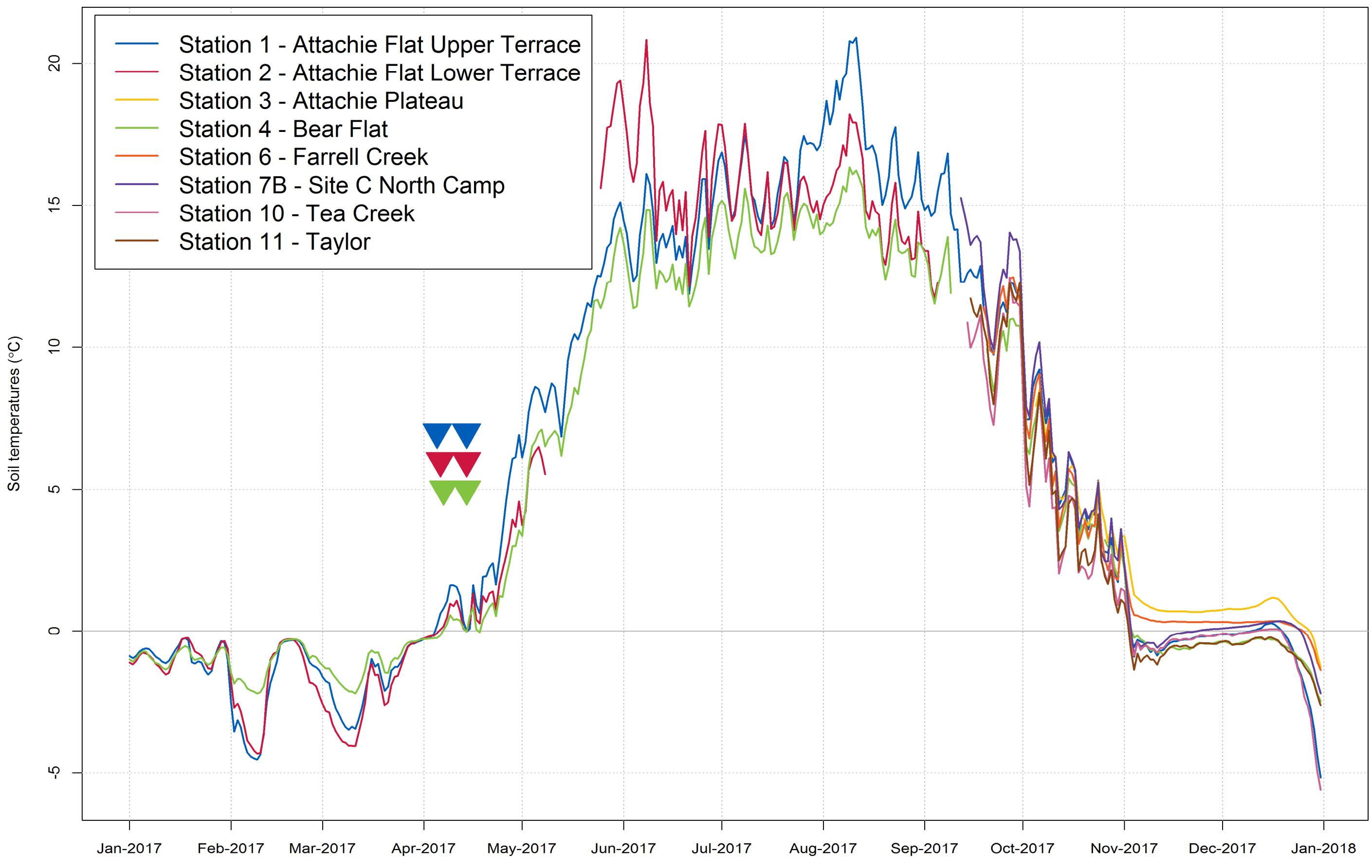


Figure 3-5: **24-hour average soil temperatures in 2017 (in ^{0}C). The blue, red and green triangles indicate the time stamps when daily averaged soil temperature exceeded (leftmost triangle) or approached (rightmost triangle) 0°C at Stations 1, 2 and 4. The remaining stations only had soil moisture and temperature sensors installed in September 2017.**

Soil moisture follows a similar response pattern between all stations wherein liquid precipitation (rain) events were clearly reflected as sudden increases in moisture followed by a gradual decline. An increase of soil moisture is also recorded when soil temperature increases beyond or very near to 0°C when the soil becomes permeable to surface water produced by the snowmelt. Differences between stations are attributable to different soil types as shown in Table 3-2 and agricultural land management practices (Figure D-15) between locations.

Further discussion concerning soil temperatures and how this relates to the energy balance is presented in Appendix D.

Table 3-2: Soil types at the Site C Eddy Covariance stations.

	Station 1 – Attachie Flat Upper Terrace	Station 2 – Attachie Flat Lower Terrace	Station 4 – Bear Flat
Soil type	Regosolic Black with Eutric Brunisol (low organic matter content, well drained)	Cumulic Regosol (lowest organic matter content, periodically flooded)	Regosolic Dark Grey, Regosolic Black Chernozemic (highest organic matter content, well to imperfectly drained)

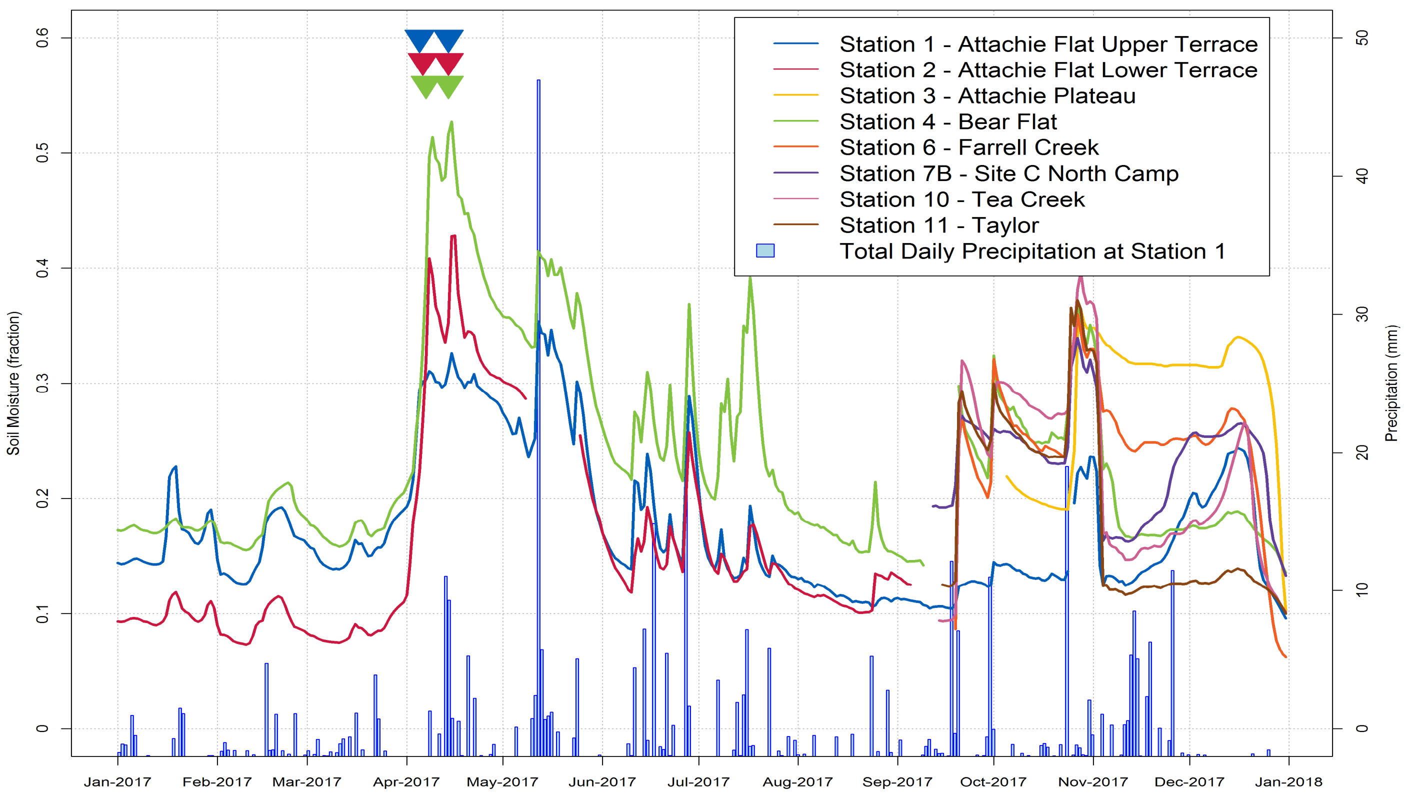


Figure 3-6: 24-hour average soil moisture readings in 2017 (expressed as a fraction). The blue, red and green triangles indicate the time stamps when daily averaged soil temperature exceeded (leftmost triangle) or approached (rightmost triangle) 0°C at Stations 1, 2 and 4.

3.5 Energy and Carbon Balance

The full eddy covariance (EC) report can be found in Appendix D and a summary is provided below.

3.5.1 Data Recovery

The eddy covariance system uptime prior to manual data screening for quality assurance/quality control (QA/QC) was reduced by 10 % to 76 % in 2017, down from 86% in 2016. This was largely because the EC Licor system was removed for calibration on two separate occasions in 2017. Once was at the beginning of the year (February to March) following the previous year protocols, and once more at the end (November to December). These steps have resulted in the systems being fully operational for the spring freshet in 2018 (February to April) to improve growing season coverage that will improve the crop moisture calculations relying upon both evapotranspiration (ET) and carbon balance (C-balance) measurements during that time period. Station 2 (Attachie Flat Upper Terrace) was decommissioned in mid-September of 2017, greatly reducing the annual coverage for that station.

Gap-filling of the carbon balance components at all three stations was very challenging in the 2017 calendar year by the relatively late winter removal of the IRGA units at EC Station 1 (Attachie Flat Upper Terrace) and Station 4 (Bear Flat) for their annual calibration. The delay resulted in the loss of flux measurements at the start of the growing season. Caution should be exercised when interpreting the C-balance traces for the 2017 year due to the uncertainty produced from gap-filling the IRGA calibration period, which affects the partitioning of NEP into its component fluxes GEP and R. More information regarding the precise timing and nature of agricultural practices (ploughing, sowing, irrigation, etc.) would improve gap-filling and has been requested from farmers in future years.

3.5.2 Results

Growing season (May to September) conditions at all three EC stations were similar to moderately wet years 2015 and 2016. Growing season rainfall at Station 1 (Attachie Flat Upper Terrace) was 235 mm in 2016 and 228 mm in 2017. A relatively deep snow pack prevailed at the stations in early 2017 and there was a cool start to the growing season. After an abrupt start, warmer than normal temperatures dominated throughout the growing season resulting in 2017 being the warmest year on record for that time period.

Of the multi-year data set of records reviewed, the 2017 annual ET at the two remaining EC stations was high and comparable to years 2015 and 2016. At Station 1 (Attachie Flat Upper Terrace) (352 mm) ET was measured at just 12 mm more than in 2015 (340 mm) while at Station 4 (Bear Flat) (371 mm) the 2017 annual total equalled that measured in 2016. This is encouraging as agricultural management practices at both locations were the same between the three years and climatic conditions were similar. Winter soil temperatures were warm, due to insulation from the snowpack. A consequence of this is that at all three of the EC stations during spring thaw the soil heated up quickly, resulting in record high monthly ET at Station 1 (Attachie Flat Upper Terrace) in May.

All EC stations were C-sinks for 2017 with Station 1 (Attachie Flat Upper Terrace) showing the influence of agricultural intervention as well as climate at different stages of the growing season. Station 1 was a strong C-sink with an annual NEP of 329 g C/m^2 (Figure D-12). The C-sink potential strongest in April, May and June prior to harvest in late July when gains in photosynthesis (GEP) can be seen to drop off at that station. Station 4 (Bear Flat) was a very weak C-sink with an NEP of only 5 g C m-2 which appears to be largely due to much higher respiration (R) and a later peak in GEP. Of relevance is that these patterns in GEP closely follow the same pattern in ET which would increase with increasing photosynthetic activity and resulting transpiration. It is possible that the higher monthly R at Station 4 is the result of decomposing plant residuals from the previous year when the pasture was not harvested as it was at Station 1.

4 AIR QUALITY RESULTS

Section 12.3.4 of the FDS conditions for the approval of the Project requires BC Hydro to develop a plan that includes procedures to monitor air quality effects at locations used by Aboriginal groups. To this end, BC Hydro has developed an Air Quality Monitoring Program (BC Hydro, 2016). As part of the monitoring program, BC Hydro has installed a network of air quality stations in areas that may be affected by Project construction activities.

BC Hydro currently operates four air quality monitoring stations in the Peace River area. Two of these stations are located in the vicinity of the Project construction including:

- Station 1 –Attachie Flat Upper Terrace; and
- Station 8 – Old Fort.

Two of these stations are located directly within Project construction work areas including:

- Station 7B/C – Site C North Camp/Fort St. John North Camp C; and
- Station 9 – 85th Avenue.

Stations 1, 8 and 7B/C have continuous Thermo Scientific SHARP 5030 and Station 9 has Thermo Scientific SHARP 5030i monitors. These monitors measure particulate matter with diameters less than 10 µm (PM_{10}) and 2.5 µm ($PM_{2.5}$). Station 7B/C – Site C North Camp/Fort St. John North Camp C also measures NO_X (using a Thermo Scientific 42i analyzer), SO_2 (using a Thermo Scientific 43i analyzer) and CO (using a Thermo Scientific 48i analyzer).

Figure 2-1 and Table 2-1 provide the locations of all current air quality monitoring stations. Once construction of the shoreline protection berm begins in the area around Hudson's Hope (anticipated in 2020), an ambient air quality station will be installed there also.

4.1 Particulate Matter

Table 4-1 gives an overview of the completeness of the datasets for PM_{10} and $PM_{2.5}$ at each station as well as the number of excursions and/or exceedances above the provincial 24-hour ambient air quality objectives (AAQOs) and a comparison of the annual averages with the provincial annual AAQOs. An excursion is defined as when the 24-hour average of $PM_{2.5}$ is greater than the 24 hour AAQO without the 98th percentile of daily $PM_{2.5}$ exceeding the AAQO. An exceedance refers to PM_{10} values above the 24-hour AAQO. The lower percentage complete for 24-hour averages than for hourly data stems from a requirement that, to consider a 24-hour average valid, it must contain at least 75% (18 hours) of valid data. This ensures that 24-hour averages are not biased toward one single part of the day. Many of the excursions and exceedances were related to smoke from forest fires or community specific events such as road dust. In these cases, the BC MOE issued Smoky Skies Bulletins and Air Quality Advisories, respectively. Specific dates for these in 2017 are provided later in this section.

Table 4-2 provides percentiles of note for concentrations of particulate matter at each of the air quality stations. PM_{10} and $PM_{2.5}$ at Station 1 (Attachie Flat Upper Terrace) and Station 8 (Old Fort) as well as PM_{10} at Station 9 (85th Avenue) were below the AAQO for 99% of valid days or more in 2017. At Station 7B/C (Site C North Camp / Fort St. John North Camp C) $PM_{2.5}$ concentrations were below the AAQO for 98% of valid days and PM_{10} concentrations were below the AAQO for fewer than 90% of valid days in 2017.

All particulate monitors except PM_{10} at Station 9 (85th Avenue) had a data completeness of greater than 75% (typical of BC MOE permit requirements). Low data completeness for PM_{10} at Station 9 was due to a persistent sample leak in the instrument in early 2017 that required the instrument be sent to the manufacturer for repair.

Three excursions above the 25 µg/m^3 AAQO and no exceedances of the AAQO for PM_{10} for a 24-hour averaging period were observed at Station 1 (Attachie Flat Upper Terrace) in 2017. Five excursions above the AAQO for $PM_{2.5}$ and 52 exceedances of the AAQO for PM_{10} both over 24-hour averaging periods were observed at Station 7B/C (Site C North Camp / Fort St. John North Camp C). At Station 8 (Old Fort), three excursions above the 24-hour AAQO for $PM_{2.5}$ and no exceedances above the 24-hour AAQO for PM_{10} were observed. Four excursions above the 24-hour AAQO for $PM_{2.5}$ and two exceedances above the 24-hour AAQO for PM_{10} were observed at Station 9 (85th Avenue).

None of the stations recorded any exceedances of the 98th percentile of $PM_{2.5}$ over the provincial AAQO of 25 µg/m^3. The annual average $PM_{2.5}$ B.C. provincial AAQO of 8 µg/m^3 was not exceeded at any of the four stations in 2017.

Table 4-1: Summary of measured PM results for 2017 (in µg/m^3)

Parameter	Station 1 (Attachie Flat Upper Terrace)		Station 7B/C (Site C North Camp / Fort St. John North Camp C)		Station 8 (Old Fort)		Station 9 (85th Avenue)	
	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}
Percentage data completeness for hourly data	93.0	93.6	96.2	95.8	95.5	95.7	84.3	69.7
Percentage data completeness (24-hour averages)	91.8	92.9	96.4	95.9	95.9	97.0	83.6	70.1
24-hour AAQO	25	50	25	50	25	50	25	50
24-hour AAQO excursions or exceedances (1)	3	0	5	52	3	0	4	2
98th percentile of 24-hour daily averages	14.6	21.0	19.2	133	15.3	29.4	15.6	44.4
Annual AAQO	8	NA(2)	8	NA(2)	8	NA(2)	8	NA(2)
Annual average	3.5	5.9	5.4	31.7	4.4	9.5	4.7	11.6

Notes: Sources: BC MOE 2009
(1) Excursion is used here for $PM_{2.5}$ when the 24-hour average of $PM_{2.5}$ is greater than the 24-hour AAQO without the 98th percentile of daily $PM_{2.5}$ exceeding the AAQO. Exceedance is used here to refer to PM_{10} values above the 24-hour AAQO.
(2) NA is used where the quantity in question is not applicable to the measurement.

Table 4-2: Percentile values of 24-hour averaged PM concentrations for 2017 (in µg/m^3)

Percentile	Station 1 (Attachie Flat Upper Terrace)		Station 7B/C (Site C North Camp / Fort St. John North Camp C)		Station 8 (Old Fort)		Station 9 (85th Avenue)	
	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}
0%	0	0	0.05	0.5	0.07	0.2	0.5	0.8
10%	0.5	2.0	1.2	4.6	1.3	2.9	1.3	2.7
25%	1.1	2.9	2.4	8.9	2.1	4.6	2.1	5.2
50%	2.4	4.6	4.5	17.2	3.5	7.8	3.5	8.7
75%	4.4	7.3	6.7	32.7	5.8	12.6	6.1	14.8
90%	7.6	11.6	10.4	**63.5**	8.7	18.9	9.0	24.3
95%	9.9	16.0	13.8	**89.3**	10.5	24.5	12.0	32.3
97.5%	13.0	19.5	19.1	**128**	13.9	28.3	15.3	43.2
98%	14.6	21.0	19.2	**133**	15.3	29.4	15.6	44.4
99%	20.9	24.1	**26.2**	**224**	17.0	31.4	**27.5**	45.7
99.9%	**33.5**	34.1	**33.1**	**652**	**31.4**	42.5	**35.9**	**56.9**

Notes: Bolded values are greater than the AAQO

Figure through Figure 4-4 show the time series of the 24-hour daily average of both PM_{10} and $PM_{2.5}$ at each of the four AQ stations, respectively. Table 4-3 lists the events that led to excursions or exceedances at the four monitoring stations and directs the reader to the appropriate section of Appendix E where a preliminary examination of each elevated PM event is presented. Note that some of these events persisted over more than one day.

The 2017 calendar year featured a very active wildfire season during which several smoke events affected the Peace region. Smoky Skies Bulletins were issued for the following dates based on the potential for regional impact from wildfire smoke:

- Jul 15-17 (Peace);
- Aug 11-14 (Peace); and
- Sep 6 – 9 (Peace).

As well as potential impact of smoke from the wildfires, Fort St. John was affected by dust advisories caused by dry road conditions and high winds which triggered regional air quality advisories on the following dates:

- Apr 4 – 8 (Dust, Fort St John);
- May 3 – 5 (Dust, Fort St John);
- May 30 – June 5 (Dust, Fort St John); and
- Nov 9 – 11 (Fine Particulate Matter, Fort St John and Taylor).

These advisories provide important regional context for the air quality exceedances recording by the Site C monitoring network. Events observed at more than one station can be considered regional in nature and likely related to forest fires or dusty roads; whereas, events recorded at only one station (such as at the main Project dam construction site, Station 7B/C (Site C North Camp / Fort St. John North Camp C) are more likely to originate from a local particulate emission source.

An alerting system operated for the duration of 2017 to immediately notify BC Hydro and its contractors about any excursions taking place so they could work to identify the source and mitigate it's associated effects if it was found to be related to their operations. A discussion for each alert received and the site contractor response to the alert can be found in Table E-1 of Appendix E. This table also indicates when BCH issued letters to the contractor as a reminder of its obligations with respect to enacting air quality mitigation.

Appendix F includes two figures that present examples of active mitigation by the site contractor to suppress roadway dust emissions. A brine mixture of calcium chloride and water was applied on May 25 and again on October 10-11, 2017 on several of the main site construction roads as indicated on the figures. Water was also used as a dust suppressant on several occasions in 2017. Details of all completed mitigation measures, contractor inspection comments coupled with air quality alerts, and BC MOE-issued Smoky Skies Bulletins and Air Quality Advisories are all included in Table E-1.

Table 4-3: Summary of PM excursion or exceedance events recorded at Site C in 2017

Start Date	End Date	Station	Contaminant	Section in Appendix E
2017-01-06	**2017-01-08**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.1
2017-01-14	**2017-01-17**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.2
2017-02-08	**2017-02-10**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.3
2017-02-11	**2017-02-14**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.4
2017-02-12	**2017-02-13**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	$PM_{2.5}$	E.5
2017-02-15	**2017-02-16**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.6
2017-02-24	**2017-02-26**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.7
2017-04-04	**2017-04-06**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.8
2017-04-07	**2017-04-08**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.9
2017-04-23	**2017-04-24**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.10
2017-04-25	**2017-04-27**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.11
2017-05-03	**2017-05-04**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.12
2017-05-07	**2017-05-10**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.13
2017-05-18	**2017-05-19**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.14
2017-05-22	**2017-05-24**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.15
2017-05-28	**2017-06-09**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.16
2017-05-30	**2017-05-31**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	$PM_{2.5}$	E.17
2017-06-20	**2017-06-21**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.18
2017-06-25	**2017-06-27**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.19
2017-07-01	**2017-07-08**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.20
2017-07-10	**2017-07-13**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.21
2017-07-12	**2017-07-16**	Station 9 - 85th Avenue	$PM_{2.5}$	E.22
2017-07-15	**2017-07-16**	Station 8 - Old Fort	$PM_{2.5}$	E.23
2017-08-01	**2017-08-02**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.24
2017-08-11	**2017-08-14**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.25
2017-08-13	**2017-08-14**	Station 9 - 85th Avenue	$PM_{2.5}$	E.26
2017-08-13	**2017-08-14**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	$PM_{2.5}$	E.27

Start Date	End Date	Station	Contaminant	Section in Appendix E
2017-08-14	**2017-08-20**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.28
2017-08-23	**2017-08-24**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.29
2017-09-07	**2017-09-08**	Station 9 - 85th Avenue	$PM_{2.5}$	E.30
2017-09-07	**2017-09-08**	Station 8 - Old Fort	$PM_{2.5}$	E.31
2017-09-07	**2017-09-08**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.32
2017-09-07	**2017-09-08**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	$PM_{2.5}$	E.33
2017-09-07	**2017-09-08**	Station 1 - Attachie Flat Upper Terrace	$PM_{2.5}$	E.34
2017-09-10	**2017-09-11**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.35
2017-10-15	**2017-10-16**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	PM_{10}	E.36
2017-11-09	**2017-11-10**	Station 7B/C – Site C North Camp/Fort St. John North Camp C	$PM_{2.5}$	E.37
2017-11-09	**2017-11-10**	Station 9 - 85th Avenue	$PM_{2.5}$	E.38
2017-11-09	**2017-11-10**	Station 8 - Old Fort	$PM_{2.5}$	E.39
2017-11-09	**2017-11-10**	Station 1 - Attachie Flat Upper Terrace	$PM_{2.5}$	E.40
2017-12-21	**2017-12-22**	Station 1 - Attachie Flat Upper Terrace	$PM_{2.5}$	E.41

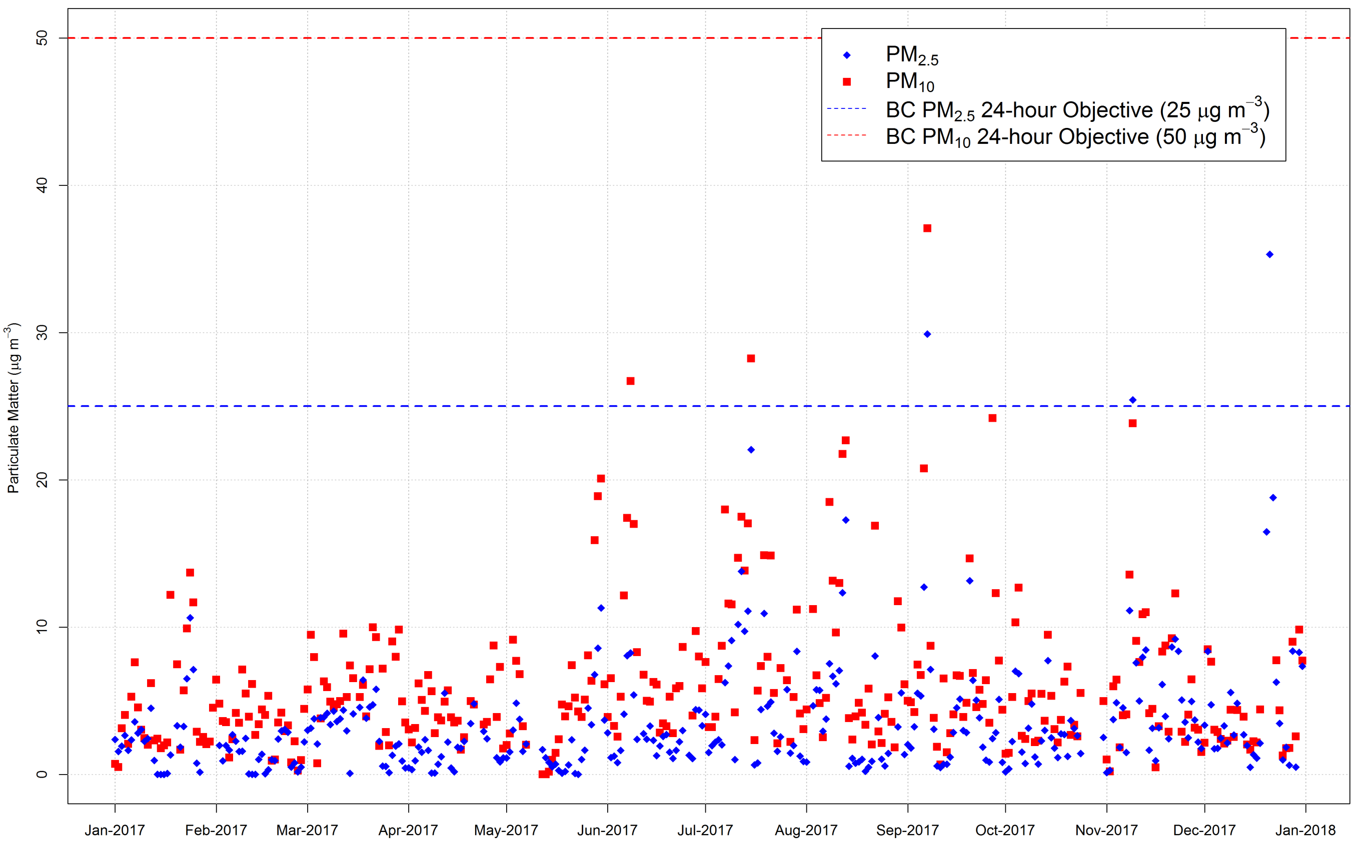


Figure 4-1: **Daily average $PM_{2.5}$ and PM_{10} measurements from Station 1 – Attachie Flat Upper Terrace for 2017 (in µg/m^3). The target AAQO's are plotted as broken lines.**

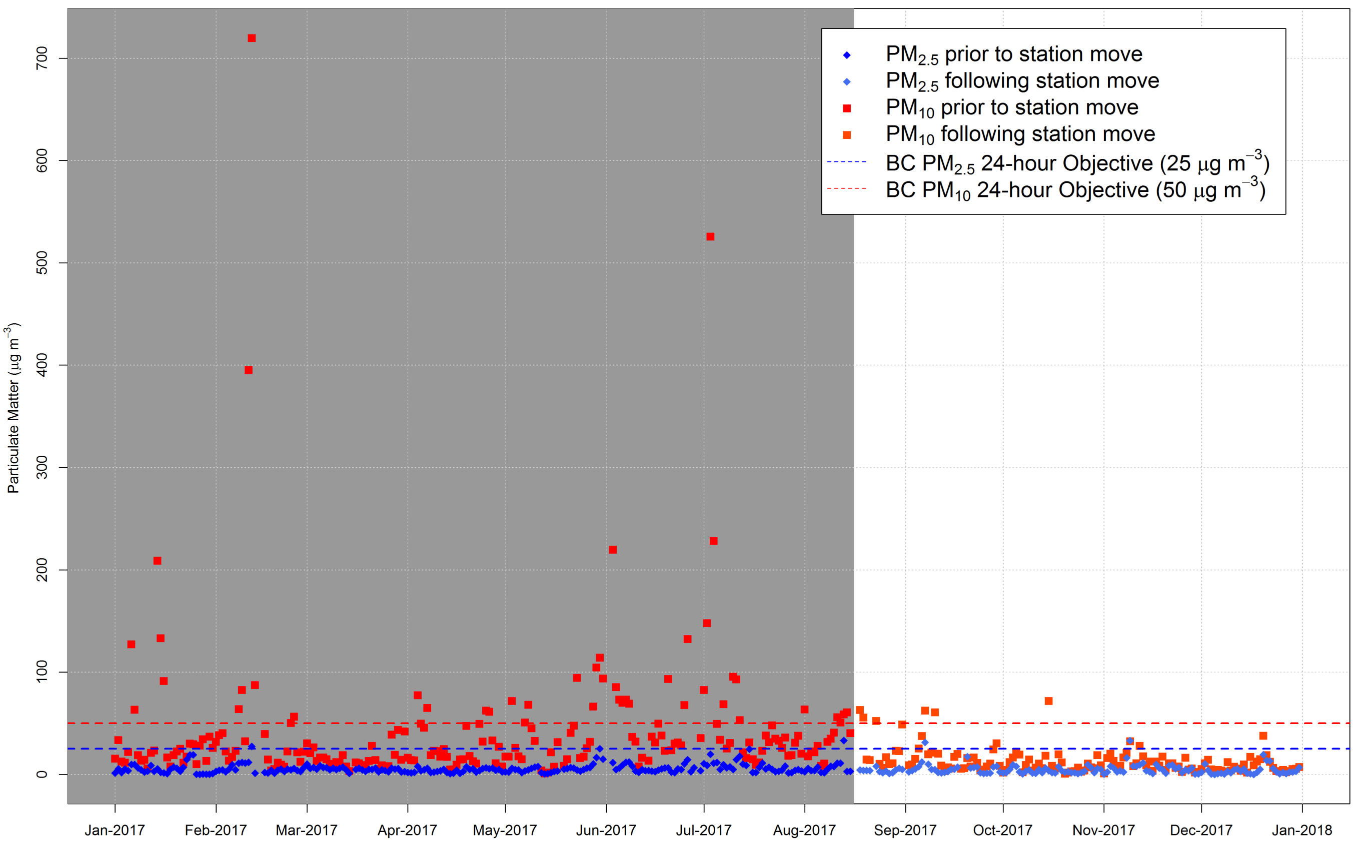


Figure 4-2: **Daily average $PM_{2.5}$ and PM_{10} measurements from Station 7B – Site C North Camp / 7C – Fort St. John North Camp C for 2017 (in µg/m^3). The change in background from grey to white colour indicates the time of the station move.**

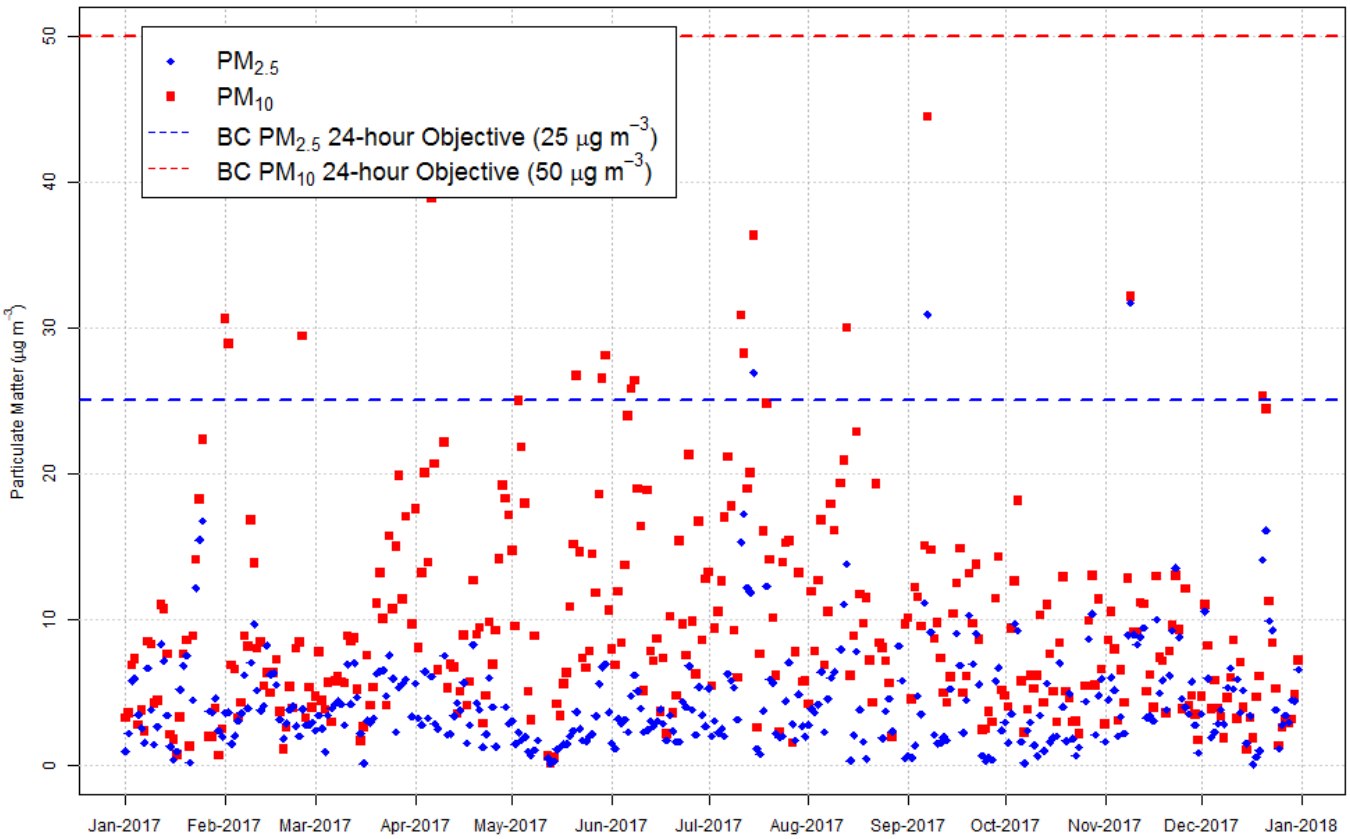


Figure 4-3: **Daily average $PM_{2.5}$ and PM_{10} measurements from Station 8 – Old Fort for 2018 (in µg/m^3). The target AAQO's are plotted as broken lines.**

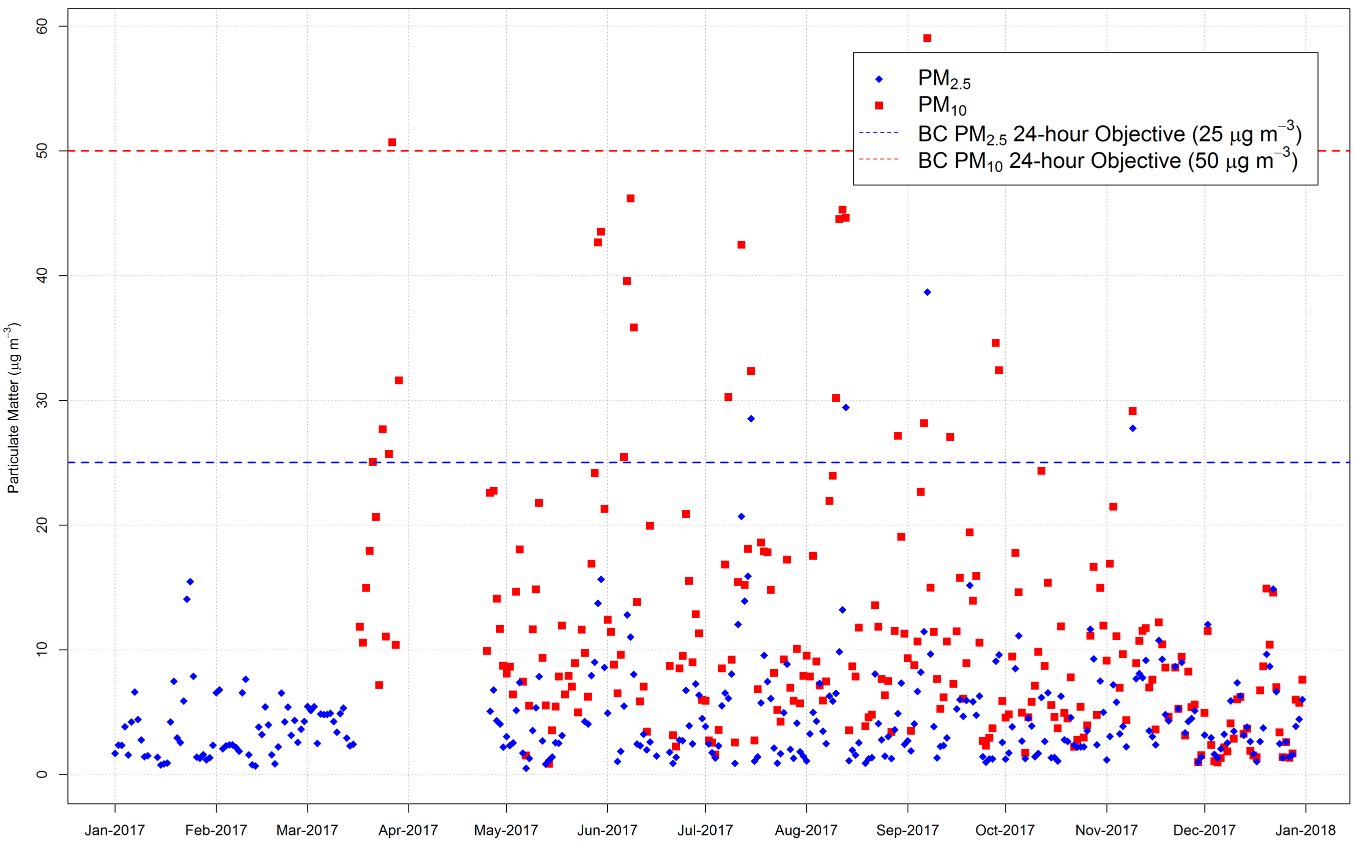


Figure 4-4: **Daily average $PM_{2.5}$ and PM_{10} measurements from Station 9 - 85th Avenue for 2017 (in µg/m^3). The target AAQO's are plotted as broken lines.**

4.2 Gaseous Criteria Air Contaminants

Table 4-4 gives an overview of the completeness of the datasets for gaseous criteria air contaminants (CO, NO_2 and SO_2) measured at Station 7B/C (Site C North Camp / Fort St. John North Camp C) as well as the number of any excursions and/or exceedances above the provincial AAQOs and a comparison of the annual averages with the provincial AAQOs.

For CO, a value is an exceedance once it is greater than the provincial Pollution Control Objectives (PCOs); whereas, for NO_2 and SO_2, there is only an exceedance if the 98th and 97th percentile of daily 1-hour maxima in the year is greater than the AAQOs, respectively. If this condition has not been met, values above the respective AAQOs do not constitute exceedances and are classified as excursions.

Table 4-4: Summary of gaseous criteria air contaminant results for 2017 (in µg/m^3)

Parameter	NO_2	SO_2	CO	CO (8-h rolling average)
Percentage data completeness for 1-hour data	89.9	81.4	93.4	92.2
1 hour AAQO	188	196	14,300	NA(1)
8 hour AAQO	NA(1)	NA(1)	NA(1)	5,500
Number of AAQO Exceedances or Excursions (2)	0	0	0	0
Annual AAQO	60	13	NA(1)	NA(1)
Annual Average	8.7	0.9	144	NA(1)
97th percentile of Daily 1-Hour Maximum	NA(1)	29.1	NA(1)	NA(1)
98th percentile of Daily 1-Hour Maximum	72.0	NA(1)	NA(1)	NA(1)

Notes: (1): NA is used where the quantity in question is not applicable to the measurement.
(2): The term excursion is used here for NO_2 and SO_2 and when the daily 1-hour maximum is greater than their respective AAQO but without satisfying the 98th or 97th percentile condition for achievement.

No excursions of the 1-hour SO_2 and 1-hour NO_2 AAQOs were observed in 2017. There were also no observed exceedances of the 1-hour or 8-hour PCOs for CO in 2017. The annual average NO_2 and SO_2 concentrations were well below their respective annual AAQOs.

Figure 4-5 through Figure 4-7 show the daily 1-hour maximum concentrations of NO_2 and SO_2, as well as the 1-hour and 8-hour rolling average CO concentrations, respectively. The maximum NO_2 concentration of 90.0 µg/m^3 was recorded on February 9, the maximum SO_2 concentration of 105.5 µg/m^3 was recorded on June 14 and the CO concentration recorded both its one-hour and 8-hour rolling average maxima of 1050 µg/m^3 and 902 µg/m^3 on March 9.

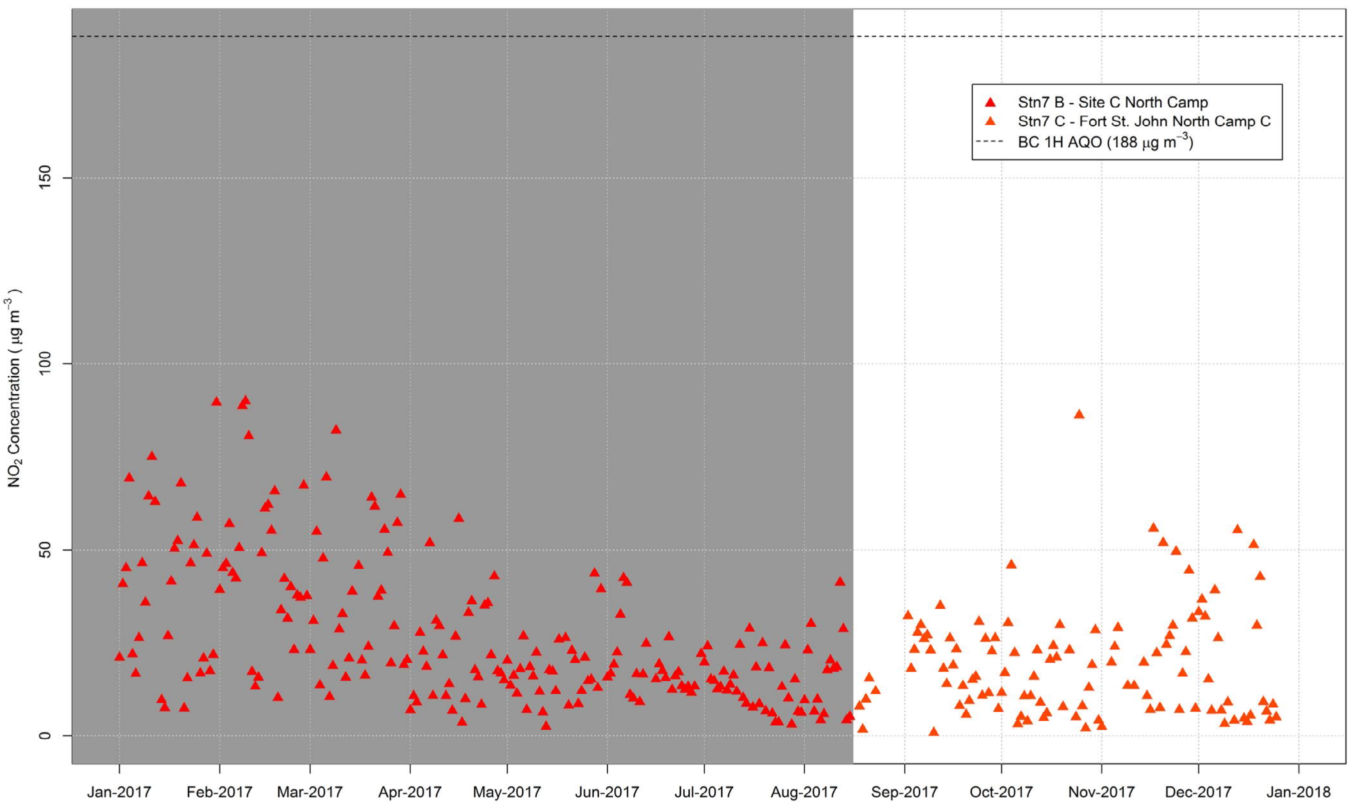


Figure 4-5: **Daily 1-hour maximum NO_2 concentrations from Station 7B – Site C North Camp / 7C – Fort St. John North Camp C for 2017 (in µg/m^3). The change in background from grey to white indicates the time of the station move. The target AAQO is plotted as a broken line.**

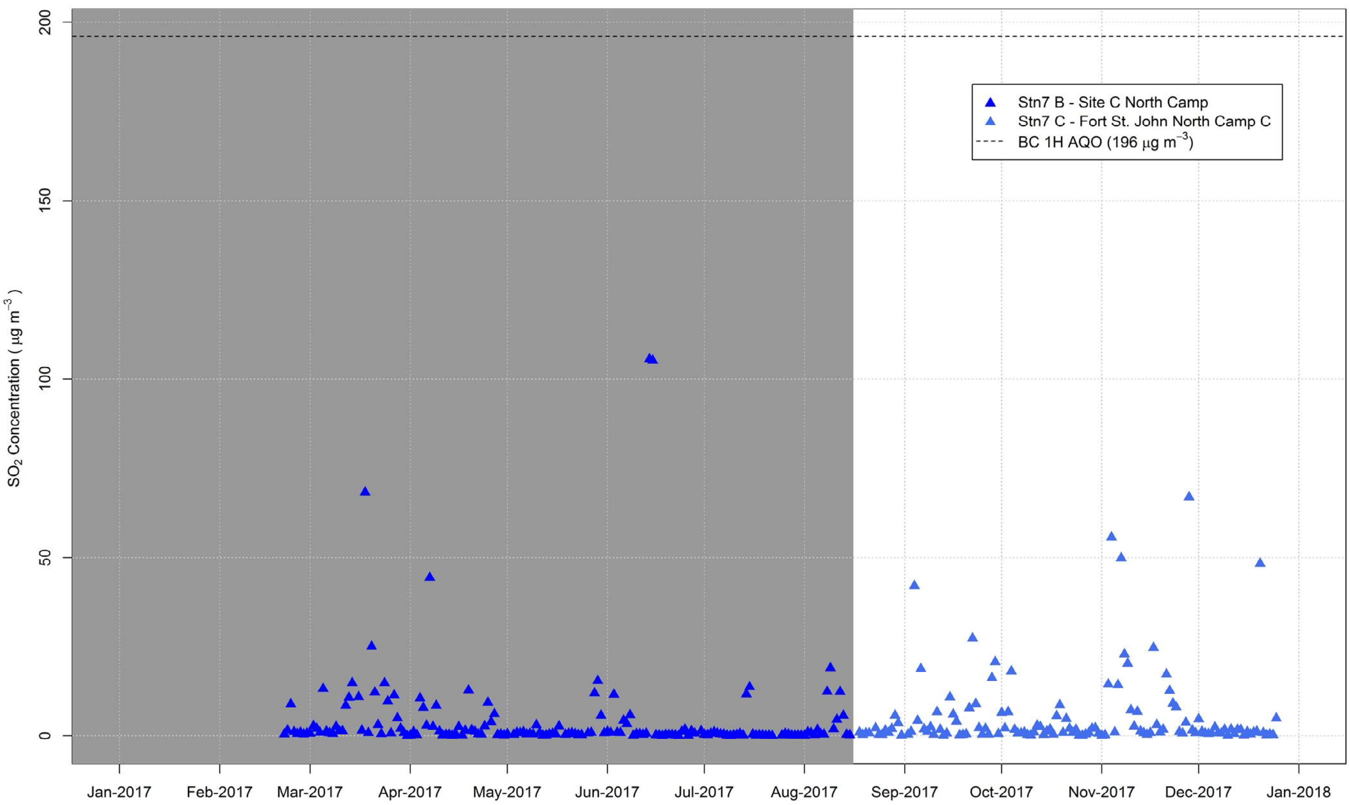


Figure 4-6: **Daily 1-hour maximum SO_2 concentrations from Station 7B – Site C North Camp / 7C – Fort St. John North Camp C for 2017 (in μg/m^3). The change in background from grey to white indicates the time of the station move. The target AAQO is plotted as a broken line.**

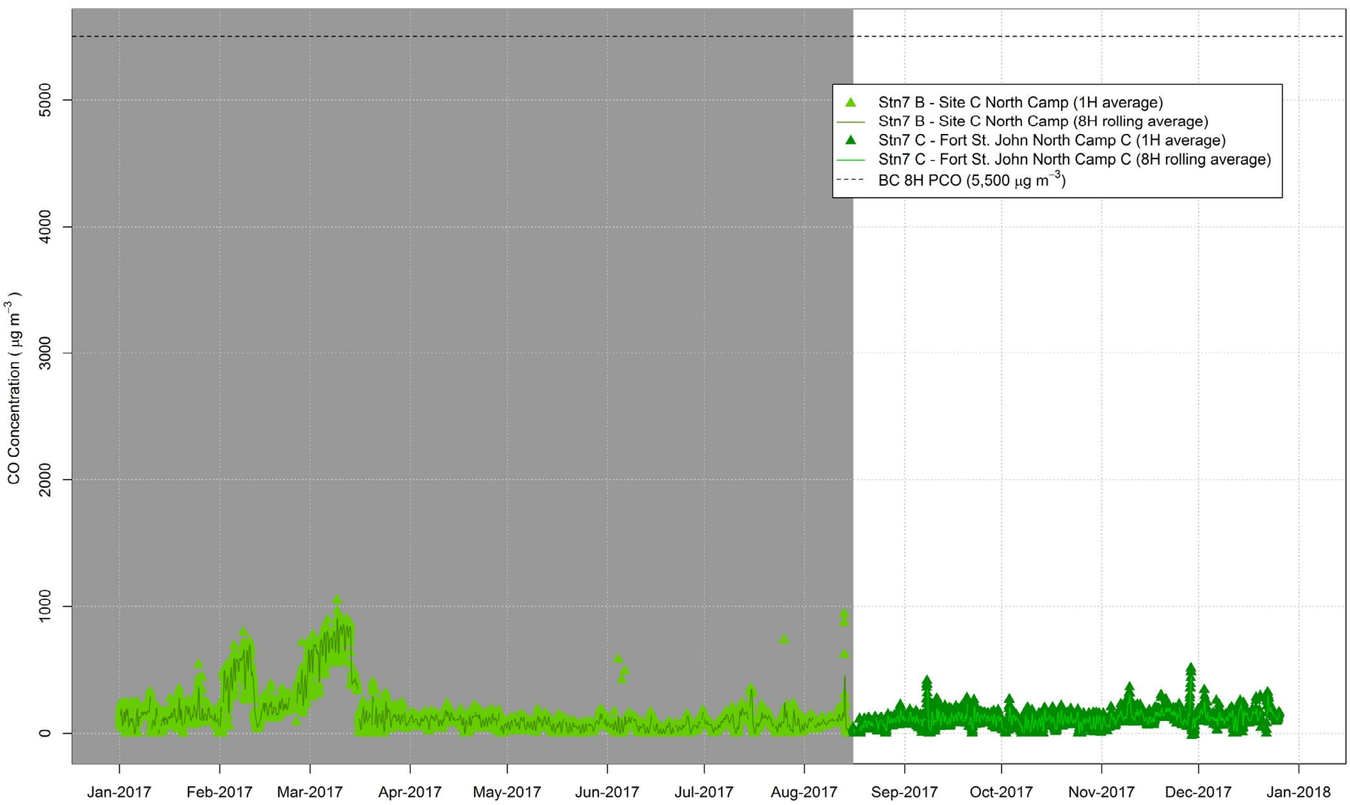


Figure 4-7: **1-hour and 8-hour rolling average CO concentrations from Station 7B – Site C North Camp / 7C – Fort St. John North Camp C for 2017 (in µg/m^3). The change in background from grey to white indicates the time of the station move. The target AAQO is plotted as a broken line.**

4.3 Air Quality Reporting

Section 12.3.3 of the FDS conditions requires that BC Hydro produce a plan that includes procedures to enable the appropriate authorities to alert sensitive receptor groups and Reservoir Area Aboriginal Groups in case of any measured exceedances of the AAQO's and to address those exceedances. Following Section 5.0 of BC Hydro's Air Quality Monitoring Program, that forms part of the CEMP (BC Hydro 2016), BC Hydro has developed a Memorandum of Understanding (MOU) with the BC MOE to allow access to all air quality readings monitored by BC Hydro. According to the MOU, the BC MOE will be responsible for reporting the information publicly on the Ministry's near real-time air quality data portal[1]. This data portal is currently active and available to all interested parties to view current and historical air quality data from BC Hydro's air quality monitoring stations. Quality assured data are provided annually to the BC MOE. Final validated data must be delivered four to eight weeks prior to the subsequent Provincial Clean Air Day as indicated in the MOU. Based on these measurements and other monitoring in the region, the BC MOE and Northern Health are able to issue air quality advisories. Beginning in January 2018 and also as noted in the MOU, measurements from the Site C monitoring network will be shared with the Pacific Climate Impacts Consortium (PCIC).[2] PCIC is a regional climate service centre at the University of Victoria that provides practical information on the physical impacts of climate variability and change in the Pacific and Yukon Region of Canada.

4.3.1 Monitoring Station Audits

The BC MOE conducted audits of the four ambient monitoring stations on March 29, August 11 and November 8, 2017. The results of these audits are presented in Table 4-5.

Table 4-5: Summary of BC MOE audit results for 2017

Station	Parameter	Audit dates		
		March 29, 2017	August 24, 2017	November 8, 2017
Station 1 – Attachie Flat Upper Terrace	SHARP $PM_{2.5}$	Pass	Pass	Pass
	SHARP PM_{10}	Pass	Pass	Pass
Station 7B/C – Site C North Camp / Fort St. John North Camp C	SHARP $PM_{2.5}$	Pass	Pass	Pass
	SHARP PM_{10}	Pass	Pass	Pass
	NO_X	Fail	Fail	Pass
	SO_2	Fail	Pass	Pass
Station 8 – Old Fort	SHARP $PM_{2.5}$	Fail	Pass	Pass
	SHARP PM_{10}	Pass	Pass	Pass
Station 9 – 85th Avenue	SHARP $PM_{2.5}$	Fail	Pass	Pass
	SHARP PM_{10}	Fail	Pass	Pass

Audit findings led to improvements in maintenance procedures such as training of personnel, on-site documentation and response times for repairs. These improvements made it possible to achieve a 100% pass rate during the November 8, 2017 audit.

[1] https://envistaweb.env.gov.bc.ca/ Data is available by searching in the reporting tool under purpose = BC HYDRO
[2] https://www.pacificclimate.org/

5 CONCLUSIONS

In fulfillment of the conditions outlined by the environmental assessment, this document reports on the climate and air quality as observed by the Site C monitoring network and the Environment Canada weather station at Fort St. John Airport during the 2017 calendar year. Very small differences in ambient air temperature or in relative humidity were observed between the stations. This was attributed to the short distances and small elevation differences between stations; however, wind speed and wind direction were found to vary between stations due to small-scale surface features and terrain elevations having a larger impact on the local air flow patterns.

Site C network stations recorded a warmer annual average temperature, less precipitation and lower wind speeds than the Fort St. John Airport. The Fort St. John Airport annual average temperature was warmer than the 30-year climate normals and it observed greater precipitation and higher wind speeds.

Differences in soil temperature between the stations were most pronounced from April to September. During this period, Station 4 (Bear Flat) consistently recorded the lowest soil temperatures. During the remaining months, soil temperatures are similar between the stations.

Three excursions above the 25 µg/m^3 AAQO for $PM_{2.5}$ and no exceedances of the AAQO for PM_{10}, and both based on a 24-hour averaging period, were observed at Station 1 (Attachie Flat Upper Terrace) in 2017. Five excursion above the AAQO for $PM_{2.5}$ and 52 exceedances of the AAQO for PM_{10} for the 24-hour averaging period were observed at Station 7B/C (Site C North Camp / Fort St. John North Camp C). At Station 8 (Old Fort), three excursions above the 24-hour AAQO for $PM_{2.5}$ and no exceedances above the 24-hour AAQO for PM_{10} were observed. Four excursions above the 24-hour AAQO for $PM_{2.5}$ and two exceedances for the 24-hour AAQO for PM_{10} were observed at Station 9 (85th Avenue).

Year 2017 had a very active wildfire season in the Peace region during which several smoke events affected the study area. Despite this, many of the 24-hour PM_{10} exceedances observed at Station 7B/C (Site C North Camp / Fort St. John North Camp C) have been attributed to dam construction activities. An alerting system is in place to immediately notify BC Hydro and its contractors about any elevated concentrations or excursions taking place so they can work to identify the activities onsite that may be responsible for the emissions and implement mitigation measures or change activities to reduce those emissions. BC Hydro conducted environmental audits throughout 2017 to verify implementation of the EPPs, including implementation of appropriate mitigation measures in response to air quality alerts. An improvement to the air quality management system was implemented in June 2017, with BC Hydro's ACMT database which was used to house environmental inspection reports.

No excursions of the 1-hour SO_2 and 1-hour NO_2 AAQOs were observed in 2017. There were also no observed exceedances of the 1-hour or 8-hour PCOs for CO in 2017. The annual average NO_2 and SO_2 concentrations were well below their respective annual AAQOs.

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APPENDIX A

2017 COMPLIANCE SUMMARY

Table A- 1: Summary of AQMP Conditions and Year 2017 Compliance Summary

Condition	Condition Description	Plan Reference	Status	Evidence/Deliverables
EAC Condition 57	The EAC Holder must develop an Air Quality Management Plan and Smoke Management Plan	Construction Environmental Management Plan Section 4.1 (Air Quality Management Plan) and Appendices A (Smoke Management Plan and B (Air Quality Monitoring Plan)	Completed February 4, 2016	Construction Environmental Monitoring Plan
	The Air Quality Management Plan and Smoke Management Plan must include at least the following to describe how the EAC Holder:			
	• Identify places of high use by Aboriginal Groups for traditional purposes and develop mitigation measures if adverse effects are predicted at those locations.	Groundtruthing activities are conducted per the Aboriginal Plant Use Mitigation Plan, Cultural Resources Mitigation Plan, and Heritage Resources Management Plan.	BC Hydro has extended an open invitation to interested Aboriginal groups to verify and accurately site land use information. Ground truthing activities are ongoing. To date, the following ground truthing activities related to current use for traditional purposes (i.e., harvesting medicinal/food plants) have taken place: • Along the transmission line right-of-way with Saulteau First Nations registered trapline holders and McLeod Lake Indian Band • In the Cache Creek area with McLeod Lake Indian Band,	To date, ground truthing has identified areas of Aboriginal use along the transmission line right-of-way, Cache Creek / Bear Flats, and Halfway River / Attachie Flats. Confidential ground truthing reports that summarize the ground truthing activities identify times when these areas may be used. Setback distances and ignition criteria described in the Smoke Management Plan (Sections 4.4 and 5.0, respectively) would apply in these areas. Aboriginal groups will be notified of planned debris burning through the activities and tools described in section 5.0 of the Aboriginal Group Communications Plan (Appendix D of the CEMP).

Condition	Condition Description	Plan Reference	Status	Evidence/Deliverables
			Doig River First Nation, and Halfway River First Nation. • In the dam-site area with McLeod Lake Indian Band and Doig River First Nation • Halfway River First Nation in the vicinity of the Halfway River.	
	• Measures to manage emissions and dust from all Project activities.	Construction Environmental Management Plan Section 4.1	Completed February 4, 2016, and ongoing	Section 4.1 provides mitigation measures to be completed to manage emissions and dust.
	• Measures to manage Project effects on air quality associated with concrete production at concrete batch plants.	Construction Environmental Management Plan Section 4.1	Completed February 4, 2016, and ongoing	Section 4.1 provides mitigation measures to be taken to manage air quality effects associated with concrete batch plant operations
	• Control Project-related smoke by following the most current BC Ministry of Environment Open Burning Smoke Control Regulation.	Construction Environmental Management Plan Appendix A	Ongoing	No open burning occurred in 2017.
	• Measures to retain vegetative barriers, or install temporary barriers, where practical.	Construction Environmental Management Plan Section 4.1	Ongoing	Section 4.1 identifies this commitment.
	• Procedures to provide MOE with data collected during monitoring so that they can notify sensitive populations if air quality thresholds are exceeded.	Construction Environmental Management Plan Appendix B Section 5.0	Ongoing	BC Hydro has entered into an agreement with the BC MOE to make all air quality measurements available in near real-time. All operational air quality stations are accessed hourly by the BC MOE.
	The EAC Holder must monitor air quality associated with shoreline protection works at Hudson's Hope during the construction period and for the first two years of operations.	Construction Environmental Management Plan Appendix B Section 4.0	Future requirement	Shoreline protection works at Hudson's Hope are planned to commence in 2020– 2022, and air quality monitoring plans will be implemented during construction and for the first 2 years of reservoir operations.

Condition	Condition Description	Plan Reference	Status	Evidence/Deliverables
	The EAC Holder must provide these draft Air Quality Management Plan and Smoke Management Plan to MOE, City of Fort St. John, District of Hudson's Hope, Peace River Regional District, District of Taylor, District of Hudson's Hope, District of Chetwynd and Aboriginal Groups for review a minimum of 90 days prior to the commencement of construction activities.	Draft Construction Environmental Management Plan Section 4.1 (Air Quality Management Plan) and Appendix A (Smoke Management Plan) and Appendix B (Air Quality Monitoring Program)	Completed	The draft CEMP was submitted for review and comment on October 17, 2014.
	The EAC Holder must file the final Air Quality Management Plan and Smoke Management Plan with EAO, MOE, City of Fort St. John, District of Hudson's Hope, Peace River Regional District, District of Taylor, District of Chetwynd and Aboriginal Groups a minimum of 30 days prior to the commencement of construction activities.	Construction Environmental Management Plan Section 4.1 (Air Quality Management Plan) and Appendix A (Smoke Management Plan) and Appendix B (Air Quality Monitoring Program)	Completed	The final (Revision 1) of the CEMP was provided to regulatory agencies, governments and Aboriginal Groups on June 5, 2015. The CEMP continues to be updated as required, with the most recent version, Revision 4, dated July 26, 2016, was accessible to regulators, government agencies, Aboriginal Groups and the public via the Site C Clean Energy Project website at: https://www.sitecproject.com/document-library/environmental-management.

Condition	Condition Description	Plan Reference	Status	Evidence/Deliverables
	The EAC Holder must develop, implement and adhere to the final Air Quality Management Plan and Smoke Management Plan, and any amendments, to the satisfaction of EAO.	Construction Environmental Management Plan Section 4.1 (Air Quality Management Plan) and Appendices A (Smoke Management Plan and B (Air Quality Monitoring Plan)	Ongoing	2017 Air Quality Management Plan Annual Report BC Hydro audits contractor compliance with implementation of relevant requirements of the Air Quality Management Plan through: • reviewing Environmental Protection Plans (EPPs) submitted by the contractors and, • conducting environmental audits during construction to verify that requirements of the Plan are being considered and implemented as required BC Hydro will continue to issue Field Advice Memos to its contractors to address any issues of non-compliance.
EAC Condition 59	The EAC Holder must outline measures including relocation of affected home-owners, as deemed appropriate in consultation with affected home-owners, to address serious levels of noise or changes in air quality during construction of the Project. The measures would be included in the appropriate plans.	Construction Environmental Management Plan Section 4.11 (Noise and Vibration Management) and Appendix B (Air Quality Monitoring Plan)	Consultation with affected homeowners or Northern Health/BC Ministry of Environment to occur if necessary	A noise and air quality complaint response process has been developed and is being implemented. Key steps in the process include proactive noise mitigation, complaint response, monitoring/notification as required, and additional mitigation if warranted.

Condition	Condition Description	Plan Reference	Status	Evidence/Deliverables
FDS Condition 12.1	The Proponent shall ensure that Designated Project construction is undertaken in a manner that protects the health of Aboriginal peoples, by ensuring that exceedances of federal and provincial ambient air quality objectives are avoided or minimized and by managing the potential effects of smoke and dustfall.		Ongoing	Construction Environmental Management Plan Section 4.1 (Air Quality Management Plan) and Appendices A (Smoke Management Plan and B (Air Quality Monitoring Plan) BC Hydro audits contractor compliance with implementation of relevant requirements of the Air Quality Management Plan through: • reviewing Environmental Protection Plans (EPPs) submitted by the contractors and, • conducting environmental audits during construction to verify that requirements of the Plan are being considered and implemented as required BC Hydro will continue to issue Field Advice Memos to its contractors to address any issues of non-compliance.
FDS Condition 12.2	The Proponent shall develop, in consultation with Reservoir Area Aboriginal groups, an air quality management plan to ensure exceedances of those ambient air quality objectives due to Designated Project construction are avoided or minimized at human receptor sites located outside the Project Activity Zone.	Construction Environmental Management Plan Section 4.1 (Air Quality Management Plan) and Appendices A (Smoke Management Plan and B (Air Quality Monitoring Plan)	Completed February 4, 2016	Construction Environmental Management Plan
FDS Condition 12.3	The plan shall include:			

Condition	Condition Description	Plan Reference	Status	Evidence/Deliverables
FDS Condition 12.3.1	• measures to avoid or minimize exceedances of federal and provincial ambient air quality objectives for Total Suspended Particulates (TSP), Particulate Matter ($PM_{2.5}$, PM_{10}), Carbon Monoxide (CO), Nitrogen Dioxide (NO_2) and Sulphur Dioxide (SO_2);	Construction Environmental Management Plan Section 4.1	Completed February 4, 2016	Construction Environmental Management Plan
FDS Condition 12.3.2	• measures to minimize or manage the potential effects of smoke and dustfall;	Construction Environmental Management Plan Section 4.1 (Air Quality Management Plan) and Appendices A (Smoke Management Plan)	Completed February 4, 2016	Construction Environmental Management Plan
FDS Condition 12.3.3	• procedures to enable the appropriate authorities to alert sensitive receptor groups and Reservoir Area Aboriginal groups in cases of exceedance of air quality standards and to address those exceedances; and	Construction Environmental Management Plan Appendix B Section 5.0	Ongoing	BC Hydro has entered into an agreement with the BC MOE to make all air quality data available in near real-time. All operational air quality stations are accessed hourly by the BC MOE.
FDS Condition 12.3.4	• procedures to monitor air quality effects at locations used by Aboriginal groups and to develop mitigation measures if adverse effects are predicted at those locations.	Construction Environmental Management Plan Appendix B	Completed July 8, 2016	Air quality monitors measuring PM_{10} and $PM_{2.5}$ were installed at three locations before construction began. A fourth station at the construction site measuring PM_{10}, $PM_{2.5}$, SO_2, NO_x and CO was installed July 7, 2016.
FDS Condition 12.4	The Proponent shall submit to the Agency and Reservoir Area Aboriginal groups a draft copy of the plan for review 90 days prior to initiating construction.	Construction Environmental Management Plan Section 4.1 (Air Quality Management Plan) and Appendix A (Smoke Management Plan)	Completed	The draft CEMP was submitted for review and comment on October 17, 2014.
FDS Condition 12.5	The Proponent shall submit to the Agency the final plan a minimum of 30 days prior to initiating construction.	Construction Environmental Management Plan Section 4.1 (Air Quality	Completed	The final Construction Environmental Management Plan, along with the Consideration

Condition	Condition Description	Plan Reference	Status	Evidence/Deliverables
	When submitting the final plan, the Proponent shall provide to the Agency an analysis that demonstrates how it has appropriately considered the input, views or information received from Reservoir Area Aboriginal groups.	Management Plan) and Appendices A (Smoke Management Plan)		Tracking Table was submitted on June 5, 2015.
FDS Condition 12.6	The Proponent shall implement the plan and provide to the Agency an analysis and summary of the implementation of the plan, as well as any amendments made to the plan in response to the results, on an annual basis during construction and the first year of operation.	Air Quality Management Plan 2015	Third Annual Report to CEAA included in this document.	Air Quality Management Plan 2015. • 1st Annual Report to CEAA submitted July 2016. • Second Annual Report submitted March 21, 2017 and revised June 14, 2017. • Third Annual Report included in this document.
FDS Condition 12.7	The Proponent shall provide a copy of the same version of its annual reporting on ambient air quality as provided to the Agency and in the same timeframe to Reservoir Area Aboriginal groups and the Métis Nation British Columbia.	Air Quality Management Plan 2015	Third Annual Report to CEAA included in this document.	Air Quality Management Plan 2015. • 1st Annual Report to CEAA submitted July 2016. • Second Annual Report submitted March 21, 2017 and revised June 14, 2017. • Third Annual Report included in this document

APPENDIX B

DATA TABLES

Table B- 1: **Monthly average temperatures at all Site C network stations and Fort St. John Airport for the year 2017 as well as the 30-year climate normals from 1981- to 2010.**

Month	Station 1 – Attachie Flat Upper Terrace	Station 2 – Attachie Flat Lower Terrace	Station 3 – Attachie Plateau	Station 4 – Bear Flat	Station 6 – Farrel Creek	Station 7B/C – Site C North Camp/Fort St. John North Camp C	Station 10 – Tea Creek	Station 11 - Taylor	FSJ Airport	Climate Normals
Jan	-7.7	-8.3	-7.2	-7.4	-6.6	-6.7	-	-	-7.8	-12.8
Feb	-7.6	-7.8	-7.6	-7.5	-6.5	-7.0	-	-	-8.6	-9.6
Mar	-6.8	-7.0	-7.3	-6.5	-6.3	-6.8	-	-	-8.5	-4.6
Apr	4.1	3.9	3.5	4.3	4.1	3.9	-	-	2.3	3.9
May	12.2	-	12.1	12.4	12.1	13.0	-	-	11.7	9.8
Jun	14.9	15.2	14.8	14.8	14.9	15.8	-	-	14.5	14.1
Jul	16.0	15.5	16.0	15.8	16.0	17.2	-	-	15.7	16.2
Aug	16.2	15.1	16.5	16.3	16.1	17.6	-	-	16.2	14.9
Sep	11.9	-	12.1	-	11.7	12.9	-	-	11.8	10.1
Oct	4.9	-	5.0	4.8	5.2	5.4	4.6	4.8	3.9	3.6
Nov	-10.1	-	-10.5	-10.2	-9.5	-10.2	-10.8	-10.2	-11.4	-6.6
Dec	-9.9	-	-8.1	-9.6	-8.5	-7.3	-7.7	-8.3	-8.0	-11.4
Annual average	3.2	-	3.4	3.1	3.6	4.0	-	-	2.7	2.3

Notes: Measurements were discontinued at Station 2 on September 6, 2017.
Measurements began at Station 10 on September 14, 2017.
Measurements began at Station 11 on September 15, 2017.
A “-“ indicates a period for which the data was not sufficiently complete to calculate a valid monthly or annual average.

Table B- 2: Monthly average relative humidity measured at15:00 LST at all Site C network stations and Fort St. John Airport for the year 2017 as well as the 30-year climate normals from 1981 to 2010.

Month	Station 1 – Attachie Flat Upper Terrace	Station 2 – Attachie Flat Lower Terrace	Station 3 – Attachie Plateau	Station 4 – Bear Flat	Station 6 – Farrel Creek	Station 7B/C – Site C North Camp/Fort St. John North Camp C	Station 10 – Tea Creek	Station 11 - Taylor	FSJ airport	Climate Normals
Jan	71.9	73.6	65.8	68.6	66.0	70.3	-	-	73.6	68.5
Feb	66.3	67.8	60.5	62.4	56.7	62.8	-	-	67.2	62.9
Mar	56.0	57.0	53.1	52.6	48.3	54.8	-	-	60.7	53.8
Apr	47.4	48.6	49.8	46.0	46.6	48.9	-	-	54.2	42.6
May	38.4	-	39.0	37.6	36.9	35.1	-	-	38.9	41.1
Jun	43.7	40.8	42.0	43.4	41.0	39.2	-	-	44.0	45.7
Jul	43.7	48.3	46.3	46.3	45.5	43.5	-	-	48.1	49.3
Aug	37.9	44.2	40.9	40.0	38.9	38.6	-	-	43.8	50.6
Sep	40.2	-	40.5	-	42.4	42.3	-	-	45.6	52.4
Oct	52.1	-	52.3	48.4	52.1	52.2	52.9	51.1	56.6	57.9
Nov	74.1	-	73.5	71.8	69.4	74.0	76.2	68.4	75.6	72.3
Dec	72.3	-	61.4	66.1	66.3	64.9	64.8	66.7	66.5	71.5
Annual average	53.6	-	52.0	52.1	50.8	52.1	-	-	56.2	55.7

Notes: Measurements were discontinued at Station 2 on September 6, 2017.
Measurements began at Station 10 on September 14, 2017.
Measurements began at Station 11 on September 15, 2017.
A "-" indicates a period for which the data was not sufficiently complete to calculate a valid monthly or annual average.

Table B- 3: Monthly precipitation totals at all Site C stations and Fort St. John Airport for the year 2017 as well as the 30-year climate normals from 1981 to 2010.

Month	Station 1 – Attachie Flat Upper Terrace	Station 2 – Attachie Flat Lower Terrace	Station 3 – Attachie Plateau	Station 4 – Bear Flat	Station 6 – Farrel Creek	Station 7B/C – Site C North Camp/Fort St. John North Camp C	Station 10 – Tea Creek	Station 11 - Taylor	FSJ Airport	Climate Normals
Jan	13.6	-	18.5	-	16.5	16.3	-	-	30.3	25.4
Feb	16.2	-	15.5	29.2	20.1	20.2	-	-	28.7	19.0
Mar	17.5	19.3	18.8	15.6	22.0	20.6	-	-	36.9	23.7
Apr	43.8	45.4	37.4	34.6	64.2	45.7	-	-	70.4	20.0
May	78.9	-	78.8	68.5	78.8	70.4	-	-	74.3	37.9
Jun	67.1	51.2	64.3	45.6	69.1	49.2	-	-	54.5	65.6
Jul	33.5	40.7	40.5	51.5	47.8	64.5	-	-	60.4	75.2
Aug	16.3	15.0	13.2	12.8	8.3	17.8	-	-	12.0	51.2
Sep	40.6	-	41.9	38.4	54.3	54.6	-	-	53.8	44.7
Oct	32.5	-	50.4	30.5	61.0	59.6	36.5	59.4	79.6	30.8
Nov	61.6	-	51.8	49.2	63.2	54.4	-	55.3	83.1	29.2
Dec	1.0	-	1.0	1.2	0.9	2.0	3.0	1.9	5.0	22.0
Total(1)	422	-	432	377	506	475	-	-	589	445

Notes: Measurements were discontinued at Station 2 on September 6, 2017.
Measurements began at Station 10 on September 14, 2017.
Measurements began at Station 11 on September 15, 2017.
A "-" indicates a period for which the data was not sufficiently complete to calculate a valid monthly or annual total.

APPENDIX C

SEASONAL WIND ROSES

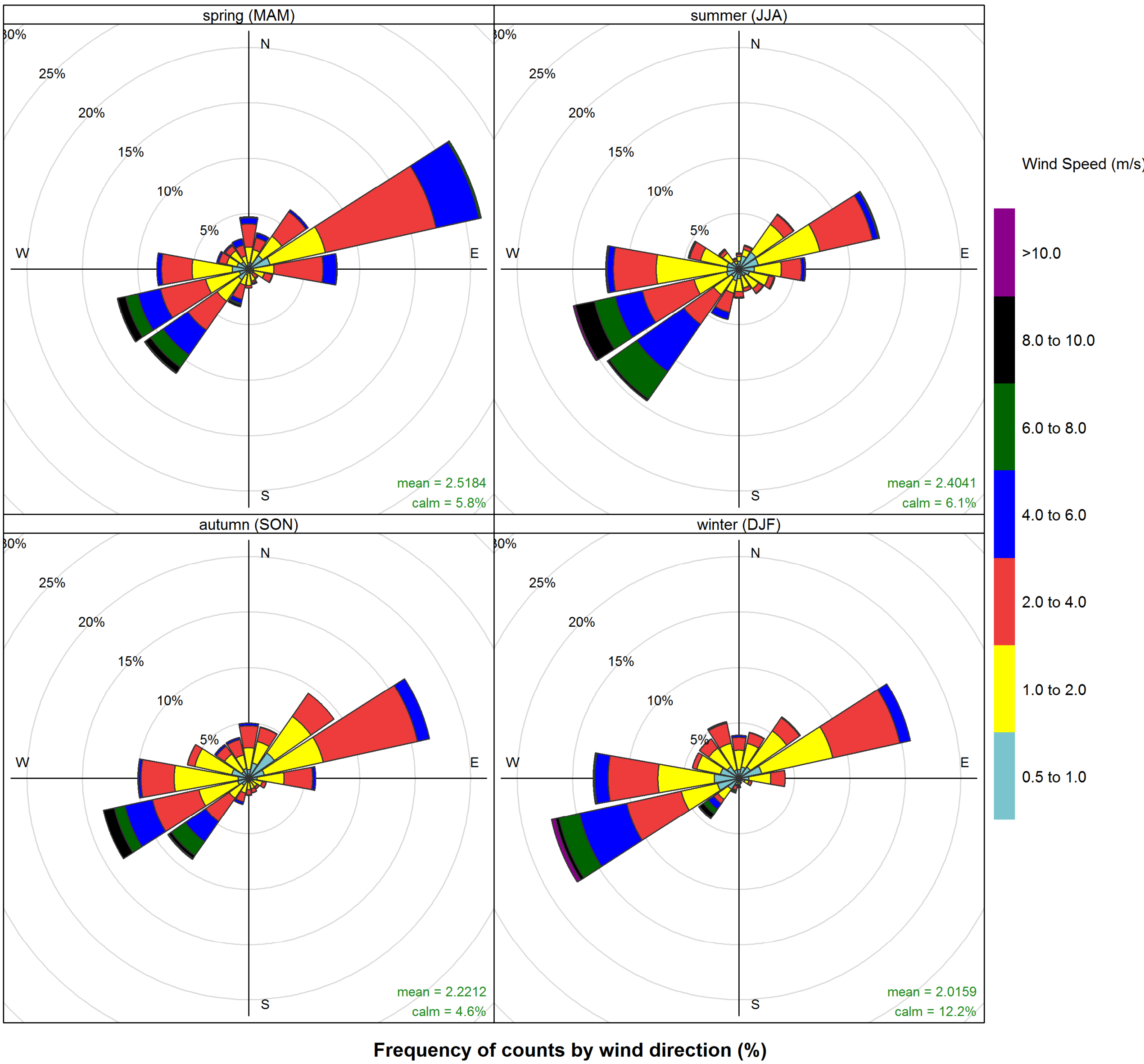

Figure C-1: Wind Roses by season for Station 1 (Attachie Flat Upper Terrace) for 2017.

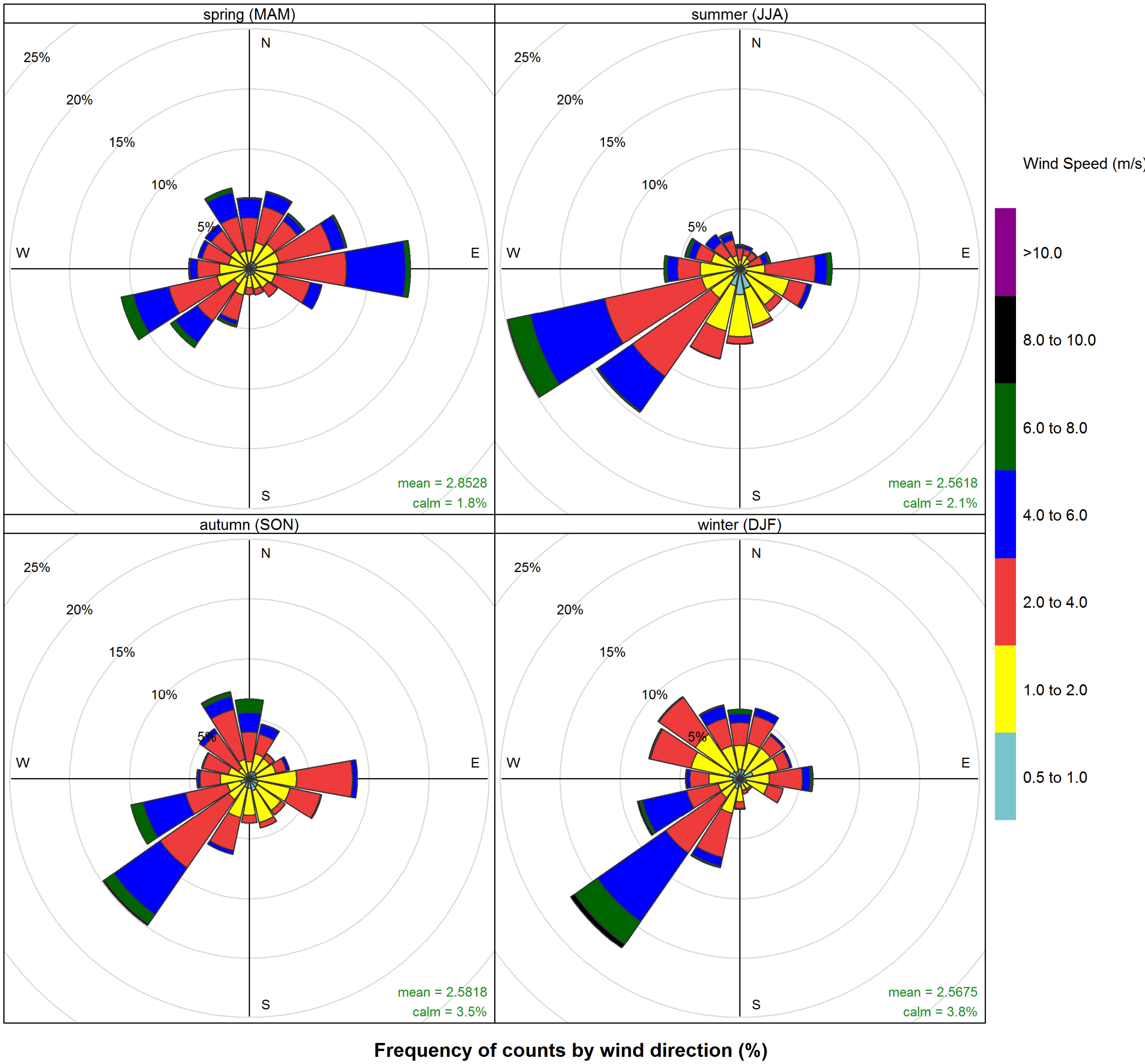

Figure C-2: Wind Roses by season for Station 3 (Attachie Plateau) for 2017.

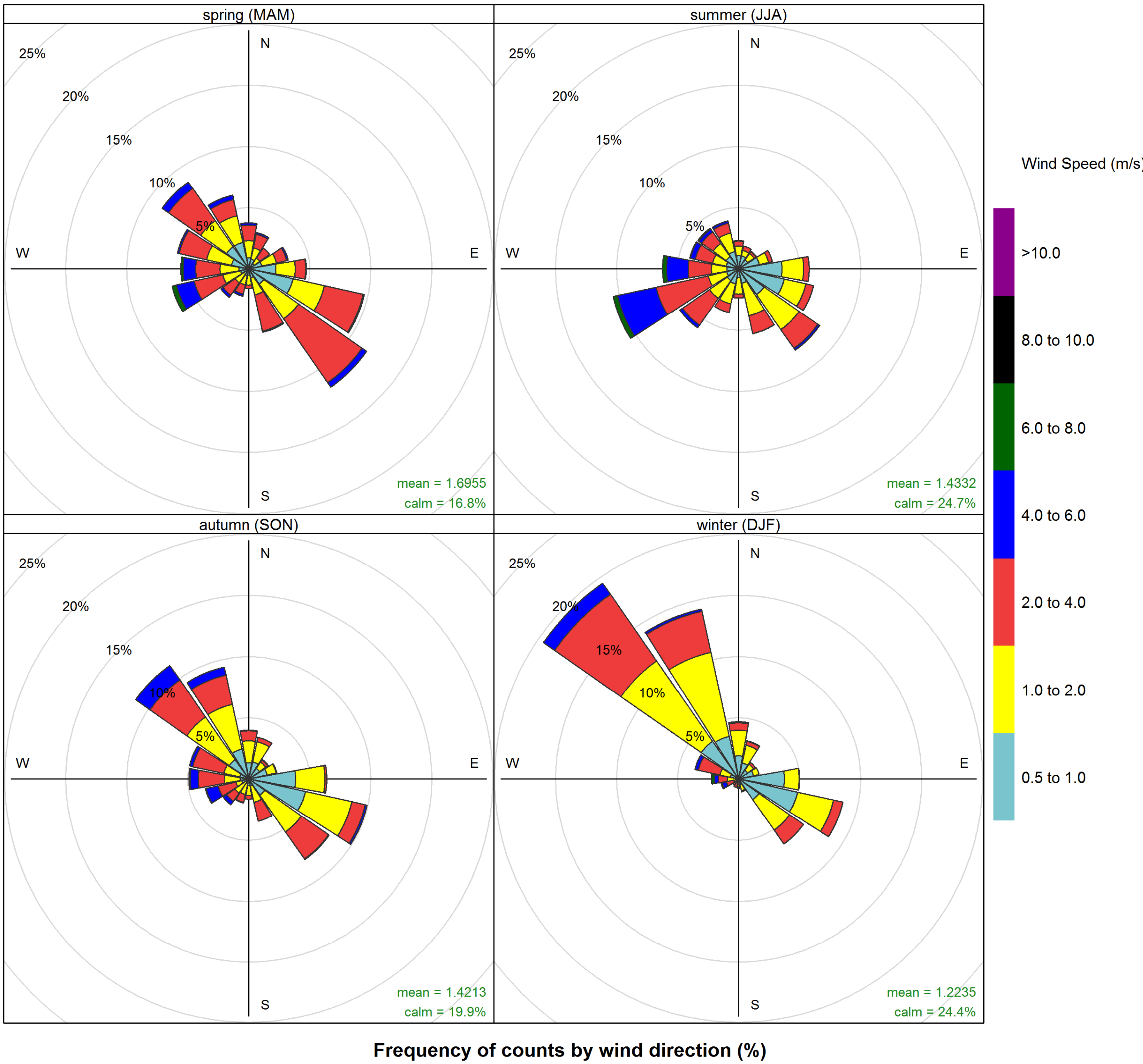

Figure C-3: Wind Roses by season for Station 4 (Bear Flat) for 2017.

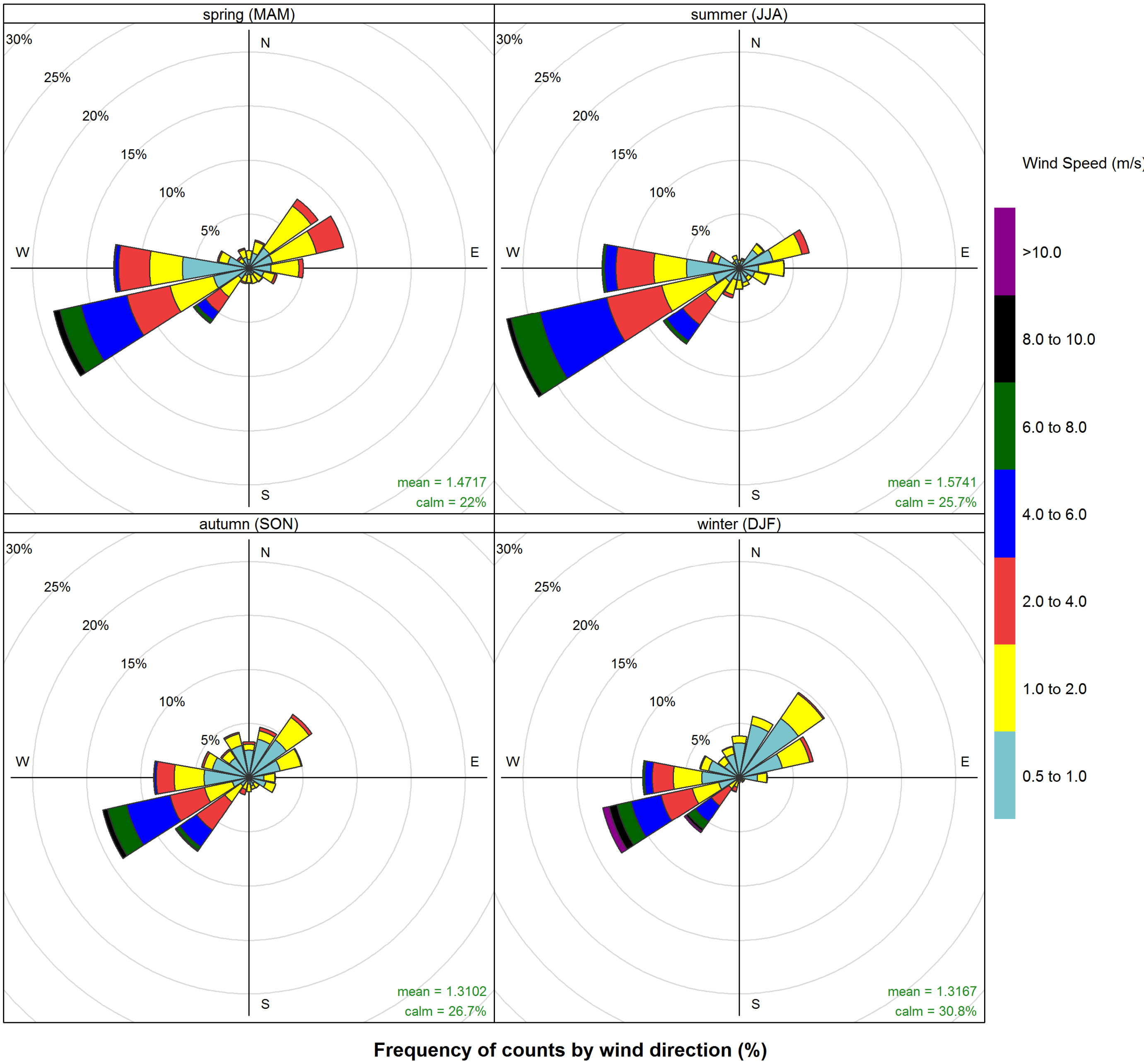

Figure C-4: Wind Roses by season for Station 6 (Farrell Creek) for 2017.

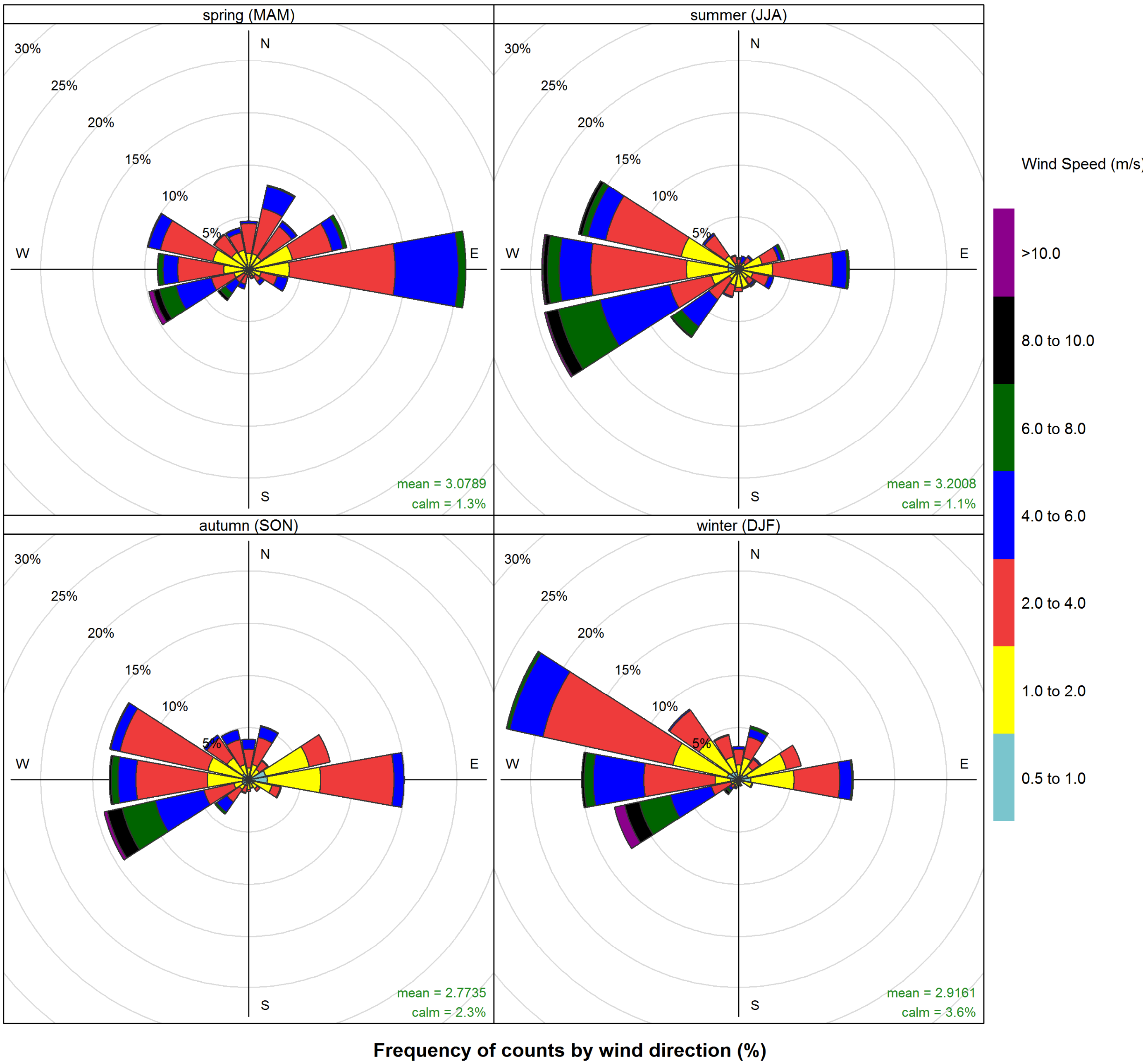

Figure C-5: **Wind Roses by season for Station 7B/C (Site C North Camp/Fort St. John North Camp C) for 2017.**

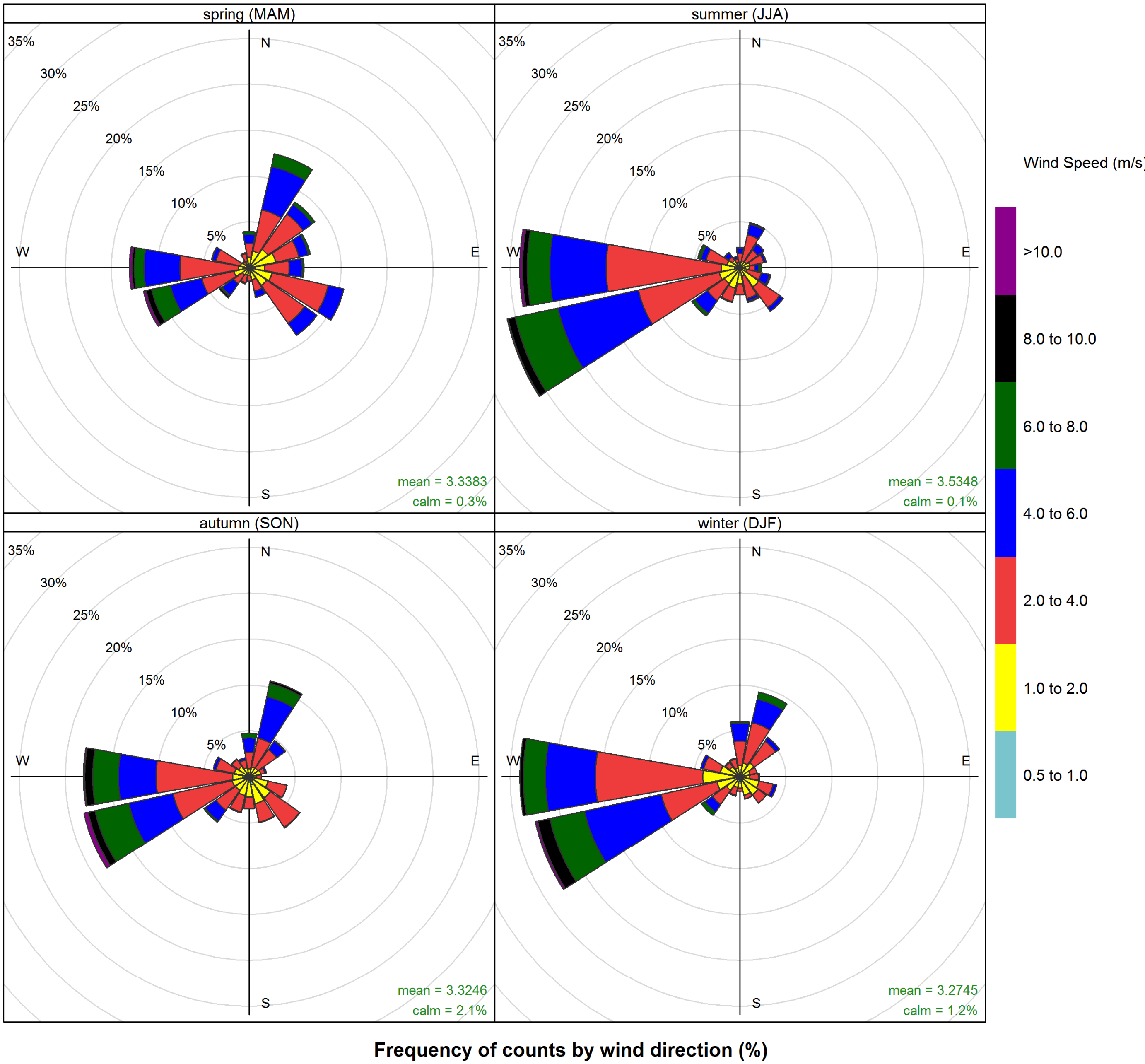

Figure C-6: Wind Roses by season for Station 9 (85th Avenue) for 2017.

APPENDIX D

EDDY COVARIANCE REPORT

D1 INTRODUCTION AND METHODS

As part of the collection of baseline environmental data for the Site C project area, eddy covariance (EC) systems were installed at three meteorological stations: Station 1 (Upper Attachie), Station 2 (Lower Attachie) and Station 4 (Bear Flat). This report summarizes the results of the EC component of the baseline environmental measurement program for 2017.

The EC technique has become the standard method for measuring sensible heat flux (H), latent heat flux (λE) and CO_2 flux (F_c) over footprints of ≤ 1 km^2 (Baldocchi, 2003). Knowledge of the partitioning of available energy (R_n – G, or net radiation minus soil heat flux) between sensible and latent heat fluxes is critical for understanding the interaction of the measured ecosystem with the overall water cycle, atmospheric boundary layer development, weather, and climate (Wilson et al. 2002). Measurements of F_c yield the net ecosystem productivity (NEP)—the difference between gross ecosystem photosynthesis (GEP) and ecosystem respiration (R). NEP is a direct measure of whether an ecosystem is a source (NEP < 0), or a sink (NEP > 0) of atmospheric C over time and is a useful indicator of ecosystem health because it integrates the individual responses of GEP and R to weather and environmental variables. In addition, in managed forest or agricultural settings, NEP measurements can serve as a useful indicator of overall ecosystem response to a particular management practice (e.g. selective harvesting, no-tillage farming).

EC systems were installed at Station 2 and Station 4 on December 2, 2010. An additional EC system was installed at Station 1 on January 13, 2011. During 2017 system 2 was decommissioned as its location on the lower terrace was scheduled to be flooded.

Since the installation at each of these stations, continuous 10 Hz measurements of the three components of the wind vector and air temperature have been made using a 3-dimensional ultrasonic anemometer (model CSAT3, Campbell Scientific Inc. (CSI), Logan, Utah), while 20 Hz turbulent fluctuations of CO_2 and H_2O have been measured using an open-path infrared gas analyser (IRGA) (model LI-7500A, LI-COR, Inc., Lincoln, Nebraska). Signals were measured with a data logger (CSI, model CR1000) with a synchronous-device-for-measurement (SDM) connection. High frequency (HF) data were stored on a compact flash card that was replaced every 2-3 weeks. Half-hourly covariances and other statistics were calculated on the data logger (to provide near-real time diagnostics), and as well from the raw HF data using in-house MATLAB processing code. H, λE and F_c fluxes were calculated as the half-hourly covariances of the sonic air temperature, H_2O or CO_2 mixing ratio with the vertical wind velocity (w), respectively. Further details of the flux calculations can be found in Brown et al. (2010). Briefly, sensible heat (H), latent heat (λE) and CO_2 (F_C) fluxes were calculated as the half-hourly covariances of the sonic air temperature, H_2O and CO_2 mixing ratios with the vertical wind velocity (w), respectively (Webb et al. 1980).

For example, in the case of H_2O, λE is calculated using

$$\lambda E = \lambda \rho_a \overline{w' s_v'} \qquad (1)$$

where ρ_a is the dry air density, w is the vertical wind velocity, s_v is the H_2O mixing ratio, λ is the latent heat of vaporization, and the primes indicate fluctuations from the half-hourly mean value and the overbar indicates the time average. The calculation is therefore a 30-minute block average with no detrending applied.

D2 EC SYSTEM PERFORMANCE

D2.1 System uptime/data loss

Protocols for data recovery, extraction, and re-processing high frequency EC data, and cleaning (i.e., removal of unreliable data and gap-filling) of the resulting half-hourly CO_2 (F_c), sensible heat (H) and latent heat (λE) fluxes were unchanged from 2011-2017.

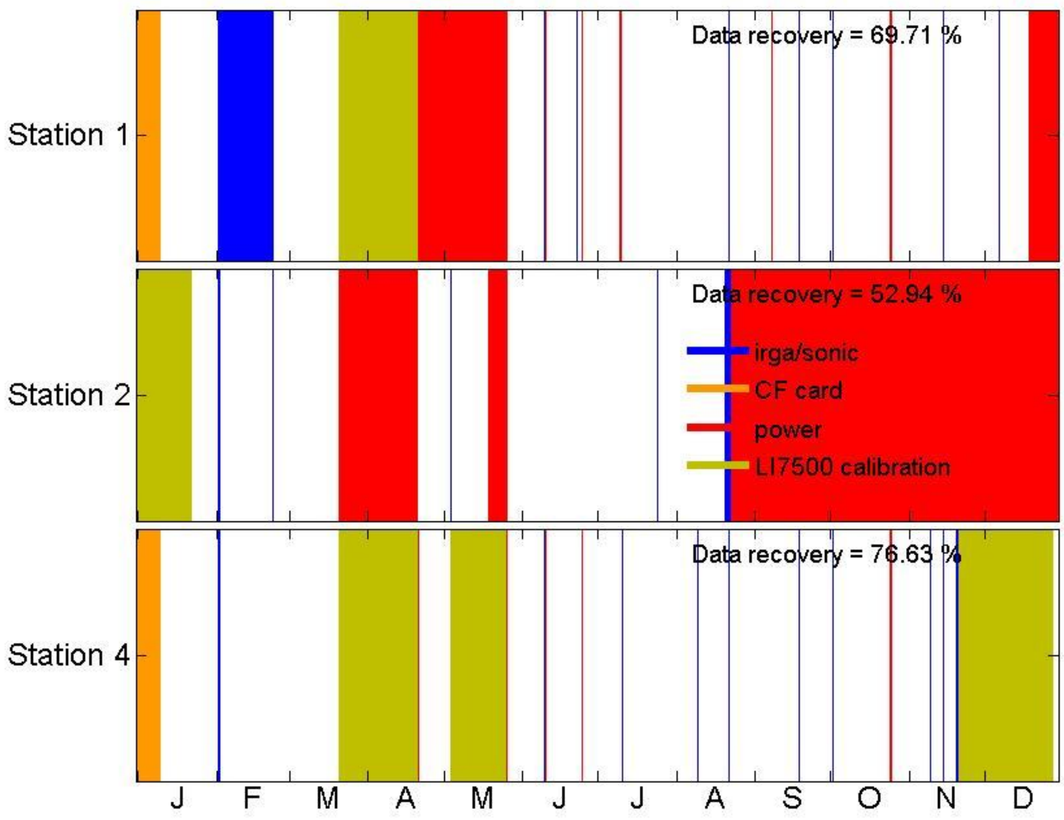

Figure D - 1. EC system performance for Stations 1, 2, 4 in 2017 indicating sources (IRGA/sonic anemometer failure, CF card malfunction, power (low battery voltage), IRGA calibration) of data loss prior to manual QA/QC of the data. Vertical bars indicate flux data loss. Annual data recovery percentage indicated in each panel.

EC system uptime prior to manual data screening for quality assurance/control (QC/QA) in 2017 was 70% at station 1. This was in large due to an extended down time associated with the Li7500 calibration and downtime at the beginning and end of the year when problems with the CF card were encountered. The end of year gap is indicated in red because data collection was halted completely due to the CF card problems i.e., No logger data files were generated. This opportunity was taken to send the Li7500 for calibration to reduce downtime in 2018 and have the system fully operational to monitor the complete spring freshet for first time during this study. At Station 2 the annual EC system uptime was improved in 2017 to 53%, from 27% in 2016, regardless of the system being permanently shutdown in late August of 2017. Station 4 had the highest system uptime in 2017 at 77%, down from 87% in 2016 largely due to a Li7500 chopper failure during May and because an additional Li7500 calibration was performed in December to facilitate monitoring the complete spring freshet for first time during this study in 2018.

D2.2 QA/QC issues

D2.2.1 Gap-filling

Gap-filling of the carbon balance components (NEP, GEP, and R) at all three stations was made more challenging for the 2017 calendar year by the relatively late removal of the IRGA units at all three EC stations for their annual calibration. The delay, which resulted from unavoidable scheduling conflicts, resulted in the loss of flux measurements at the start of the growing season. In all but 2015, 2016 and 2017 the IRGA units had been returned to operation just prior to spring thaw and the onset of biologically-linked carbon and water fluxes from the agricultural soils. In future, efforts will be made to remove IRGA before the end of year for reinstallation prior to spring thaw.

In a natural forest or grassland ecosystem, filling data gaps in the λE and F_c fluxes this time interval would typically be accomplished using protocols slightly modified from those used in the Fluxnet Canada Research Network and the Canadian Carbon Program (Barr et al. 2004, Brown et al., 2010). This approach is best suited to natural ecosystems where the response of the local vegetation is largely the result of the integration of the phenological response of the individual species of plants and trees and environmental variables such as light, air temperature and soil temperature and moisture.

In the agricultural settings in which the Site C EC stations are situated, the biological response is affected by human factors, as the farmer is the one controlling the sowing and planting; hence the timing of the photosynthetic response cannot be captured in a model without more detailed knowledge of the actions of each individual farmer following spring thaw. While gap-filling the carbon balance flux components was accomplished using the same FCRN approach as in prior years, interpretation of changes the these fluxes during the gap-filled period should be done with some caution (discussed further below, see Section 3.5).

In contrast to the C-balance flux components, gap-filling of λE was accomplished using the same energy balance closure model approach (Amiro et al., 2006) of previous years and introduced no additional uncertainty as H continued to be measured throughout the IRGA calibration period.

D2.2.2 Uncertainty Analysis

Uncertainties associated with calculating annual totals of *ET*, NEP, GEP, and R from the half-hour EC fluxes were determined using techniques detailed extensively elsewhere (Brown et al. 2010, Krishnan et al. 2006, Morgenstern et al 2004). Random error was assessed using propagation of errors following Morgenstern et al. (2004), in which up to a 20% error is randomly assigned to each half-hourly measured flux (NEP or λE). The uncertainty due to the gapfilling algorithms was estimated using Monte Carlo simulation following the procedure of Krishnan et al. (2006). Briefly, gaps were created in annual NEP or λE ranging from a half-hour to 10 days in length and a uniformly distributed random number generator was applied to day and night-time data separately so as to approximate the typical diurnal distribution of data gaps in the annual dataset for each site. For each iteration, the standard FCRN gapfilling approach as modified by Brown et al. (2010) discussed above was used to fill the gaps generated. This procedure was then repeated 1000 times, and the simulated annual values of NEP, R, GEP or *ET* were then sorted to determine the 95% confidence intervals. For the Site C EC stations, the combined random and systemic error introduced from the gap filling procedure amounted to ~10 mm for the annual *ET* and ~30 g C for the annual NEP. It should be noted that the IRGAs are removed for calibration at a time of year (February-March) when energy, water and carbon fluxes are very close to zero—hence they are relatively easy to model. The shift of the calibration period into the growing season necessarily increases the uncertainty involved in gap-filling from the values reported above as the daytime EC fluxes are higher and change more rapidly due to shifts in weather and agricultural practices.

Finally, as is standard Fluxnet protocol, the annual totals for *ET* and NEP reported below have not been corrected for energy balance closure. As noted in previous annual reports (Grant et al. 2012, 2013, 2014, 2016) the energy balance closure continues to be ~0.75 for each of Station 1 and 4. Hence, the EC fluxes could be up to 25% underestimated.

D3 Results

D3.1 Climate Measurements

RWDI Air continued to manage the climate instrumentation and data collection of at all three EC stations. As reported in other sections, annual cumulative precipitation recorded at Fort St. John Airport (589 mm) was 144 mm greater than the 30-year climate normal (445 mm). Most of this increase was picked up outside of the growing season with monthly cumulative precipitation at Fort St. John Airport exceeding the 30-year climate normal for the months of January through May and from September to November. Growing season (May-Sept) precipitation at all three EC stations was similar to 2016 (Station 1: 235 mm) with Station 1 cumulative growing season precipitation measured to be 228 mm.

There was a cool start to 2017 and for all stations air temperatures (T_{air}) started rising in late March and peaked in late May. High air temperatures were maintained through September resulting 2017 having the warmest temperatures on record. The soil temperatures (T_{soil}) lagged this increase in air temperature by about 1 month in the early part of the growing season while snow melted.

The most notable difference in the environmental conditions among the EC stations was higher vapour pressure deficit (*D*) at Station 2 in late May into June followed by lower vapour pressure deficit towards the end of the growing season when compared to both Stations 1 and 4 (Fig. D-2). This is likely the result of high air temperatures experience in May through June and by comparison cooler air temperatures later in the growing season at Station 2, when compared to Stations 1 and 4 (Fig. D-2). That Station 2 is consistently cooler than other sites (in all years) is likely due to its lower elevation and proximity to cooler air over the river. Consistent with other years the wind speeds were noticeably lower at Station 4 (Fig. D-2).

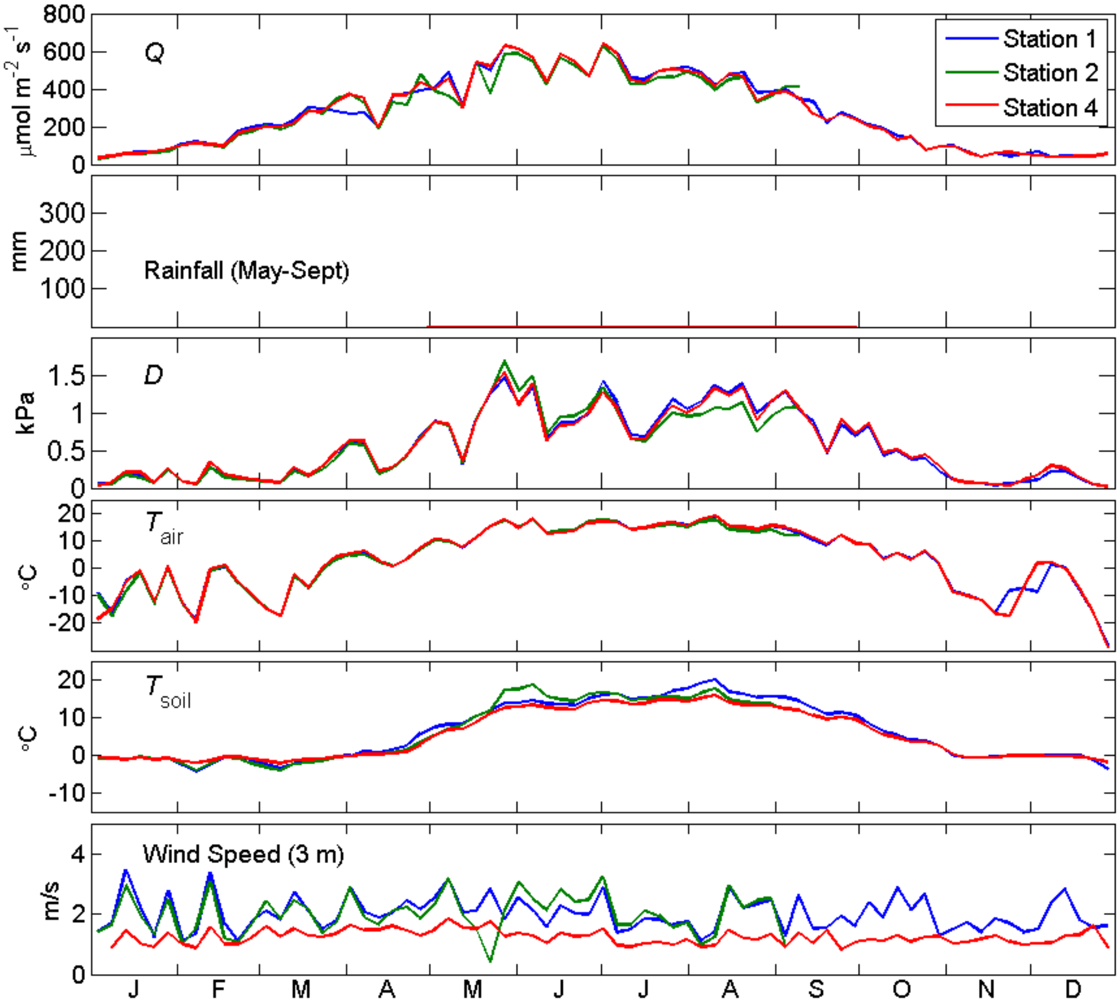

Figure D - 2. **Five-day-averaged climate variables for Stations 1, 2 and 4 for 2017: (a) daytime average downwelling photosynthetically active radiation (*Q*), (b) growing season cumulative rainfall, not provided (c) daytime average vapour pressure deficit (*D*), (d) 24-h average air temperature (T_{air}), (e) 24-h average soil temperature (T_{soil}), and (f) 24-h sonic anemometer cup wind speed (3-m height).**

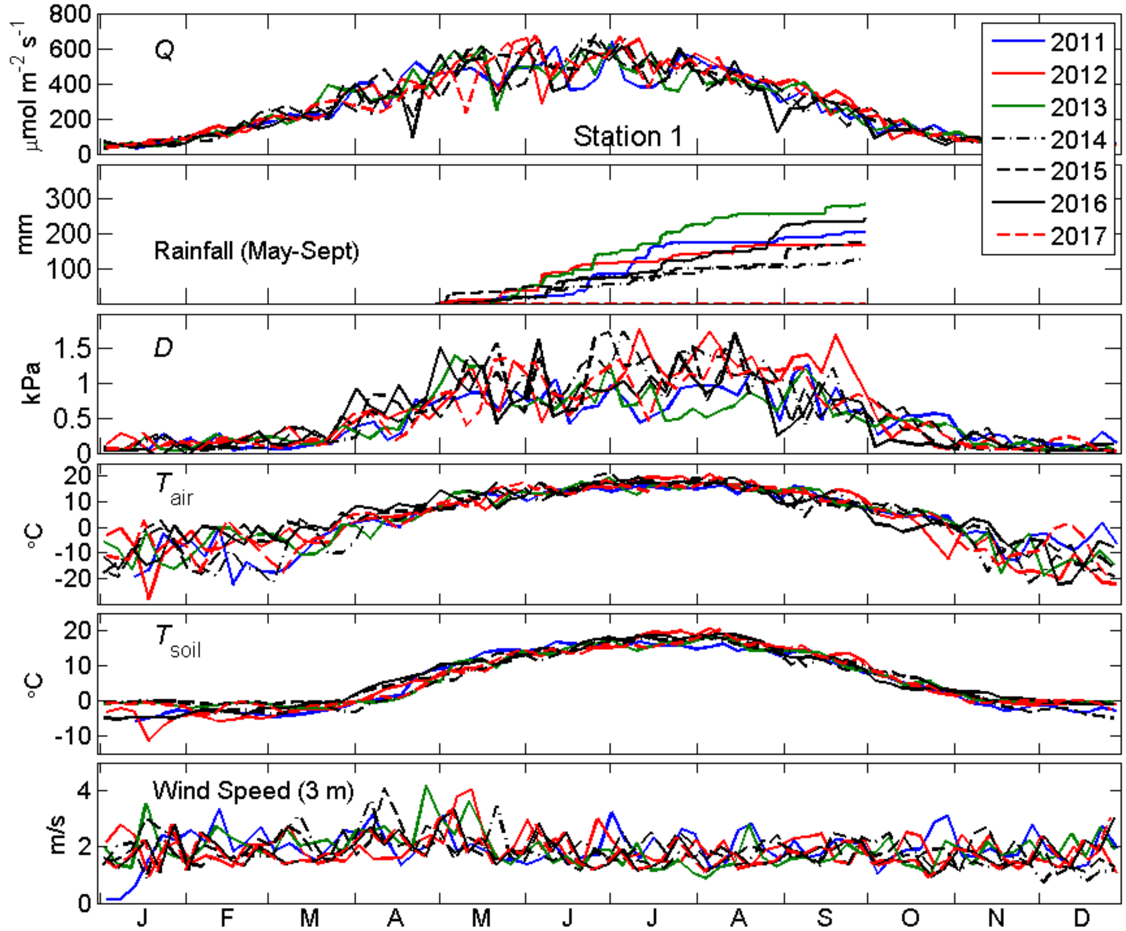

Figure D - 3. **Five-day-averaged climate variables for Stations 1 2011-2017: (a) daytime average downwelling photosynthetically active radiation (*Q*), (b) growing season cumulative rainfall, not included for 2017, (c) daytime average vapour pressure deficit (*D*), (d) 24-h average air temperature (T_{air}), (e) 24-h average soil temperature (T_{soil}), and (f) 24-h sonic anemometer cup wind speed (3-m height).**

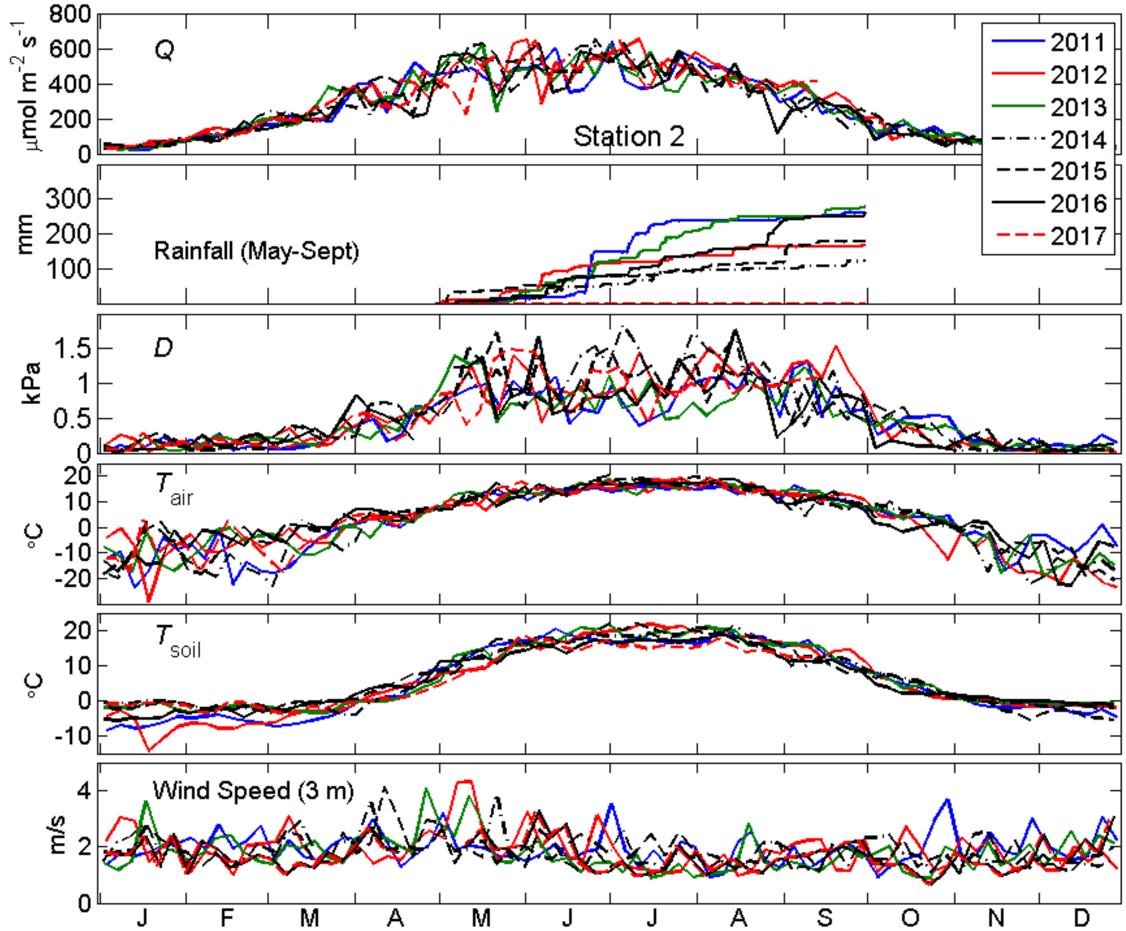

Figure D - 4. **Five-day-averaged climate variables for Stations 2 2011-2017: (a) daytime average downwelling photosynthetically active radiation (*Q*), (b) growing season cumulative rainfall, not included for 2017, (c) daytime average vapour pressure deficit (*D*), (d) 24-h average air temperature (T_{air}), (e) 24-h average soil temperature (T_{soil}), and (f) 24-h sonic anemometer cup wind speed (3-m height).**

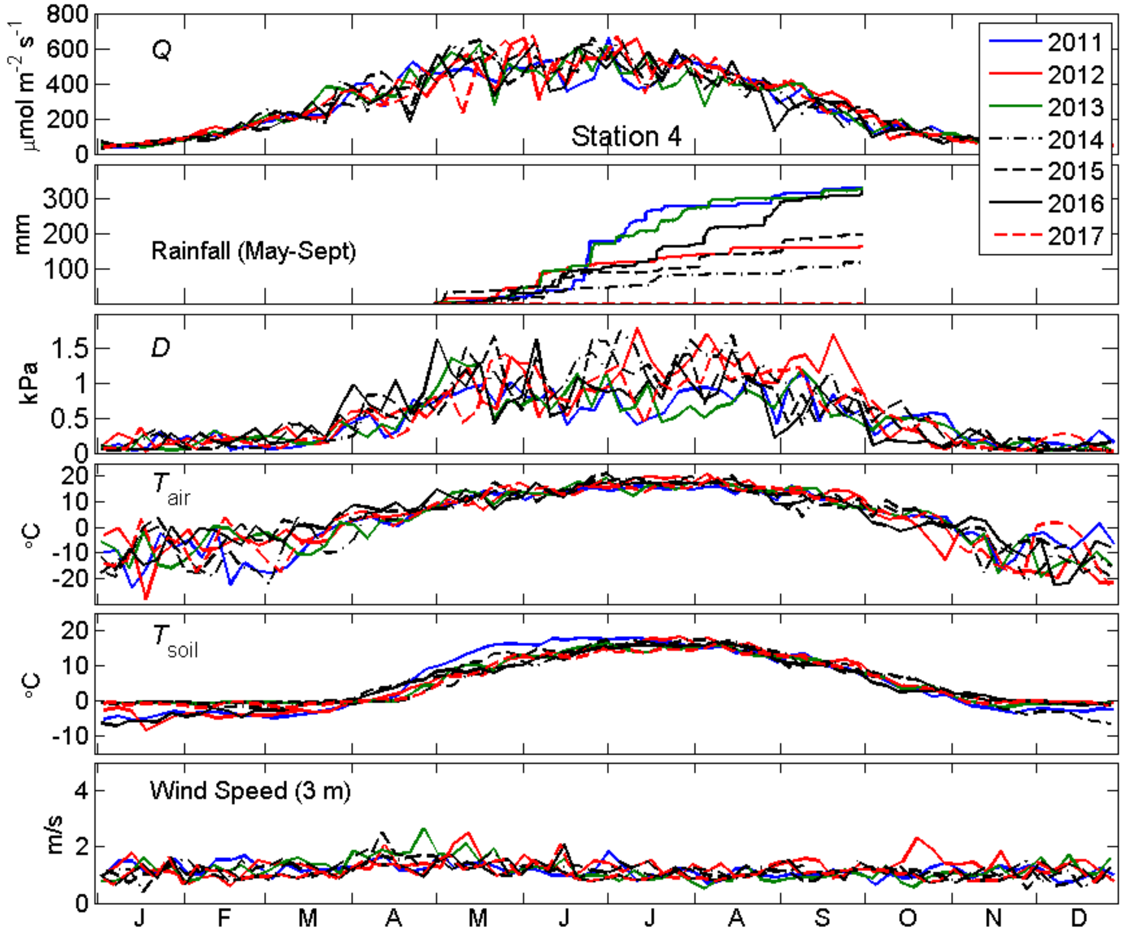

Figure D - 5. Five-day-averaged climate variables for Stations 4 2011-2017: (a) daytime average downwelling photosynthetically active radiation (*Q*), (b) growing season cumulative rainfall, not included for 2017, (c) daytime average vapour pressure deficit (*D*), (d) 24-h average air temperature (T_{air}), (e) 24-h average soil temperature (T_{soil}), and (f) 24-h sonic anemometer cup wind speed (3-m height).

When the conditions from 2011-2017 are plotted by station (Fig. D-3, D-4, D-5), the most notable differences are indicative of a late and warm start to the growing season with on average lower incoming photosynthetic photon flux (*Q*), *D*, and T_{air} during the earlier annual time period (Jan-May). This trend was reversed through and toward the end of the growing season (Jul-Oct) with on average high *Q*, T_{air} and T_{soil} though

not *D*. The warmer soil temperatures experiences early in the year in 2017 similar to 2013 and 2014 is indicative of a deeper snowpack insulating the soil below from very cold air temperature experienced in early March 2017.

This resulted in a prolonged snow coverage into March (See site image - Attachment A) and this was particularly pronounced at Station 4 where soil temperatures remain well insulated from changes in air temperature through to mid-April (Fig. D-5) one month later than Station 1 (Fig. D-3)

D3.2 Energy Balance Measurements

From the available data in 2017 the seasonal pattern of variation in each component of the energy balance was similar to 2015 (Fig. D-6, D-7, D-8), which experienced a moderately wet growing season and warm temperatures. The latent heat (λE) fluxes peaked at Station 1 in May after air temperature increased significantly in April after a cool, wet winter into spring time period. During this peak in latent fluxes the untilled field was dominated by forage grasses on one side and early season growth of rapeseed on the other (See site images - Attachment A). Station 4 latent fluxes can be seen to peak later in July with a similar magnitude to station 1 (Fig. D-6). This earlier peak in latent fluxes at Station 1 compared to Station 4 is consistent with other years. Similar to other years both net radiation (R_n) and latent heat flux follow a decreasing trend at all sites through July and into September, when incoming radiation is seasonally reduced and water likely becomes more limited towards the end of summer. The sensible heat (H) flux at Station 1 was characteristically low in the early part of the growing season while much of the energy was partitioned into the latent flux and soil heart flux (G) + storage (S_t). It then increased in August after the forage crop was harvested in July. The sensible heat flux at Station 4 was highest at the beginning of the growing season when last seasons stubble was still present and at the end of the growing season when there is evidence of vegetation die back from the onset of drought conditions (See site images - Attachment A). The early year energy balance components at Station 2 indicates similar trends to precious years with relation to those measured at the other stations.

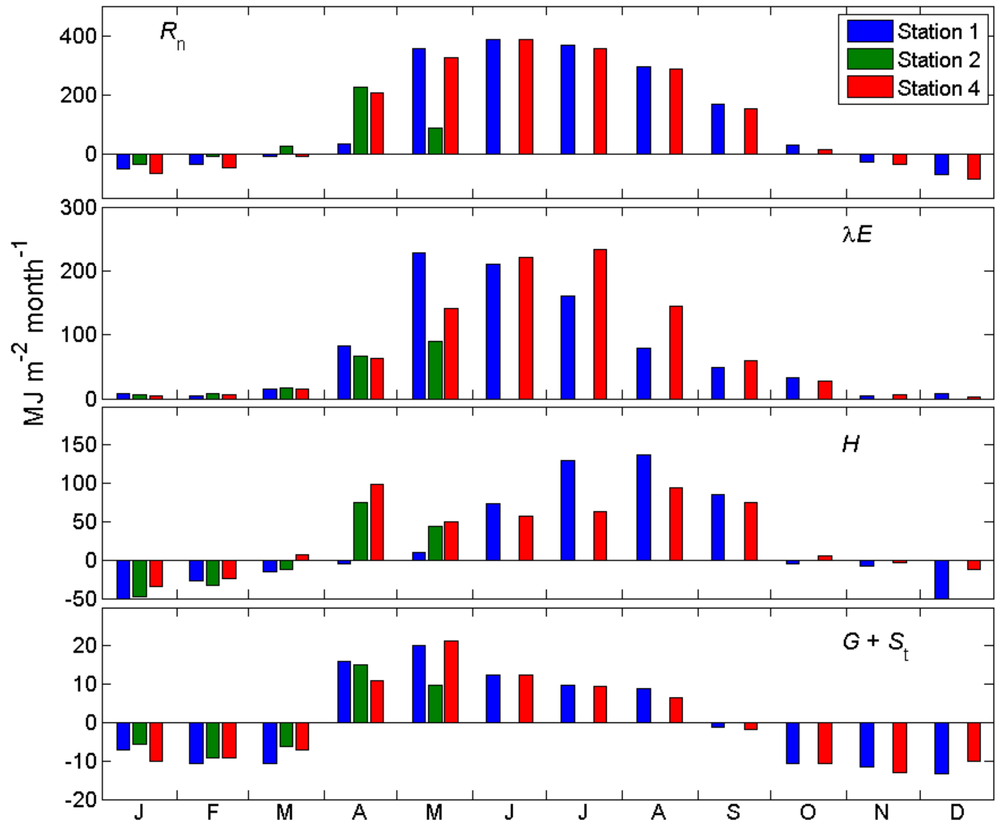

Figure D - 6. 2017 Annual energy balance for Stations 1, 2 and 4, with monthly total energy flux by term (a) R_n, (b) λE, (c) H, and (d) $G + S_t$. Note: Station 2 data not available during spring and fall due to extensive data loss at those times.

An examination of the seasonal patterns of variation in the energy balance components at all of the stations for 2011-2017 (Fig. D-7, D-8) reveals similar patterns at Stations 1 and 4 in the two wetter years (2011, 2013), the three drier years (2012, 2014, 2015) and moderately wet 2016. Specifically, in the two wetter years the latent heat flux is dominant and remains higher later into the growing season while in dry years the sensible heat flux dominates. At Station 4, the interannual pattern was strengthened by the fact that the agricultural land management practices were consistent between pairs of wet and dry years: animals were grazed at Station 4 in two of the dry years (2012, 2014) whereas in the two wet years (2011, 2013) and in 2015, 2016 and 2017 the pasture was left undisturbed.

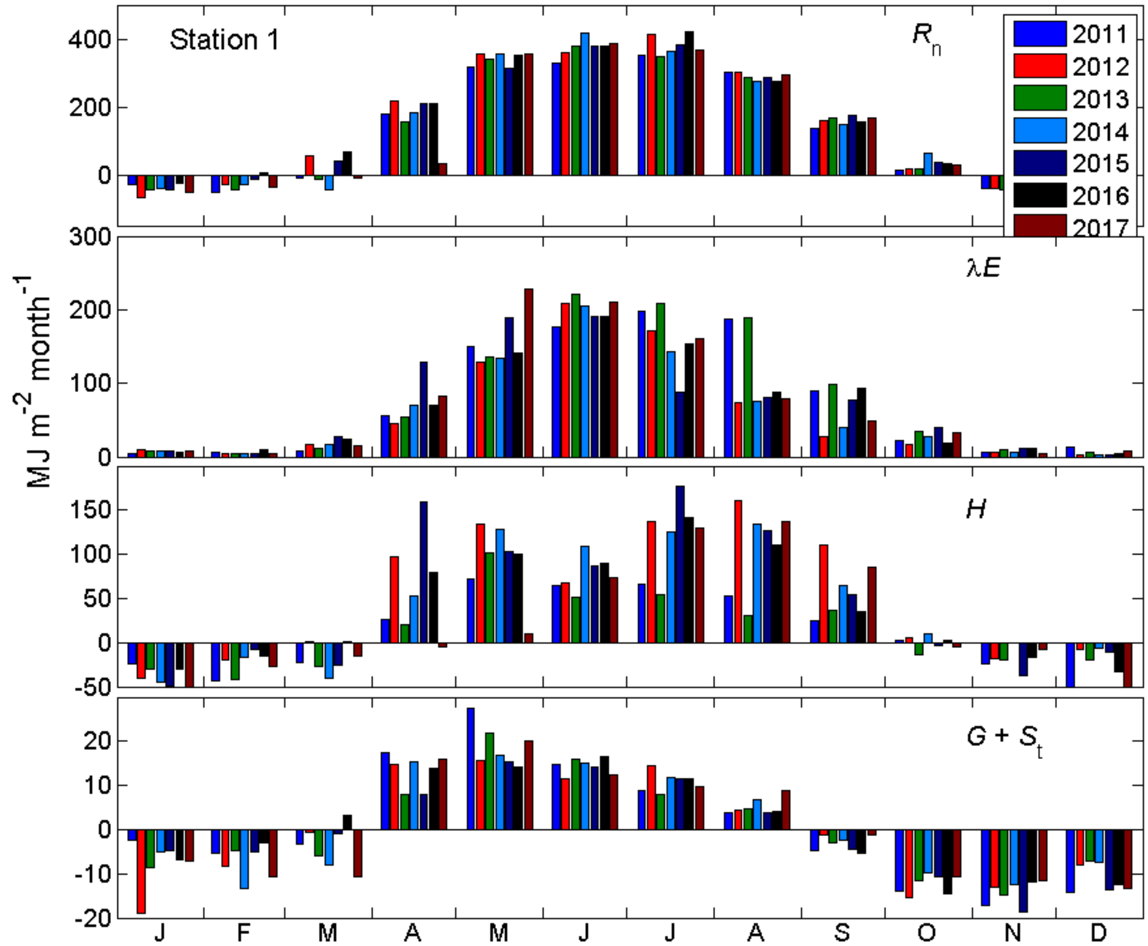

Figure D - 7. Annual energy balance for Stations 1 and 4, 2011-2017 with monthly total energy flux by term (a) R_n, (b) λE, (c) H, and (d) $G + S_t$.

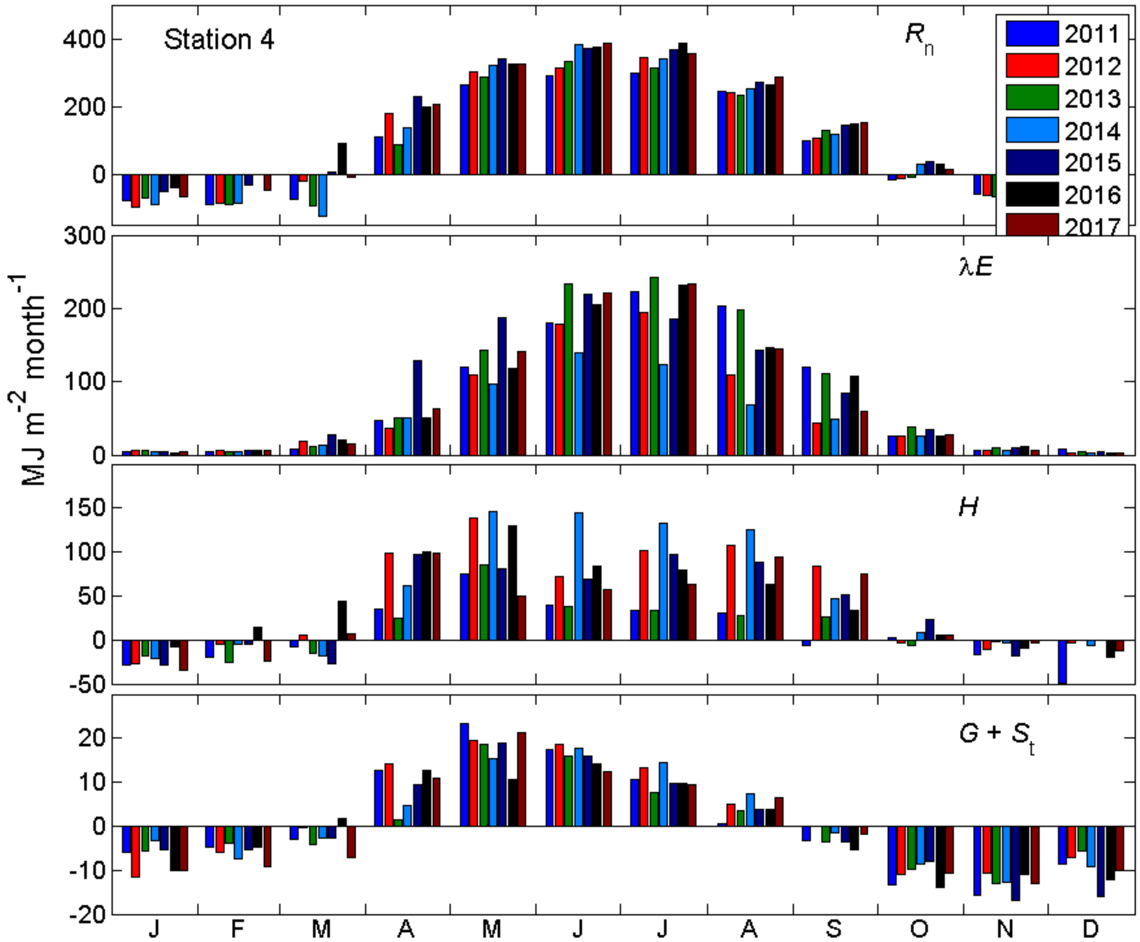

Figure D - 8. **Annual energy balance for Stations 1 and 4, 2011-2017 with monthly total energy flux by term (a) R_n, (b) λE, (c) H, and (d) $G + S_t$.**

D3.3 Evapotranspiration

Annual ET was similar for stations 1 (352) and 4 (371 mm) in spite of noticeable difference in the season dynamics of that signal (Fig. D-9). These annual values are lower than wet years (2011, 2013) and higher than dry years (2012, 2014) and similar to moderately wet years (2015, 2016). The monthly ET measured at Station 1 during May 2017 was the highest measured at that site (Fig. D-10). These were smaller only than ET measured at Station 2 during July of 2012. This was likely the result of a warm April into May with ample soil water availability and, compared to Station 4, higher wind speeds. The pattern emerging from available ET measurements at Station 2 is characteristic of other years in that it is generally similar throughout winter, increasing less so than Stations 1 and 4 in May (Fig D-9). During 2017 the monthly values at Station 4 are very similar to those experienced in 2016 and amazingly the measured annual total is equal for those two years. This is encouraging as agricultural management practices were the same between the two years and both years had similar climatic conditions. Station 2 in general has higher ET values than the other stations and this is dependent on agricultural practices.

The healthy cover of forage crop at that station during the warm growing season of 2017 (See site images - Attachment A) and high ET values measured at the other Stations would suggest that the annual total would potentially have been larger than other years (>438 mm)

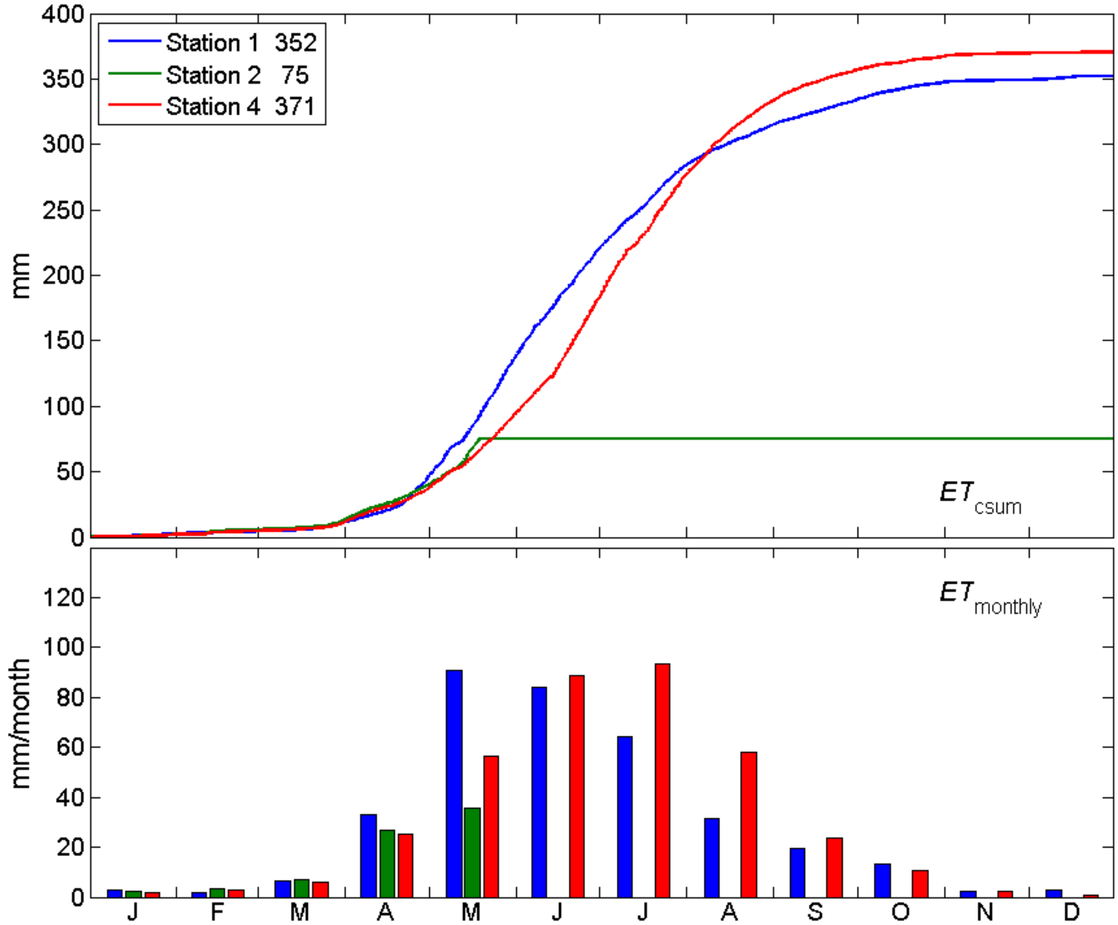

Figure D - 9. Cumulative (ET_{csum}) and monthly ($ET_{monthly}$) evapotranspiration at Station 1 and Station 4 for 2017. Annual ET totals in mm are shown in the legend.

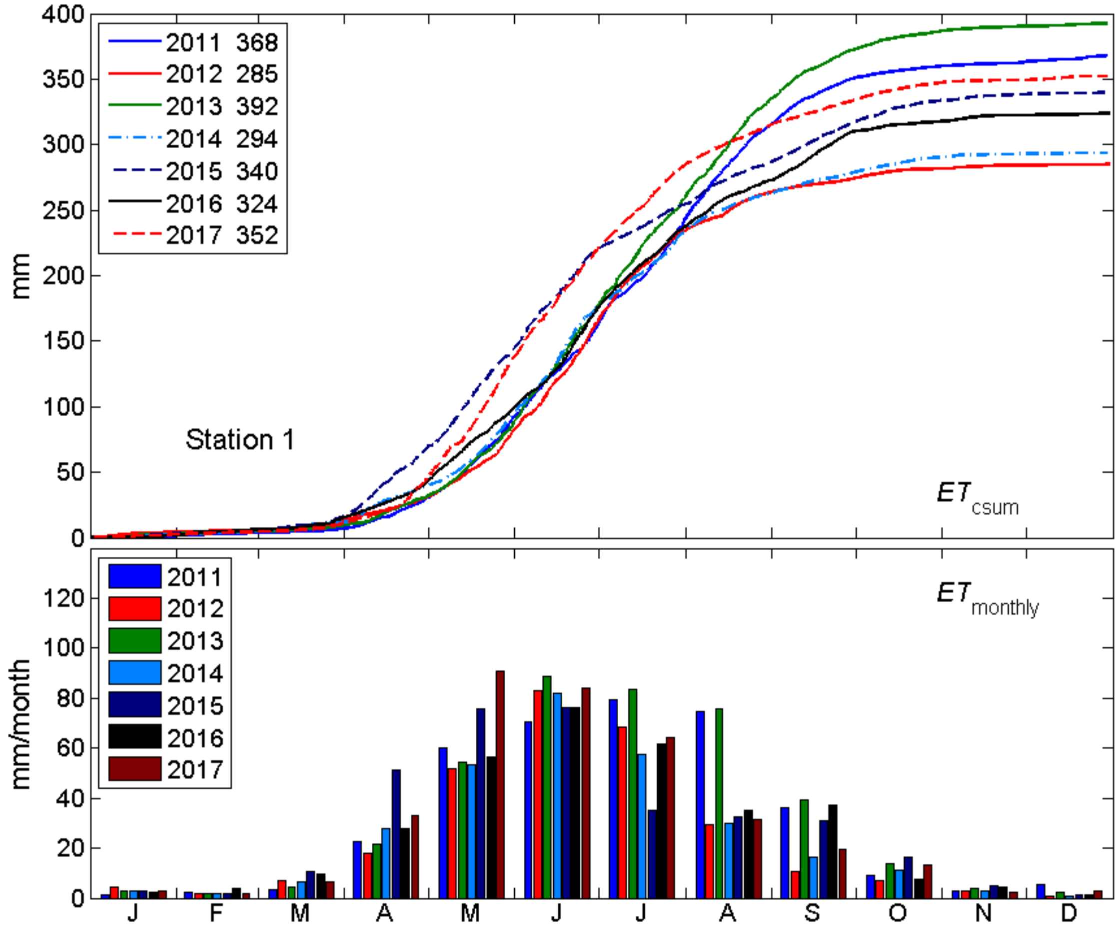

Figure D - 10. Annual cumulative ET (upper panels) monthly ET (lower panels) for Station 1, 2011-2017.

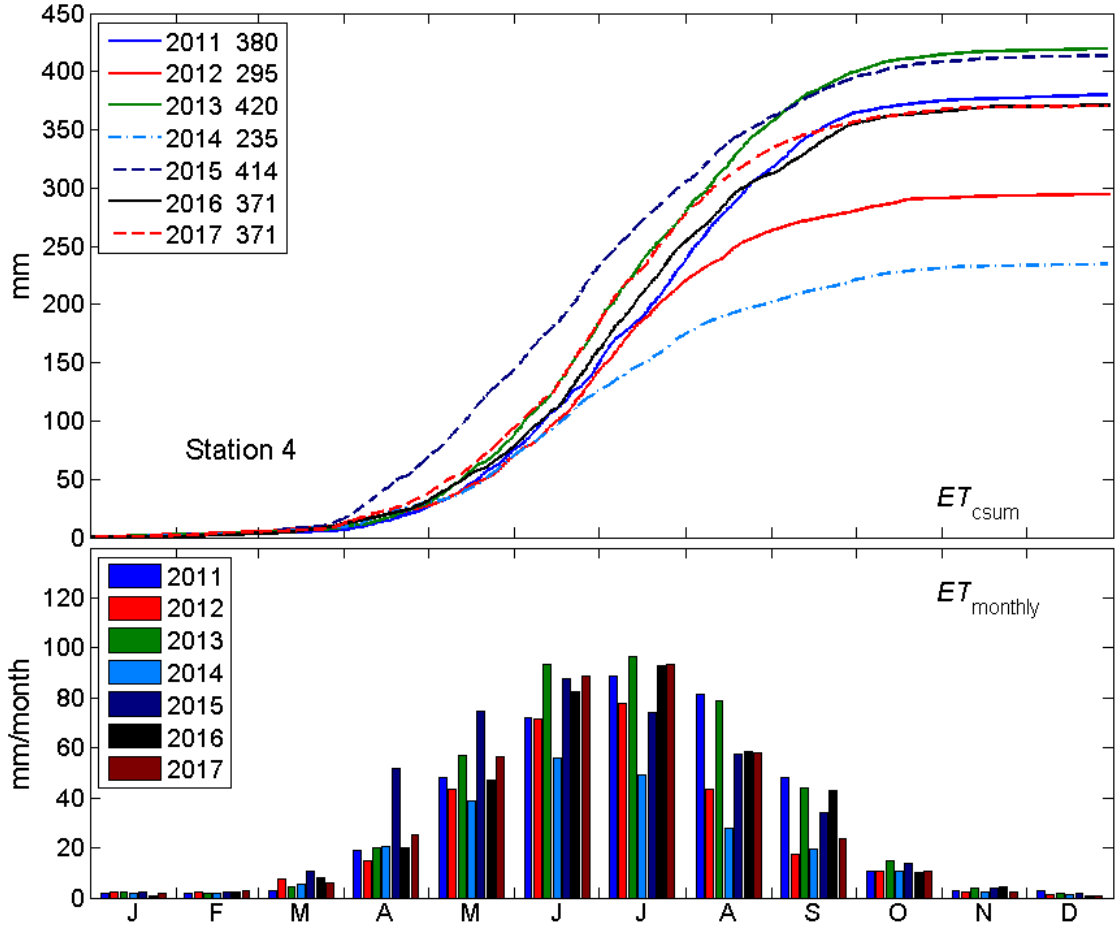

Figure D - 11. Annual cumulative ET (upper panels) monthly ET (lower panels) for Stations 4, 2011-2017.

D3.4 C balance

All EC stations were C-sinks for 2017 with Station 1 showing the influence of agricultural intervention at different stages of the growing season, as well as climate. Station 1 was a strong C-sink with annual net ecosystem production (NEP) of 329 g C m^{-2} (Fig. D-12). The C-sink potential strongest in April, May and June prior to site harvest in late July when gains in photosynthesis (GEP) can be seen to drop off at that station. Station 4 was a very weak C-sink with NEP of only 5 g C m^{-2} which appears to be largely due to much higher respiration (R) and a later peak in GEP. Of relevance is that these patterns in GEP closely follow the same pattern in ET which would increase with increasing photosynthetic activity and resulting transpiration. It is possible that the higher monthly R at Station 4 is the result of decomposing plant residuals from the previous year when the pasture was not harvested as it was at Station 1.

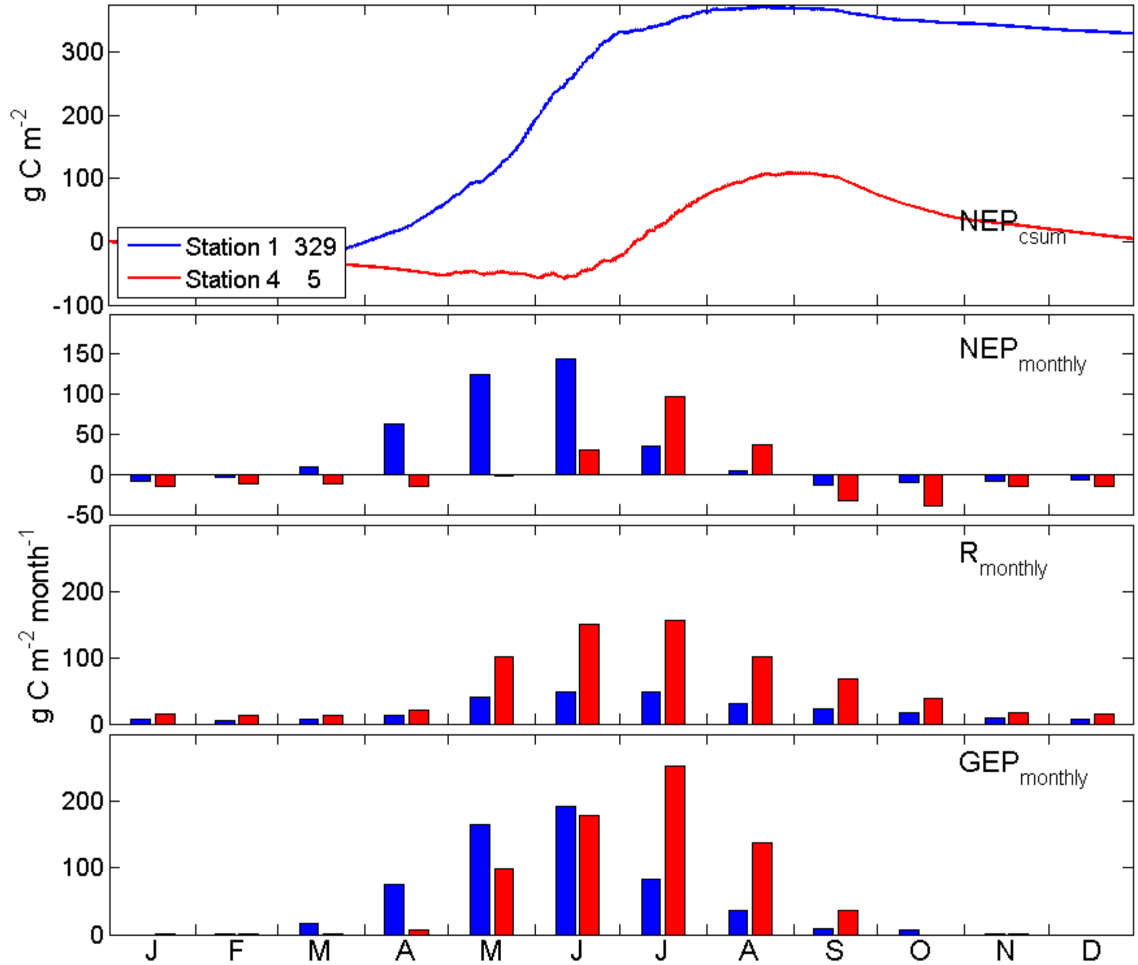

Figure D - 12. C balance components for 2017 at Station 1 and Station 4. (a) Annual cumulative NEP, (b) monthly NEP, (c) monthly R and (d) monthly GEP.

When the components of the C balance are examined by station for 2011-2017 (Fig. D-9), clear patterns of inter- and intra-annual variability in GEP and R emerge between normal-to-wet years and dry years. Stations 1 and 4 are C sinks (NEP > 0) during normal-to-wet years and become near C-neutral (Station 1) or C-sources (Station 4) during dry years. In each case, the pattern is reinforced by similar patterns of agricultural practice between wet and dry years (e.g. cattle grazing or undisturbed pasture, schedules of crop planting and harvesting, respectively).

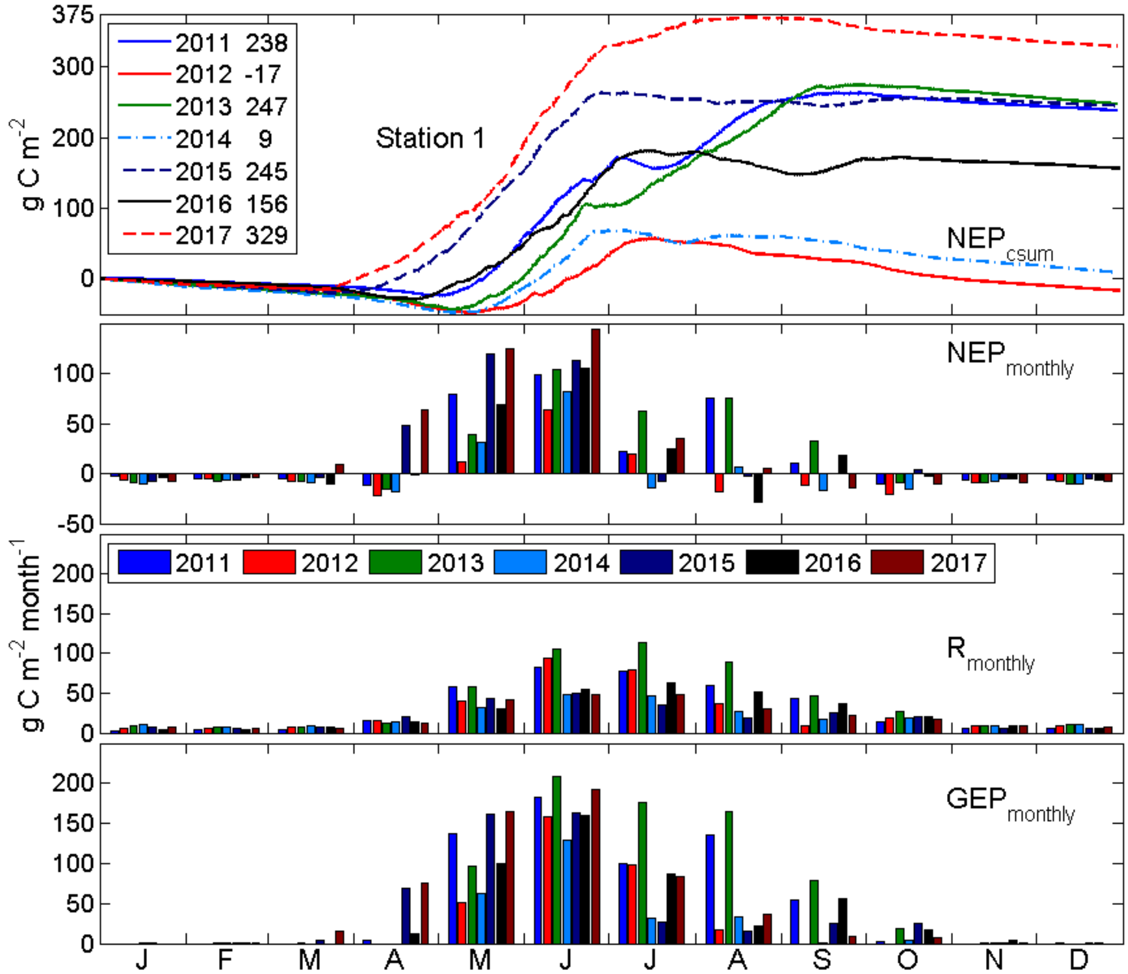

Figure D - 13. C balance components for 2011-2017 for Stations 1. (a) Annual cumulative NEP, (b) monthly NEP, (c) monthly R and (d) monthly GEP.

In previous reports, it has been pointed out that Station 2 is unique amongst the EC stations because the C balance between wet and dry years is so robust—the station has been an annual C sink in wet and dry years (Grant et al. 2012, 2013, 2014, 2015). The limited availability of data for Station 2 during 2016 and 2017 resulted in an inability to adequately model C balances. The fact that it was ungrazed pasture and was a sink for C during all other wet years would suggest that it would have been a sink of less than 220 and more than 15 g C m^{-2} for 2017. For other stations caution should be excercised when interpreting the C-balance traces for the 2017 year due to the aforementioned uncertainty produced from gap-filling the IRGA calibration period, which affects the partitioning of NEP (which is essentially measured by the IRGA) and the C components GEP and R which are derived from empirical models fit to filtered subsets of the NEP data (see Barr et al. 2004 for details).

As explained previously, this approach works best in a natural ecosystem setting and would need to be informed with much more information regarding the precise timing and nature of agricultural practices (ploughing, sowing, irrigation, etc.) during the period the IRGA was not making measurements to yield the most accurate results. A relatively low-expense addition to the EC sites that would aid in this task is the use of a digital camera mounted to each EC tower and programmed to record an image every half-hour or less.

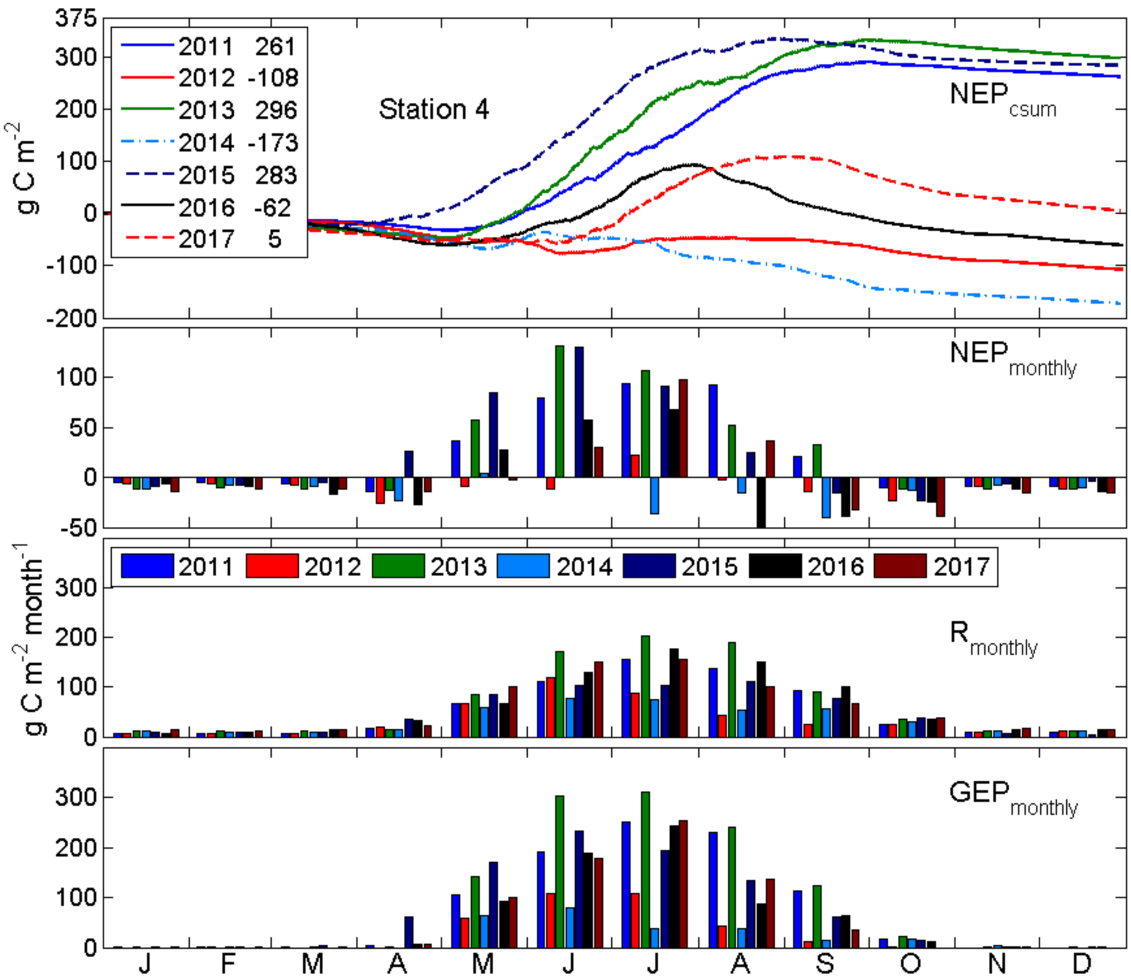

Figure D - 14. C balance components for 2011-2017 for Stations 4. (a) Annual cumulative NEP, (b) monthly NEP, (c) monthly R and (d) monthly GEP.

Much detail can be gleaned from such images regarding the precise timing and nature of agricultural management practices, which can then be subsequently incorporated in the empirical models of GEP and R just described. Changes to the timing of IRGA calibration and monthly site pictures have been made available to help in this process moving forward.

D3.5 EC flux measurement summary 2011-2017

Figure D-15 summarizes the EC results from 2011-2017; the data used in the figure is presented in the - Attachment A (Table A1) in tabular form. The top panel indicates the agricultural land management status for each station for each year, and the panels below summarize respectively: growing season rainfall, mean growing season air temperature, annual ET, mean growing season Bowen ratio ($\beta = H/\lambda E$), and finally annual NEP, R and GEP.

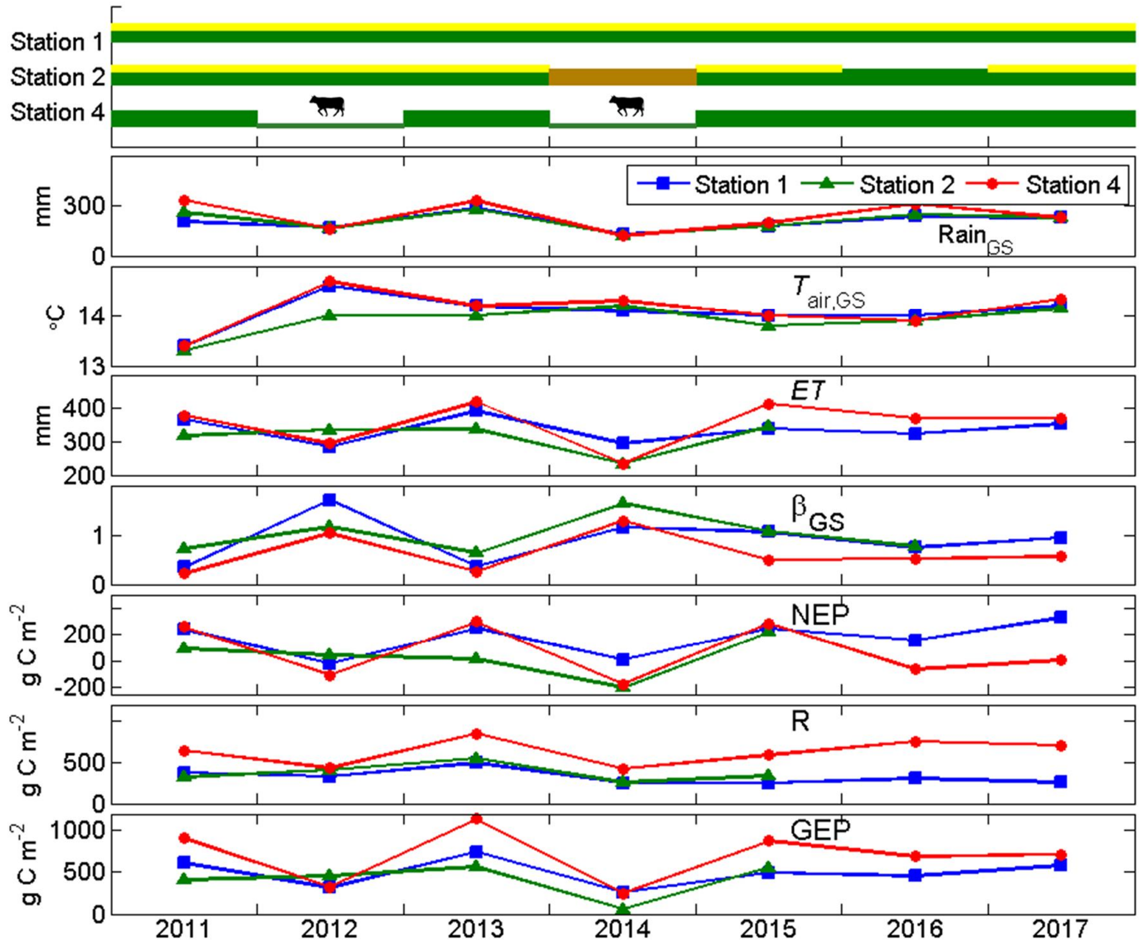

Figure D - 15. Summary of eddy covariance results 2011-2017. The top panel indicates the agricultural land management status for each station for each year (green and yellow bars=cultivated with crops, green bars=ungrazed pasture; thin green bar and cattle icon=grazed pasture; brown bar=bare soil) and the panels below summarize, respectively: growing season rainfall, mean growing season air temperature, annual *ET*, mean growing season Bowen ratio ($\beta = H/\lambda E$), and annual NEP, R and GEP.

The pattern of interannual differences in these variables between wet and dry years at Stations 1 and 4 are very similar, with sensible heat transfer dominating dry years ($\beta \geq 1$) and latent heat transfer dominating normal to wet years ($\beta < 1$). With no agricultural management changes between 2016 and 2017, and similar climate conditions it is reassuring to see ET and NEP values remain consistent.

D4 Summary

Growing season (May-Sep) conditions at all three EC stations were similar to moderately wet years 2015 and 2016. Growing season rainfall at Station 1 was 235 mm in 2016 and 228 mm in 2017. There was a deep snow pack through winter and a cool start to the growing season, however, warm temperatures dominated throughout the growing season resulting in 2017 being the warmest year on record.

The 2017 annual ET at the two remaining EC stations was high and comparable to 2015 and 2016. At Station 1 (352 mm) ET was measured at just 12 mm more than in 2015 (340 mm) while at station 4 (371 mm) the 2017 annual total equalled that measured in 2016. This is encouraging as agricultural management practices at both locations were the same between the three years and climatic conditions were similar. Winter soil temperatures were warm, due to insulation from the snowpack. A consequence of this is that at all three of the EC stations during spring thaw the soil heated up quickly, resulting in a record high monthly *ET* value at Station 1 in May.

All EC stations were C-sinks for 2017 with Station 1 showing the influence of agricultural intervention at different stages of the growing season, as well as climate. Station 1 was a strong C-sink with annual net ecosystem production (NEP) of 329 g C m^{-2}. The C-sink potential strongest in April, May and June prior to site harvest in late July when gains in photosynthesis (GEP) can be seen to drop off at that station. Station 4 was a very weak C-sink with NEP of only 5 g C m^{-2} which appears to be largely due to much higher respiration and a later peak in GEP. Of relevance is that these patterns in GEP closely follow the same pattern in ET which would increase with increasing photosynthetic activity and resulting transpiration. It is possible that the higher monthly R at Station 4 is the result of decomposing plant residuals from the previous year when the pasture was not harvested as it was at Station 1.

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Grant, N.J., Black, A., Nesic, Z. 2016. Eddy-Covariance Measurements of Energy, Water and Carbon Fluxes at Upper Attachie (Station 1), Lower Attachie (Station 2) and Bear Flat (Station 4): 2015 Summary. Report submitted to RWDI Air, Inc.

Hawthorne, I., Grant, N.J., Black, A., Nesic, Z. 2017. Eddy-Covariance Measurements of Energy, Water and Carbon Fluxes at Upper Attachie (Station 1), Lower Attachie (Station 2) and Bear Flat (Station 4): 2016 Summary. Report submitted to RWDI Air, Inc.

Krishnan, P., Black, T.A., Grant, N.J., Barr, A.G., Hogg, E.H., Jassal, R.S., Morgenstern, K., 2006. Impact of changing soil moisture distribution on net ecosystem productivity of a boreal aspen forest during and following drought. Agricultural and Forest Meteorology 139, 208–223.

Morgenstern, K., Black, T.A., Humphreys, E.R., Griffis, T.J., Drewitt, G.B., Cai, T., Nesic, Z., Spittlehouse, D.L., Livingston, N.J., 2004. Sensitivity and uncertainty of the carbon balance of a pacific northwest Douglas-fir forest during an el Niño/La Niña cycle. Agricultural and Forest Meteorology 123, 201–219.

Wilson K, et al., 2002. Energy balance closure at FLUXNET sites. Agricultural and Forest Meteorology. 113:223-243.

ATTACHMENT. A

1. Climate and EC data at Stations 1, 2, 4 for 2011-2017.

	Station 1				Station 2				Station 4			
	2011	2012	2013	2014	2011	2012	2013	2014	2011	2012	2013	2014
[b]Rainfall (mm)	204	168	287	125	261	165	279	121	332	162	331	119
[b]T_{air} (°C)	13.4	14.6	14.2	14.1	13.3	14.0	14.0	14.2	13.4	14.7	14.2	14.3
[c]ET (mm)	367	284	392	294	317	336	337	234	379	295	420	235
[b]β	0.347	1.70	0.356	1.15	0.718	1.16	0.640	1.64	0.218	1.03	0.253	1.28
[c]NEP (g C m^{-2})	238	-17	247	9	91	46	15	-198	261	-108	296	-173
[c]R (g C m^{-2})	376	330	494	250	321	408	549	253	645	430	846	419
[c]GEP (g C m^{-2})	614	313	741	259	412	454	564	55	906	322	1142	246

[b] denotes growing season total (Rainfall) or mean (T_{air}, β)

[c] denotes annual totals

	Station 1			Station 2			Station 4		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
[b]Rainfall (mm)	176	235	228	178	249	228	195	309	228
[b]T_{air} (°C)	14.0	14.0	14.28	13.8	13.9	14.15	14.0	13.9	14.34
[c]ET (mm)	340	324	352	345	NA	NA	414	371	371
[b]β	1.06	0.75	0.94	1.07	0.77	NA	0.5	0.52	0.56
[c]NEP (g C m^{-2})	245	156	329	220	NA	NA	283	-62	5
[c]R (g C m^{-2})	246	302	254	338	NA	NA	591	752	707
[c]GEP (g C m^{-2})	491	457	584	558	NA	NA	874	691	713

[b] denotes growing season total (Rainfall) or mean (T_{air}, β)

[c] denotes annual totals

2. Site photos

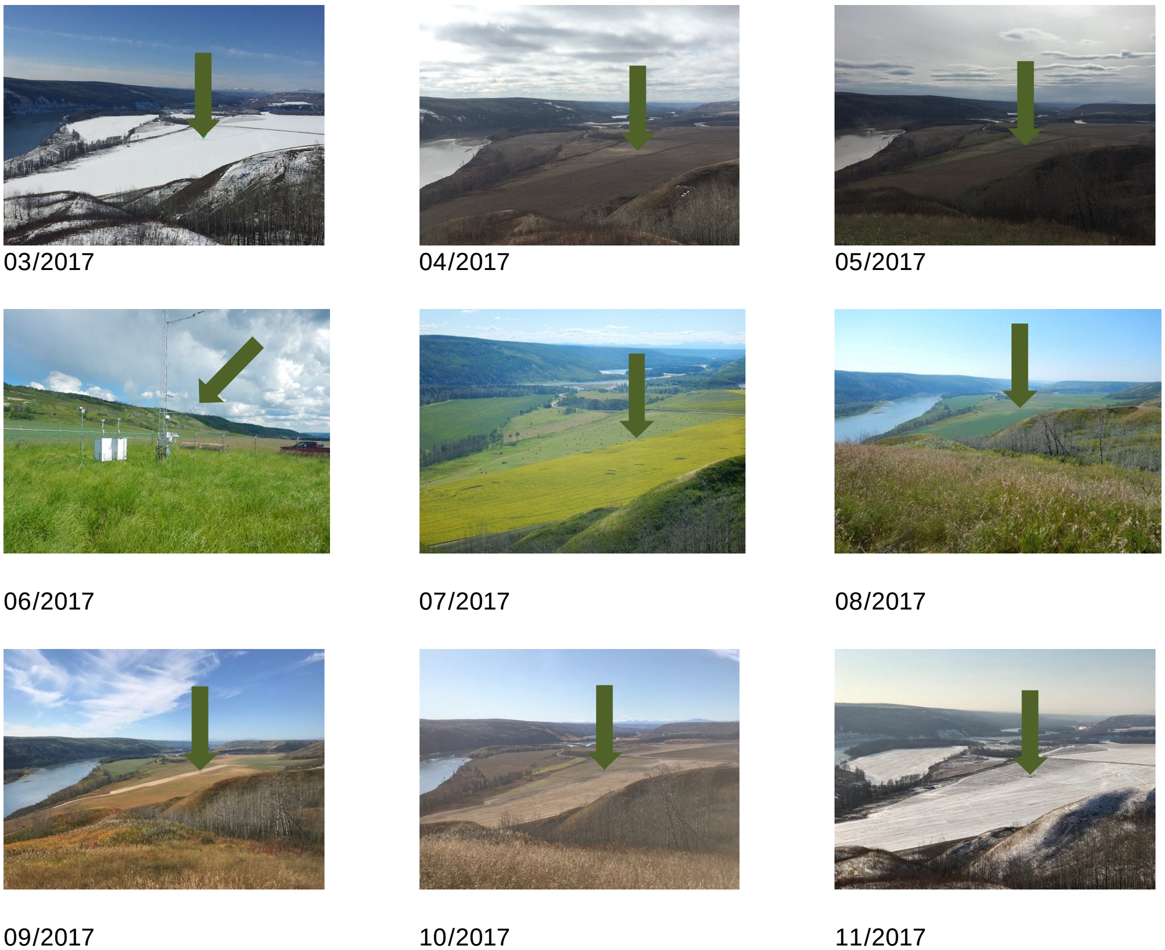
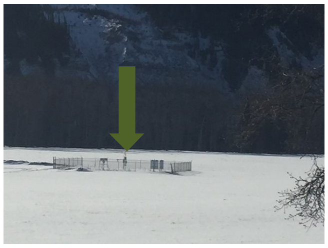
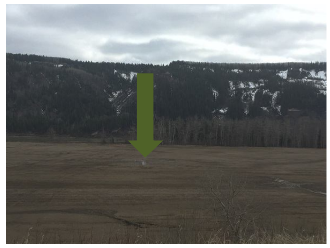


Figure D - 16. Station 1 site photos from March to November, 2017. The green arrow indicates the location of the EC equipment.

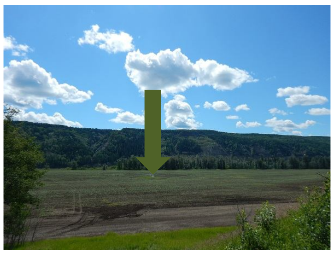


03/2017

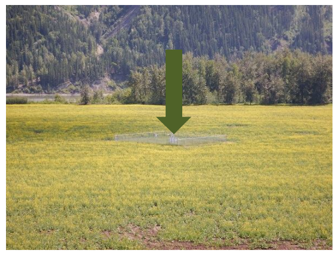


04/2017

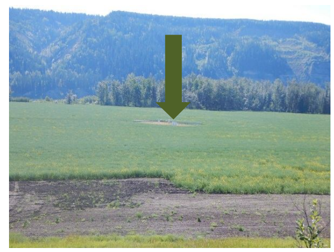
05/2017



06/2017



07/2017



08/2017

Figure D - 17. Station 2 site photos from May to December, 2017. The green arrow indicates the location of the EC equipment.

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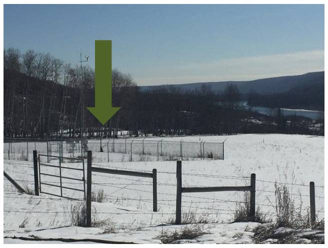
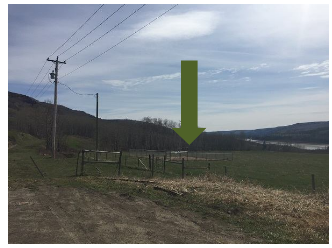
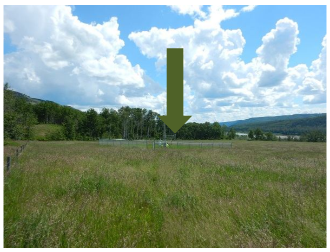


03/2017

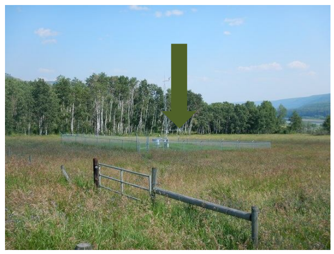
04/2017



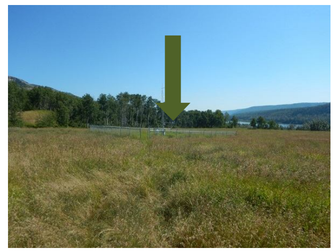
05/2017



06/2017



07/2017



08/2017

09/2017

10/2017

11/2017

Figure D - 18. Station 4 site photos from January-November, 2017. The green arrow indicates the location of the EC equipment.

3. Hardware components of the climate and eddy covariance systems at Station 4.

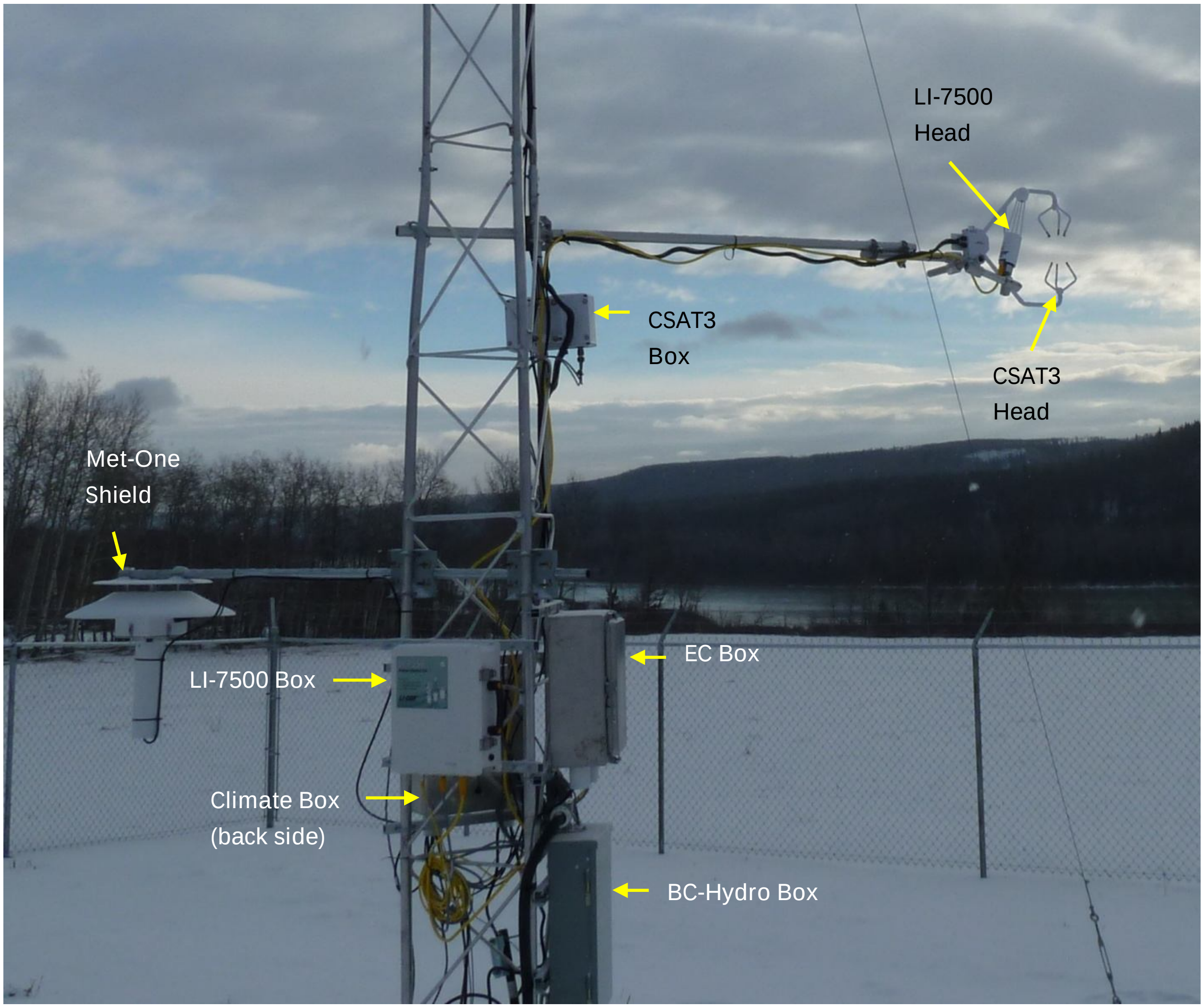


Figure D - 19. Hardware components of the climate and eddy covariance systems at Station 4.

4. List of Symbols and acronyms

Symbol / Acronym	Units	Definition
C		carbon
CO_2		carbon dioxide
DVD		digital video disc storage media (4.5 GB)
EC		eddy covariance
FCRN		Fluxnet Canada Research Network
IRGA		infrared gas analyzer
NEP	μmol m^{-2} s^{-1} or g C m^{-2} $time^{-1}$	net ecosystem production
NEP_{csum}	g C m^{-2}	cumulative net ecosystem production
$NEP_{monthly}$	g C m^{-2} $month^{-1}$	monthly total NEP
PAR	μmol m^{-2} s^{-1}	photosynthetically active radiation flux
D	kPa	vapour pressure deficit
ET	mm $time^{-1}$	evapotranspiration
ET_{csum}	mm	cumulative evapotranspiration
G	W m^{-2}	soil surface heat flux
GEP	μmol m^{-2} s^{-1} or g C m^{-2} $time^{-1}$	gross ecosystem photosynthesis
$GEP_{monthly}$	g C m^{-2} $month^{-1}$	Monthly total GEP
H	W m^{-2}	sensible heat flux
Q	μmol m^{-2} s^{-1}	downwelling photosynthetically active radiation (calculated as = 2 R_s in W m^{-2})
QA/QC		quality control/quality assurance
R_n	W m^{-2}	net radiation flux
R_a	W m^{-2}	available energy flux (= R_n –G – S_t)
R	μmol m^{-2} s^{-1} or g C m^{-2} $time^{-1}$	ecosystem respiration
$R_{monthly}$	g C m^{-2} $month^{-1}$	Monthly total R
R_s	W m^{-2}	downwelling shortwave radiation
S_t	W m^{-2} (per unit ground area)	sum of the rate of change in energy storage in the air between the EC sensors and the ground surface,
T_{air}	°C	air temperature
T_{soil}	°C	soil temperature at the 4-cm depth
u_*	m s^{-1}	friction velocity
λE	W m^{-2}	latent heat flux
β		Bowen Ratio (= $H/\lambda E$)

APPENDIX E

AIR QUALITY ALERT RESPONSE

APPENDIX E: AIR QUALITY ALERT RESPONSE

A summary of alerts in 2017 can be found in Table E-1, followed by a preliminary examination of each elevated PM event in sections E.1 through E.41. Note that not all alerts were representative of an elevated PM event, as noted in Table E-1 (i.e., some alerts were a result of instrument error).

Event number	Date / Time Alert issued	Alert text	IN / OUT	90% / 100%	Contaminant	Station Name	Instrumental Error (Y/N)	Reason for Instrumental Error	Did a measured Exceedance / excursion occur?	Dominant wind direction during event	Site Response	Comment regarding current conditions / observations
35	06-01-17 1:10	IN Alert 'PM10 > 90% Alert': PM10 (48.5 µg/m3) at Stn 7B: North Camp for 2017-01-06 01:00 PST. Description: Stn 7B: North Camp : 'PM10 > 90% Alert' 2017-01-06 01:00 PST ! IN Alert PM10 (48.5 µg/m3) conditions have triggered the 'PM10 > 90% Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	in	90%	PM10	Station 7B	N	N/A	Y	NW, E	Main Civil Works (MCW) contractor conducted visual inspection.	
	06-01-17 2:10	IN Alert 'PM10 Alert': PM10 (51.2 µg/m3) at Stn 7B: North Camp for 2017-01-06 02:00 PST. Description: Stn 7B: North Camp : 'PM10 Alert' 2017-01-06 02:00 PST ! IN Alert PM10 (51.2 µg/m3) conditions have triggered the 'PM10 Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than the BC 24-hour air quality objective of 50 ug/m3.	In	100%								
	08-01-17 3:13	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM10 Alert' 2017-01-08 03:00 PST OUT Alert PM10 conditions for the 'PM10 Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than the BC 24-hour air quality objective of 50 ug/m3.	out	100%								
	08-01-17 4:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM10 > 90% Alert' 2017-01-08 04:00 PST OUT Alert PM10 conditions for the 'PM10 > 90% Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	out	90%								
36	14-01-17 5:10	IN Alert 'PM10 > 90% Alert': PM10 (45.5 µg/m3) at Stn 7B: North Camp for 2017-01-14 05:00 PST. Description: Stn 7B: North Camp : 'PM10 > 90% Alert' 2017-01-14 05:00 PST ! IN Alert PM10 (45.5 µg/m3) conditions have triggered the 'PM10 > 90% Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	In	90%	PM10	Station 7B	N	N/A	Y	WSW	MCW contractor conducted visual inspection. During this event, BC Hydro issued a letter to the MCW contractor as a reminder of air quality mitigation obligations.	
	14-01-17 7:10	IN Alert 'PM10 Alert': PM10 (52.4 µg/m3) at Stn 7B: North Camp for 2017-01-14 07:00 PST. Description: Stn 7B: North Camp : 'PM10 Alert' 2017-01-14 07:00 PST ! IN Alert PM10 (52.4 µg/m3) conditions have triggered the 'PM10 Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than the BC 24-hour air quality objective of 50 ug/m3.	In	100%								
	17-01-17 13:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM10 Alert' 2017-01-17 13:00 PST OUT Alert PM10 conditions for the 'PM10 Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than the BC 24-hour air quality objective of 50 ug/m3.	out	100%								
	17-01-17 13:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM10 > 90% Alert' 2017-01-17 13:00 PST OUT Alert PM10 conditions for the 'PM10 > 90% Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	out	90%								

Event number	Date / Time Alert issued	Alert text	IN / OUT	90% / 100%	Contaminant	Station Name	Instrumental Error (Y/N)	Reason for Instrumental Error	Did a measured Exceedance / excursion occur?	Dominant wind direction during event	Site Response	Comment regarding current conditions / observations
37	01-02-17 23:10	OUT Alert 'NO2 Alert': NO2 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'NO2 Alert' Current Status: OUT 2017-02-01 09:00 PST ! IN Alert NO2 (224.8 µg/m3) conditions have triggered the 'NO2 Alert' alert. An OUT alert will be sent when conditions return to normal. 2017-02-01 10:00 PST OUT Alert NO2 conditions for the 'NO2 Alert' alert at Stn 7B: North Camp have returned to normal. The 1-hour average NO2 concentrations have decreased to values less than the BC 1-hour air quality objective of 188 ug/m3.	out	100%	NO2	Station 7B	Y	Update to station program caused nightly instrumental span checks to be falsely interpreted as high NO2 concentrations.	N/A	N/A	N/A	
	01-02-17 23:10	OUT Alert 'NO2 > 90% Alert': NO2 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'NO2 > 90% Alert' Current Status: OUT 2017-02-01 09:00 PST ! IN Alert NO2 (224.8 µg/m3) conditions have triggered the 'NO2 > 90% Alert' alert. An OUT alert will be sent when conditions return to normal. 2017-02-01 10:00 PST OUT Alert NO2 conditions for the 'NO2 > 90% Alert' alert at Stn 7B: North Camp have returned to normal. The 1-hour average SO2 concentrations have decreased to values less than 169.2 ug/m3 (90% of the BC 1-hour air quality objective of 188 ug/m3).	out	90%								
	02-02-17 2:10	IN Alert 'NO2 Alert': NO2 (367.4 µg/m3) at Stn 7B: North Camp for 2017-02-02 02:00 PST. Description: Stn 7B: North Camp : 'NO2 Alert' 2017-02-02 02:00 PST ! IN Alert NO2 (367.4 µg/m3) conditions have triggered the 'NO2 Alert' alert. An OUT alert will be sent when conditions return to normal. The 1-hour average NO2 concentrations have exceeded and remain greater than the BC 1-hour air quality objective of 188 ug/m3.	in	100%								
	02-02-17 2:10	IN Alert 'NO2 > 90% Alert': NO2 (367.4 µg/m3) at Stn 7B: North Camp for 2017-02-02 02:00 PST. Description: Stn 7B: North Camp : 'NO2 > 90% Alert' 2017-02-02 02:00 PST ! IN Alert NO2 (367.4 µg/m3) conditions have triggered the 'NO2 > 90% Alert' alert. An OUT alert will be sent when conditions return to normal. The 1-hour average NO2 concentrations have exceeded and remain greater than 169.2 ug/m3 (90% of the BC 1-hour air quality objective of 188 ug/m3).	in	90%								
	02-02-17 3:10	OUT Alert 'NO2 Alert': NO2 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'NO2 Alert' 2017-02-02 03:00 PST OUT Alert NO2 conditions for the 'NO2 Alert' alert at Stn 7B: North Camp have returned to normal. The 1-hour average NO2 concentrations have decreased to values less than the BC 1-hour air quality objective of 188 ug/m3.	out	100%								
	02-02-17 3:10	OUT Alert 'NO2 > 90% Alert': NO2 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'NO2 > 90% Alert' 2017-02-02 03:00 PST OUT Alert NO2 conditions for the 'NO2 > 90% Alert' alert at Stn 7B: North Camp have returned to normal. The 1-hour average SO2 concentrations have decreased to values less than 169.2 ug/m3 (90% of the BC 1-hour air quality objective of 188 ug/m3).	out	90%								
38	02-02-17 9:10	IN Alert 'PM10 > 90% Alert': PM10 (45.2 µg/m3) at Stn 8: Fort St. John Old Fort for 2017-02-02 09:00 PST. Description: Stn 8: Fort St. John Old Fort : 'PM10 > 90% Alert' 2017-02-02 09:00 PST ! IN Alert PM10 (45.2 µg/m3) conditions have triggered the 'PM10 > 90% Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	in	90%	PM10	Station 8	N	N/A	N	WSW (wind data from stn 9)	MCW contractor conducted visual inspection.	
	02-02-17 14:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 8: Fort St. John Old Fort are normal. Description: Stn 8: Fort St. John Old Fort : 'PM10 > 90% Alert' 2017-02-02 14:00 PST OUT Alert PM10 conditions for the 'PM10 > 90% Alert' alert at Stn 8: Fort St. John Old Fort have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	out	90%								
39	08-02-17 18:10	IN Alert 'PM10 > 90% Alert': PM10 (46.9 µg/m3) at Stn 7B: North Camp for 2017-02-08 18:00 PST. Description: Stn 7B: North Camp : 'PM10 > 90% Alert' 2017-02-08 18:00 PST ! IN Alert PM10 (46.9 µg/m3) conditions have triggered the 'PM10 > 90% Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	in	90%	PM10	Station 7B	N	N/A	Y	WSW	MCW contractor conducted visual inspection.	
	08-02-17 20:10	IN Alert 'PM10 Alert': PM10 (52.5 µg/m3) at Stn 7B: North Camp for 2017-02-08 20:00 PST. Description: Stn 7B: North Camp : 'PM10 Alert' 2017-02-08 20:00 PST ! IN Alert PM10 (52.5 µg/m3) conditions have triggered the 'PM10 Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than the BC 24-hour air quality objective of 50 ug/m3.	in	100%								
	10-02-17 6:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM10 Alert' 2017-02-10 06:00 PST OUT Alert PM10 conditions for the 'PM10 Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than the BC 24-hour air quality objective of 50 ug/m3.	out	100%								
	10-02-17 9:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM10 > 90% Alert' 2017-02-10 09:00 PST OUT Alert PM10 conditions for the 'PM10 > 90% Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	out	90%								

Event number	Date / Time Alert issued	Alert text	IN / OUT	90% / 100%	Contaminant	Station Name	Instrumental Error (Y/N)	Reason for Instrumental Error	Did a measured Exceedance / excursion occur?	Dominant wind direction during event	Site Response	Comment regarding current conditions / observations
40	11-02-17 11:10	IN Alert 'PM10 Alert': PM10 (53.2 µg/m3) at Stn 7B: North Camp for 2017-02-11 11:00 PST. Description: Stn 7B: North Camp : 'PM10 Alert' 2017-02-11 11:00 PST ! IN Alert PM10 (53.2 µg/m3) conditions have triggered the 'PM10 Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than the BC 24-hour air quality objective of 50 ug/m3.	in	100%	PM10	Station 7B	N	N/A	Y	WSW	MCW contractor conducted visual inspection.	
	11-02-17 11:10	IN Alert 'PM10 > 90% Alert': PM10 (53.2 µg/m3) at Stn 7B: North Camp for 2017-02-11 11:00 PST. Description: Stn 7B: North Camp : 'PM10 > 90% Alert' 2017-02-11 11:00 PST ! IN Alert PM10 (53.2 µg/m3) conditions have triggered the 'PM10 > 90% Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	in	90%								
	14-02-17 5:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM10 Alert' 2017-02-14 05:00 PST OUT Alert PM10 conditions for the 'PM10 Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than the BC 24-hour air quality objective of 50 ug/m3.	out	100%	PM10	Station 7B	N	N/A	Y	WSW		
	14-02-17 7:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM10 > 90% Alert' 2017-02-14 07:00 PST OUT Alert PM10 conditions for the 'PM10 > 90% Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	out	90%								
41	12-02-17 12:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (23.7 µg/m3) at Stn 7B: North Camp for 2017-02-12 12:00 PST. Description: Stn 7B: North Camp : 'PM2.5 > 90% Alert' 2017-02-12 12:00 PST ! IN Alert PM2.5 (23.7 µg/m3) conditions have triggered the 'PM2.5 > 90% Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM2.5 concentrations has exceeded and remains greater than 22.5 ug/m3 (90% of the BC 24-hour air quality objective of 25 ug/m3).	in	90%	PM2.5	Station 7B	N	N/A	Y	WSW	The MCW contractor implemented reduced vehicle speeds on dam site construction roads.	
	12-02-17 16:10	IN Alert 'PM2.5 Alert': PM2.5 (25.9 µg/m3) at Stn 7B: North Camp for 2017-02-12 16:00 PST. Description: Stn 7B: North Camp : 'PM2.5 Alert' 2017-02-12 16:00 PST ! IN Alert PM2.5 (25.9 µg/m3) conditions have triggered the 'PM2.5 Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM2.5 concentrations has exceeded and remains greater than the BC 24-hour air quality objective of 25 ug/m3.	in	100%								
	13-02-17 9:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM2.5 Alert' 2017-02-13 09:00 PST OUT Alert PM2.5 conditions for the 'PM2.5 Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM2.5 concentrations has decreased to values less than the BC 24-hour air quality objective of 25 ug/m3.	out	100%								
	13-02-17 10:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM2.5 > 90% Alert' 2017-02-13 10:00 PST OUT Alert PM2.5 conditions for the 'PM2.5 > 90% Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM2.5 concentrations has decreased to values less than 22.5 ug/m3 (90% of the BC 24-hour air quality objective of 25 ug/m3).	out	90%								
42	14-02-17 23:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (23.4 µg/m3) at Stn 7B: North Camp for 2017-02-14 23:00 PST. Description: Stn 7B: North Camp : 'PM2.5 > 90% Alert' 2017-02-14 23:00 PST ! IN Alert PM2.5 (23.4 µg/m3) conditions have triggered the 'PM2.5 > 90% Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM2.5 concentrations has exceeded and remains greater than 22.5 ug/m3 (90% of the BC 24-hour air quality objective of 25 ug/m3).	in	90%	PM2.5	Station 7B	Y	PM2.5 exceeded PM10 by more than twice the instrumental precision of the 5030 SHARP.	N/A	N/A	N/A	
	15-02-17 0:10	IN Alert 'PM2.5 Alert': PM2.5 (25.1 µg/m3) at Stn 7B: North Camp for 2017-02-15 00:00 PST. Description: Stn 7B: North Camp : 'PM2.5 Alert' 2017-02-15 00:00 PST ! IN Alert PM2.5 (25.1 µg/m3) conditions have triggered the 'PM2.5 Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM2.5 concentrations has exceeded and remains greater than the BC 24-hour air quality objective of 25 ug/m3.	in	100%								
	15-02-17 19:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM2.5 Alert' 2017-02-15 19:00 PST OUT Alert PM2.5 conditions for the 'PM2.5 Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM2.5 concentrations has decreased to values less than the BC 24-hour air quality objective of 25 ug/m3.	out	100%								
	15-02-17 19:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM2.5 > 90% Alert' 2017-02-15 19:00 PST OUT Alert PM2.5 conditions for the 'PM2.5 > 90% Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM2.5 concentrations has decreased to values less than 22.5 ug/m3 (90% of the BC 24-hour air quality objective of 25 ug/m3).	out	90%								

Event number	Date / Time Alert issued	Alert text	IN / OUT	90% / 100%	Contaminant	Station Name	Instrumental Error (Y/N)	Reason for Instrumental Error	Did a measured Exceedance / excursion occur?	Dominant wind direction during event	Site Response	Comment regarding current conditions / observations
43	15-02-17 17:10	IN Alert 'PM10 Alert': PM10 (59.5 µg/m3) at Stn 7B: North Camp for 2017-02-15 17:00 PST. Description: Stn 7B: North Camp : 'PM10 Alert' 2017-02-15 17:00 PST ! IN Alert PM10 (59.5 µg/m3) conditions have triggered the 'PM10 Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than the BC 24-hour air quality objective of 50 ug/m3.	in	100%	PM10	Station 7B	N	N/A	Y	SW	The MCW contractor implemented reduced vehicle speeds on dam site construction roads.	
	15-02-17 17:10	IN Alert 'PM10 > 90% Alert': PM10 (59.5 µg/m3) at Stn 7B: North Camp for 2017-02-15 17:00 PST. Description: Stn 7B: North Camp : 'PM10 > 90% Alert' 2017-02-15 17:00 PST ! IN Alert PM10 (59.5 µg/m3) conditions have triggered the 'PM10 > 90% Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	in	90%								
	16-02-17 23:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM10 Alert' 2017-02-16 16:00 PST OUT Alert PM10 conditions for the 'PM10 Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than the BC 24-hour air quality objective of 50 ug/m3.	out	100%								
	16-02-17 23:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM10 > 90% Alert' 2017-02-16 16:00 PST OUT Alert PM10 conditions for the 'PM10 > 90% Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	out	90%								
44	24-02-17 21:10	IN Alert 'PM10 > 90% Alert': PM10 (48.4 µg/m3) at Stn 7B: North Camp for 2017-02-24 21:00 PST. Description: Stn 7B: North Camp : 'PM10 > 90% Alert' 2017-02-24 21:00 PST ! IN Alert PM10 (48.4 µg/m3) conditions have triggered the 'PM10 > 90% Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	in	90%	PM10	Station 7B	N	N/A	Y	WNW	The MCW contractor implemented reduced vehicle speeds on dam site construction roads. Shortly after this event, BC Hydro issued a letter to the MCW contractor as a reminder of air quality mitigation obligations.	
	24-02-17 23:10	IN Alert 'PM10 Alert': PM10 (50.1 µg/m3) at Stn 7B: North Camp for 2017-02-24 23:00 PST. Description: Stn 7B: North Camp : 'PM10 Alert' 2017-02-24 23:00 PST ! IN Alert PM10 (50.1 µg/m3) conditions have triggered the 'PM10 Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than the BC 24-hour air quality objective of 50 ug/m3.	in	100%								
	26-02-17 8:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM10 Alert' 2017-02-26 08:00 PST OUT Alert PM10 conditions for the 'PM10 Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than the BC 24-hour air quality objective of 50 ug/m3.	out	100%								
	26-02-17 9:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'PM10 > 90% Alert' 2017-02-26 09:00 PST OUT Alert PM10 conditions for the 'PM10 > 90% Alert' alert at Stn 7B: North Camp have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	out	90%								
45	15-03-17 21:10	IN Alert 'NO2 Alert': NO2 (190.5 µg/m3) at Stn 7B: North Camp for 2017-03-15 21:00 PST. Description: Stn 7B: North Camp : 'NO2 Alert' 2017-03-15 21:00 PST ! IN Alert NO2 (190.5 µg/m3) conditions have triggered the 'NO2 Alert' alert. An OUT alert will be sent when conditions return to normal. The 1-hour average NO2 concentrations have exceeded and remain greater than the BC 1-hour air quality objective of 188 ug/m3.	in	100%	NO2	Station 7B	Y	adjustment to range on instrument not reflected in logger program	N/A	N/A	N/A	
	15-03-17 21:10	IN Alert 'NO2 > 90% Alert': NO2 (190.5 µg/m3) at Stn 7B: North Camp for 2017-03-15 21:00 PST.	in	90%								
	16-03-17 21:10	OUT Alert 'NO2 Alert': NO2 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'NO2 Alert' Current Status: OUT 2017-03-16 00:00 PST OUT Alert NO2 conditions for the 'NO2 Alert' alert at Stn 7B: North Camp have returned to normal. 2017-03-16 02:00 PST ! IN Alert NO2 (226.3 µg/m3) conditions have triggered the 'NO2 Alert' alert. An OUT alert will be sent when conditions return to normal. 2017-03-16 08:00 PST OUT Alert NO2 conditions for the 'NO2 Alert' alert at Stn 7B: North Camp have returned to normal. The 1-hour average NO2 concentrations have decreased to values less than the BC 1-hour air quality objective of 188 ug/m3.	out	100%								
	16-03-17 21:10	OUT Alert 'NO2 > 90% Alert': NO2 conditions at Stn 7B: North Camp are normal. Description: Stn 7B: North Camp : 'NO2 > 90% Alert' Current Status: OUT 2017-03-16 01:00 PST OUT Alert NO2 conditions for the 'NO2 > 90% Alert' alert at Stn 7B: North Camp have returned to normal. 2017-03-16 02:00 PST ! IN Alert NO2 (226.3 µg/m3) conditions have triggered the 'NO2 > 90% Alert' alert. An OUT alert will be sent when conditions return to normal. 2017-03-16 08:00 PST OUT Alert NO2 conditions for the 'NO2 > 90% Alert' alert at Stn 7B: North Camp have returned to normal. The 1-hour average NO2 concentrations have decreased to values less than 169.2 ug/m3 (90% of the BC 1-hour air quality objective of 188 ug/m3).	out	90%								

Event number	Date / Time Alert issued	Alert text	IN / OUT	90% / 100%	Contaminant	Station Name	Instrumental Error (Y/N)	Reason for Instrumental Error	Did a measured Exceedance / excursion occur?	Dominant wind direction during event	Site Response	Comment regarding current conditions / observations
46	17-03-17 12:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (23.4 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-03-17 12:00 PST. Description: Stn 9: Fort St. John 85th Ave : 'PM2.5 > 90% Alert' 2017-03-17 12:00 PST ! IN Alert PM2.5 (23.4 µg/m3) conditions have triggered the 'PM2.5 > 90% Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM2.5 concentrations has exceeded and remains greater than 22.5 ug/m3 (90% of the BC 24-hour air quality objective of 25 ug/m3).	in	90%	PM2.5	Station 9	Y	Fluctuations caused by instrument maintenance the following day.	N/A	N/A	N/A	
	17-03-17 15:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 9: Fort St. John 85th Ave are normal. Description: Stn 9: Fort St. John 85th Ave : 'PM2.5 > 90% Alert' 2017-03-17 15:00 PST OUT Alert PM2.5 conditions for the 'PM2.5 > 90% Alert' alert at Stn 9: Fort St. John 85th Ave have returned to normal. The 24-hour rolling average of PM2.5 concentrations has decreased to values less than 22.5 ug/m3 (90% of the BC 24-hour air quality objective of 25 ug/m3).	out	90%								
47	27-03-17 8:10	IN Alert 'PM10 > 90% Alert': PM10 (45.8 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-03-27 08:00 PST. Description: Stn 9: Fort St. John 85th Ave : 'PM10 > 90% Alert' 2017-03-27 08:00 PST ! IN Alert PM10 (45.8 µg/m3) conditions have triggered the 'PM10 > 90% Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	in	90%	PM10	Station 9	Y	Leak	N/A	E, NE	N/A	
	27-03-17 10:10	IN Alert 'PM10 Alert': PM10 (50.3 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-03-27 10:00 PST. Description: Stn 9: Fort St. John 85th Ave : 'PM10 Alert' 2017-03-27 10:00 PST ! IN Alert PM10 (50.3 µg/m3) conditions have triggered the 'PM10 Alert' alert. An OUT alert will be sent when conditions return to normal. The 24-hour rolling average of PM10 concentrations has exceeded and remains greater than the BC 24-hour air quality objective of 50 ug/m3.	in	100%								
	28-03-17 0:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 9: Fort St. John 85th Ave are normal. Description: Stn 9: Fort St. John 85th Ave : 'PM10 Alert' 2017-03-28 00:00 PST OUT Alert PM10 conditions for the 'PM10 Alert' alert at Stn 9: Fort St. John 85th Ave have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than the BC 24-hour air quality objective of 50 ug/m3.	out	100%								
	28-03-17 5:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 9: Fort St. John 85th Ave are normal. Description: Stn 9: Fort St. John 85th Ave : 'PM10 > 90% Alert' 2017-03-28 04:00 PST OUT Alert PM10 conditions for the 'PM10 > 90% Alert' alert at Stn 9: Fort St. John 85th Ave have returned to normal. The 24-hour rolling average of PM10 concentrations has decreased to values less than 45 ug/m3 (90% of the BC 24-hour air quality objective of 50 ug/m3).	out	90%								
48	29-03-17 20:10	IN Alert 'PM10 Alert': PM10 (51.6 µg/m3) at Stn 7B: North Camp for 2017-03-29 19:00 PST.	in	100%	PM10	Station 7B	Y	MOE audit was being carried out on instruments during large PM10 spike that led to alert	N		N/A	
	29-03-17 20:10	IN Alert 'PM10 > 90% Alert': PM10 (51.6 µg/m3) at Stn 7B: North Camp for 2017-03-29 19:00 PST.	in	90%								
	30-03-17 14:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	30-03-17 16:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
49	30-03-17 1:10	IN Alert 'PM10 > 90% Alert': PM10 (46.4 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-03-30 00:00 PST.	in	90%	PM10	Station 9	Y	Found during audit previous day that the mass foil calibration on this unit was out by greater than 5%	N/A	N/A	N/A	
	30-03-17 4:10	IN Alert 'PM10 Alert': PM10 (50.2 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-03-30 03:00 PST.	in	100%								
	30-03-17 9:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	100%								
	30-03-17 10:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	90%								
50	04-04-17 18:10	IN Alert 'PM10 > 90% Alert': PM10 (48.2 µg/m3) at Stn 7B: North Camp for 2017-04-04 17:00 PST.	in	90%	PM10	Station 7B	N	N/A	Y	E		Event occurred during an air quality advisory relating to road dust in Fort St John.
	04-04-17 19:10	IN Alert 'PM10 Alert': PM10 (61.9 µg/m3) at Stn 7B: North Camp for 2017-04-04 18:00 PST.	in	100%								
	06-04-17 1:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	06-04-17 7:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
51	07-04-17 1:10	IN Alert 'PM10 > 90% Alert': PM10 (46.8 µg/m3) at Stn 7B: North Camp for 2017-04-07 00:00 PST.	in	90%	PM10	Station 7B	N	N/A	Y	E, NE		Event occurred during an air quality advisory relating to road dust in Fort St John.
	07-04-17 4:10	IN Alert 'PM10 Alert': PM10 (51.1 µg/m3) at Stn 7B: North Camp for 2017-04-07 03:00 PST.	in	100%								
	08-04-17 8:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	08-04-17 8:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
52	20-04-17 0:10	IN Alert 'PM10 > 90% Alert': PM10 (46.2 µg/m3) at Stn 7B: North Camp for 2017-04-19 23:00 PST.	in	90%	PM10	Station 7B	N	N/A	N	E	MCW contractor conducted visual inspection.	
	20-04-17 3:10	IN Alert 'PM10 Alert': PM10 (50.6 µg/m3) at Stn 7B: North Camp for 2017-04-20 02:00 PST.	in	100%								
	20-04-17 14:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	20-04-17 18:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
53	23-04-17 19:10	IN Alert 'PM10 > 90% Alert': PM10 (45.1 µg/m3) at Stn 7B: North Camp for 2017-04-23 18:00 PST.	in	90%	PM10	Station 7B	N	N/A	N	E	MCW contractor conducted visual inspection.	
	24-04-17 3:10	IN Alert 'PM10 Alert': PM10 (50.1 µg/m3) at Stn 7B: North Camp for 2017-04-24 02:00 PST.	in	100%								
	24-04-17 7:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	24-04-17 11:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
54	25-04-17 9:10	IN Alert 'PM10 > 90% Alert': PM10 (46.3 µg/m3) at Stn 7B: North Camp for 2017-04-25 08:00 PST.	in	90%	PM10	Station 7B	N	N/A	Y	E	MCW contractor conducted visual inspection.	
	25-04-17 10:10	IN Alert 'PM10 Alert': PM10 (50.2 µg/m3) at Stn 7B: North Camp for 2017-04-25 09:00 PST.	in	100%								
	27-04-17 12:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	27-04-17 12:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
55	03-05-17 14:10	IN Alert 'PM10 > 90% Alert': PM10 (45.4 µg/m3) at Stn 7B: North Camp for 2017-05-03 13:00 PST.	in	90%	PM10	Station 7B	N	N/A	Y	WSW	The MCW contractor implemented reduced vehicle speeds and applied water as a dust suppressant on dam site construction roads. The MCW contractor also informed BC Hydro that they were actively looking into alternative, suitable dust suppressants.	Event occurred during an air quality advisory relating to road dust in Fort St John.
	03-05-17 15:10	IN Alert 'PM10 Alert': PM10 (50.7 µg/m3) at Stn 7B: North Camp for 2017-05-03 14:00 PST.	in	100%								
	04-05-17 16:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	04-05-17 16:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								

Event number	Date / Time Alert issued	Alert text	IN / OUT	90% / 100%	Contaminant	Station Name	Instrumental Error (Y/N)	Reason for Instrumental Error	Did a measured Exceedance / excursion occur?	Dominant wind direction during event	Site Response	Comment regarding current conditions / observations
56	07-05-17 20:10	IN Alert 'PM10 > 90% Alert': PM10 (45.4 µg/m3) at Stn 7B: North Camp for 2017-05-07 19:00 PST.	in	90%	PM10	Station 7B	N	N/A	Y	WSW	The MCW contractor implemented reduced vehicle speeds and applied water as a dust suppressant on dam site construction roads. The MCW contractor also informed BC Hydro that they were actively looking into alternative, suitable dust suppressants.	
	08-05-17 0:10	IN Alert 'PM10 Alert': PM10 (50.5 µg/m3) at Stn 7B: North Camp for 2017-05-07 23:00 PST.	in	100%								
	09-05-17 22:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	10-05-17 0:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
	10-05-17 1:10	IN Alert 'PM10 > 90% Alert': PM10 (46 µg/m3) at Stn 7B: North Camp for 2017-05-10 00:00 PST.	in	90%								
	10-05-17 4:10	IN Alert 'PM10 Alert': PM10 (50 µg/m3) at Stn 7B: North Camp for 2017-05-10 03:00 PST.	in	100%								
	10-05-17 18:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	10-05-17 19:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
57	11-05-17 17:10	IN Alert 'PM10 > 90% Alert': PM10 (45.3 µg/m3) at Stn 7B: North Camp for 2017-05-11 16:00 PST.	in	90%	PM10	Station 7B	Y	Spider in Nephelometer	N/A	N/A	N/A	
	12-05-17 7:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
58	18-05-17 4:10	IN Alert 'PM10 Alert': PM10 (67.3 µg/m3) at Stn 7B: North Camp for 2017-05-18 04:00 MST.	in	100%	PM10	Station 7B	N	N/A	N	NE, ENE	The MCW contractor applied water as a dust suppressant on dam site construction roads.	
	18-05-17 4:10	IN Alert 'PM10 > 90% Alert': PM10 (67.3 µg/m3) at Stn 7B: North Camp for 2017-05-18 04:00 MST.	in	90%								
	19-05-17 6:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	19-05-17 6:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
59	22-05-17 19:10	IN Alert 'PM10 > 90% Alert': PM10 (45.7 µg/m3) at Stn 7B: North Camp for 2017-05-22 19:00 MST.	in	90%	PM10	Station 7B	N	N/A	Y	WSW, SSW	The MCW contractor applied water as a dust suppressant on dam site construction roads on May 22, 23 and 24, 2017. On May 25, 2017 the MCW contractor applied 250,000 m^3 of calcium chloride to the main dam site construction roads (see Figure F-1).	
	23-05-17 13:10	IN Alert 'PM10 Alert': PM10 (65.9 µg/m3) at Stn 7B: North Camp for 2017-05-23 13:00 MST.	in	100%								
	24-05-17 14:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	24-05-17 15:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
60	28-05-17 18:10	IN Alert 'PM10 > 90% Alert': PM10 (49.7 µg/m3) at Stn 7B: North Camp for 2017-05-28 18:00 MST.	in	90%	PM10	Station 7B	N	N/A	Y	E, ENE, SW		Event occurred during an air quality advisory relating to road dust in Fort St John.
	28-05-17 19:10	IN Alert 'PM10 Alert': PM10 (55.4 µg/m3) at Stn 7B: North Camp for 2017-05-28 19:00 MST.	in	100%								
	01-06-17 17:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	01-06-17 18:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
	03-06-17 10:10	IN Alert 'PM10 > 90% Alert': PM10 (46.4 µg/m3) at Stn 7B: North Camp for 2017-06-03 10:00 MST.	in	90%								
	03-06-17 12:10	IN Alert 'PM10 Alert': PM10 (51.4 µg/m3) at Stn 7B: North Camp for 2017-06-03 12:00 MST.	in	100%								
	09-06-17 19:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	09-06-17 20:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
61	30-05-17 3:10	IN Alert 'PM10 > 90% Alert': PM10 (45.1 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-05-30 03:00 MST.	in	90%	PM10	Station 9	N	N/A	N	ESE		Event occurred during an air quality advisory relating to road dust in Fort St John.
	31-05-17 1:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	90%								
62	31-05-17 2:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 7B: North Camp are normal.	out	100%	PM2.5	Station 7B	N	N/A	Y	ENE		Event occurred during an air quality advisory relating to road dust in Fort St John.
	31-05-17 8:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 7B: North Camp are normal.	out	90%								
	31-05-17 10:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (22.6 µg/m3) at Stn 7B: North Camp for 2017-05-31 10:00 MST.	in	90%								
	31-05-17 11:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 7B: North Camp are normal.	out	90%								
	30-05-17 11:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (22.7 µg/m3) at Stn 7B: North Camp for 2017-05-30 11:00 MST.	in	90%								
	30-05-17 16:10	IN Alert 'PM2.5 Alert': PM2.5 (25.9 µg/m3) at Stn 7B: North Camp for 2017-05-30 16:00 MST.	in	100%								
63	08-06-17 23:10	IN Alert 'PM10 > 90% Alert': PM10 (45.3 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-06-08 23:00 MST.	in	90%	PM10	Station 9	N	N/A	N	E, ENE	N/A	No work activities were being conducted at 85th Ave Industrial lands from 7:00am on June 8 to 7:00am on June 17, 2017; thus, this alert is not attributed to Site C construction activity.
	09-06-17 5:10	IN Alert 'PM10 Alert': PM10 (50.5 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-06-09 05:00 MST.	in	100%								
	09-06-17 15:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	100%								
	09-06-17 18:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	90%								
64	15-06-17 2:10	IN Alert 'NO2 Alert': NO2 (412.9 µg/m3) at Stn 7B: North Camp for 2017-06-15 02:00 MST.	in	100%	NO2	Station 7B	Y	Instrument left in span mode	N/A	N/A	N/A	
	15-06-17 2:10	IN Alert 'NO2 > 90% Alert': NO2 (412.9 µg/m3) at Stn 7B: North Camp for 2017-06-15 02:00 MST.	in	90%								
	15-06-17 3:10	OUT Alert 'NO2 Alert': NO2 conditions at Stn 7B: North Camp are normal.	out	100%								
	15-06-17 3:10	OUT Alert 'NO2 > 90% Alert': NO2 conditions at Stn 7B: North Camp are normal.	out	90%								
65	15-06-17 5:10	IN Alert 'PM10 > 90% Alert': PM10 (46.3 µg/m3) at Stn 7B: North Camp for 2017-06-15 05:00 MST.	in	90%	PM10	Station 7B	Y	Elevated levels did occur but operator interference throughout the period	N/A	N/A	N/A	
	15-06-17 6:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
66	17-06-17 17:10	IN Alert 'PM10 > 90% Alert': PM10 (46.1 µg/m3) at Stn 7B: North Camp for 2017-06-17 17:00 MST.	in	90%	PM10	Station 7B	N	N/A	N	W	The MCW contractor applied water as a dust suppressant on dam site construction roads.	
	18-06-17 2:10	IN Alert 'PM10 Alert': PM10 (51.7 µg/m3) at Stn 7B: North Camp for 2017-06-18 02:00 MST.	in	100%								
	18-06-17 22:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	18-06-17 23:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
67	20-06-17 16:10	IN Alert 'PM10 Alert': PM10 (58.1 µg/m3) at Stn 7B: North Camp for 2017-06-20 16:00 MST.	in	100%	PM10	Station 7B	N	N/A	Y	W, SW	The MCW contractor applied water as a dust suppressant on dam site construction roads.	
	20-06-17 16:10	IN Alert 'PM10 > 90% Alert': PM10 (58.1 µg/m3) at Stn 7B: North Camp for 2017-06-20 16:00 MST.	in	90%								
	21-06-17 17:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	21-06-17 18:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
68	25-06-17 18:10	IN Alert 'PM10 > 90% Alert': PM10 (47.6 µg/m3) at Stn 7B: North Camp for 2017-06-25 18:00 MST.	in	90%	PM10	Station 7B	N	N/A	Y	WNW	The MCW contractor applied water as a dust suppressant on dam site construction roads.	
	25-06-17 19:10	IN Alert 'PM10 Alert': PM10 (54.7 µg/m3) at Stn 7B: North Camp for 2017-06-25 19:00 MST.	in	100%								
	27-06-17 20:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	27-06-17 20:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
69	01-07-17 12:10	IN Alert 'PM10 Alert': PM10 (53.5 µg/m3) at Stn 7B: North Camp for 2017-07-01 12:00 MST.	in	100%	PM10	Station 7B	N	N/A	Y	WSW	The MCW contractor applied water as a dust suppressant on dam site construction roads.	
	01-07-17 12:10	IN Alert 'PM10 > 90% Alert': PM10 (53.5 µg/m3) at Stn 7B: North Camp for 2017-07-01 12:00 MST.	in	90%								
	06-07-17 20:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	06-07-17 21:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
	07-07-17 11:10	IN Alert 'PM10 > 90% Alert': PM10 (45.5 µg/m3) at Stn 7B: North Camp for 2017-07-07 11:00 MST.	in	90%								
	07-07-17 17:10	IN Alert 'PM10 Alert': PM10 (50.1 µg/m3) at Stn 7B: North Camp for 2017-07-07 17:00 MST.	in	100%								
	08-07-17 18:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	08-07-17 19:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
70	10-07-17 16:10	IN Alert 'PM10 > 90% Alert': PM10 (49.5 µg/m3) at Stn 7B: North Camp for 2017-07-10 16:00 MST.	in	90%	PM10	Station 7B	N	N/A	Y	WNW, SW	MCW contractor conducted visual inspection.	
	10-07-17 17:10	IN Alert 'PM10 Alert': PM10 (54.6 µg/m3) at Stn 7B: North Camp for 2017-07-10 17:00 MST.	in	100%								
	13-07-17 3:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	13-07-17 9:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								

Event number	Date / Time Alert issued	Alert text	IN / OUT	90% / 100%	Contaminant	Station Name	Instrumental Error (Y/N)	Reason for Instrumental Error	Did a measured Exceedance / excursion occur?	Dominant wind direction during event	Site Response	Comment regarding current conditions / observations
71	12-07-17 17:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (22.6 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-07-12 17:00 MST.	in	90%	PM2.5	Station 9	N	N/A	Y	WSW, NE		Event occurred during a Smoky Skies bulletin.
	12-07-17 21:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	90%								
	15-07-17 7:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (23.5 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-07-15 07:00 MST.	in	90%								
	15-07-17 8:10	IN Alert 'PM2.5 Alert': PM2.5 (25.3 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-07-15 08:00 MST.	in	100%								
	16-07-17 4:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	100%								
	16-07-17 6:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	90%								
72	15-07-17 3:10	IN Alert 'PM2.5 Alert': PM2.5 (31.5 µg/m3) at Stn 1: Peace Valley Attachie Flat Upper Terrace for 2017-07-15 03:00 MST.	in	100%	PM2.5	Station 1	N	N/A	N	E, W		Event occurred during a Smoky skies bulletin / air quality advisory.
	15-07-17 3:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (31.5 µg/m3) at Stn 1: Peace Valley Attachie Flat Upper Terrace for 2017-07-15 03:00 MST.	in	90%								
	15-07-17 22:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 1: Peace Valley Attachie Flat Upper Terrace are normal.	out	100%								
	16-07-17 0:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 1: Peace Valley Attachie Flat Upper Terrace are normal.	out	90%								
74	15-07-17 10:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (23.2 µg/m3) at Stn 8: Fort St. John Old Fort for 2017-07-15 10:00 MST.	in	90%	PM2.5	Station 8	N	N/A	Y	NNE, S (wind Data from stn9)		Event occurred during a Smoky Skies bulletin.
	15-07-17 11:10	IN Alert 'PM2.5 Alert': PM2.5 (25.4 µg/m3) at Stn 8: Fort St. John Old Fort for 2017-07-15 11:00 MST.	in	100%								
	16-07-17 6:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 8: Fort St. John Old Fort are normal.	out	100%								
	16-07-17 7:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 8: Fort St. John Old Fort are normal.	out	90%								
75	15-07-17 12:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (23.5 µg/m3) at Stn 7B: North Camp for 2017-07-15 12:00 MST.	in	90%	PM2.5	Station 7B	N	N/A	N	W, ENE		Event occurred during a Smoky Skies bulletin.
	15-07-17 14:10	IN Alert 'PM2.5 Alert': PM2.5 (25.7 µg/m3) at Stn 7B: North Camp for 2017-07-15 14:00 MST.	in	100%								
	16-07-17 0:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 7B: North Camp are normal.	out	100%								
	16-07-17 4:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 7B: North Camp are normal.	out	90%								
76	15-07-17 17:10	IN Alert 'PM10 > 90% Alert': PM10 (45.5 µg/m3) at Stn 8: Fort St. John Old Fort for 2017-07-15 17:00 MST.	in	90%	PM10	Station 8	N	N/A	N	NNE, S (wind Data from stn9)		Event occurred during a Smoky Skies bulletin.
	15-07-17 19:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 8: Fort St. John Old Fort are normal.	out	90%								
77	21-07-17 4:10	IN Alert 'PM10 > 90% Alert': PM10 (45.5 µg/m3) at Stn 7B: North Camp for 2017-07-21 04:00 MST.	in	90%	PM10	Station 7B	Y	Suspected insect interference	N/A	N/A	N/A	
	21-07-17 11:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
78	22-07-17 21:10	IN Alert 'PM10 > 90% Alert': PM10 (45.5 µg/m3) at Stn 7B: North Camp for 2017-07-22 21:00 MST.	in	90%	PM10	Station 7B	N	N/A	N	WNW	Construction activities on the Left Bank excavation were put on hold during this period due to safety concerns associated with the global instability. However, the MCW contractor continued to apply water as a dust suppressant on dam site construction roads at this time.	
	23-07-17 9:10	IN Alert 'PM10 Alert': PM10 (50.2 µg/m3) at Stn 7B: North Camp for 2017-07-23 09:00 MST.	in	100%								
	23-07-17 17:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	23-07-17 19:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
79	26-07-17 22:10	IN Alert 'PM10 Alert': PM10 (54.3 µg/m3) at Stn 7B: North Camp for 2017-07-26 22:00 MST.	in	100%	PM10	Station 7B	Y	PM10 spike occurred during weekly maintenance visit	N/A	N/A	N/A	
	26-07-17 22:10	IN Alert 'PM10 > 90% Alert': PM10 (54.3 µg/m3) at Stn 7B: North Camp for 2017-07-26 22:00 MST.	in	90%								
	27-07-17 0:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	27-07-17 1:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
80	01-08-17 3:10	IN Alert 'PM10 Alert': PM10 (55.3 µg/m3) at Stn 7B: North Camp for 2017-08-01 03:00 MST.	in	100%	PM10	Station 7B	N	N/A	N	W	Construction activities on the Left Bank excavation were put on hold during this period due to safety concerns associated with the global instability.	
	01-08-17 3:10	IN Alert 'PM10 > 90% Alert': PM10 (55.3 µg/m3) at Stn 7B: North Camp for 2017-08-01 03:00 MST.	in	90%								
	02-08-17 2:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	02-08-17 2:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
81	11-08-17 2:10	IN Alert 'PM10 > 90% Alert': PM10 (45.2 µg/m3) at Stn 7B: North Camp for 2017-08-11 02:00 MST.	in	90%	PM10	Station 7B	N	N/A	Y	E		Event occurred during a Smoky Skies bulletin.
	11-08-17 4:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
	11-08-17 7:10	IN Alert 'PM10 > 90% Alert': PM10 (45.1 µg/m3) at Stn 7B: North Camp for 2017-08-11 07:00 MST.	in	90%								
	11-08-17 12:10	IN Alert 'PM10 Alert': PM10 (51.7 µg/m3) at Stn 7B: North Camp for 2017-08-11 12:00 MST.	in	100%								
	14-08-17 6:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	14-08-17 6:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
82	12-08-17 2:10	IN Alert 'PM10 > 90% Alert': PM10 (45.4 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-08-12 02:00 MST.	in	90%	PM10	Station 9	N	N/A	N	SE, SW		Event occurred during a Smoky Skies bulletin.
	12-08-17 11:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	90%								
	13-08-17 0:10	IN Alert 'PM10 > 90% Alert': PM10 (45.2 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-08-13 00:00 MST.	in	90%								
	13-08-17 5:10	IN Alert 'PM10 Alert': PM10 (50.2 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-08-13 05:00 MST.	in	100%								
	13-08-17 22:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	100%								
	14-08-17 1:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	90%								
83	13-08-17 7:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (24.5 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-08-13 07:00 MST.	in	90%	PM2.5	Station 9	N	N/A	Y	SW		Event occurred during a Smoky Skies bulletin.
	13-08-17 8:10	IN Alert 'PM2.5 Alert': PM2.5 (29.8 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-08-13 08:00 MST.	in	100%								
	14-08-17 6:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	100%								
	14-08-17 6:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	90%								
84	13-08-17 7:10	IN Alert 'PM2.5 Alert': PM2.5 (26 µg/m3) at Stn 7B: North Camp for 2017-08-13 07:00 MST.	in	100%	PM2.5	Station 7B	N	N/A	Y	WSW		Event occurred during a Smoky Skies bulletin.
	13-08-17 7:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (26 µg/m3) at Stn 7B: North Camp for 2017-08-13 07:00 MST.	in	90%								
	14-08-17 7:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 7B: North Camp are normal.	out	100%								
	14-08-17 7:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 7B: North Camp are normal.	out	90%								
85	13-08-17 10:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (23.1 µg/m3) at Stn 1: Peace Valley Attachie Flat Upper Terrace for 2017-08-13 10:00 MST.	in	90%	PM2.5	Station 1	N	N/A	N	W, WNW, E		Event occurred during a Smoky skies bulletin / air quality advisory.
	13-08-17 15:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 1: Peace Valley Attachie Flat Upper Terrace are normal.	out	90%								
86	13-08-17 15:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 8: Fort St. John Old Fort are normal.	out	90%	PM2.5	Station 8	N	N/A	N	SW		Event occurred during a Smoky Skies bulletin.
	13-08-17 14:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (22.6 µg/m3) at Stn 8: Fort St. John Old Fort for 2017-08-13 14:00 MST.	in	90%								

Event number	Date / Time Alert issued	Alert text	IN / OUT	90% / 100%	Contaminant	Station Name	Instrumental Error (Y/N)	Reason for Instrumental Error	Did a measured Exceedance / excursion occur?	Dominant wind direction during event	Site Response	Comment regarding current conditions / observations
87	14-08-17 23:10	IN Alert 'PM10 Alert': PM10 (50.8 µg/m3) at Stn 7B: North Camp for 2017-08-14 23:00 MST.	in	100%	PM10	Station 7B	N	N/A	Y	W, WSW		Station move occurred in the middle of this event. Data affected by these activities was removed from the dataset, though, what remains is valid and reflects environmental conditions. Event occurred during a Smoky skies bulletin / air quality advisory.
	14-08-17 23:10	IN Alert 'PM10 > 90% Alert': PM10 (50.8 µg/m3) at Stn 7B: North Camp for 2017-08-14 23:00 MST.	in	90%								
	15-08-17 23:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	16-08-17 0:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
	16-08-17 11:10	IN Alert 'PM10 > 90% Alert': PM10 (50 µg/m3) at Stn 7B: North Camp for 2017-08-16 11:00 MST.	in	90%								
	16-08-17 12:10	IN Alert 'PM10 Alert': PM10 (61.1 µg/m3) at Stn 7B: North Camp for 2017-08-16 12:00 MST.	in	100%								
	17-08-17 21:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	100%								
	17-08-17 21:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B: North Camp are normal.	out	90%								
	18-08-17 17:10	IN Alert 'PM10 Alert': PM10 (50.2 µg/m3) at Stn 7B/C: North Camp for 2017-08-18 17:00 MST.	in	100%								
	18-08-17 17:10	IN Alert 'PM10 > 90% Alert': PM10 (50.2 µg/m3) at Stn 7B/C: North Camp for 2017-08-18 17:00 MST.	In	90%								
	20-08-17 12:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	out	100%								
	20-08-17 13:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	Out	90%								
89	23-08-17 1:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (22.6 µg/m3) at Stn 8: Fort St. John Old Fort for 2017-08-23 01:00 MST.	In	90%	PM2.5	Station 8	Y	An insect was in the machine	N/A	N/A	N/A	
	23-08-17 4:10	IN Alert 'PM2.5 Alert': PM2.5 (25.1 µg/m3) at Stn 8: Fort St. John Old Fort for 2017-08-23 04:00 MST.	in	100%								
	23-08-17 13:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 8: Fort St. John Old Fort are normal.	out	100%								
	23-08-17 15:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 8: Fort St. John Old Fort are normal.	out	90%								
90	23-08-17 13:10	IN Alert 'PM10 Alert': PM10 (53.2 µg/m3) at Stn 7B/C: North Camp for 2017-08-23 13:00 MST.	in	100%	PM10	Station 7B	N	N/A	Y	WSW		Event coincides with a station visit. However data affected by the visit was marked invalid so the remaining data reflects the environmental conditions.
	23-08-17 13:10	IN Alert 'PM10 > 90% Alert': PM10 (53.2 µg/m3) at Stn 7B/C: North Camp for 2017-08-23 13:00 MST.	in	90%								
	24-08-17 11:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	out	100%								
	24-08-17 12:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	out	90%								
91	31-08-17 16:10	IN Alert 'NO2 Alert': NO2 (355.3 µg/m3) at Stn 7B/C: North Camp for 2017-08-31 16:00 MST.	in	100%	NO2	Station 7B	Y	Failed solenoid	N/A	N/A	N/A	
	31-08-17 16:10	IN Alert 'NO2 > 90% Alert': NO2 (355.3 µg/m3) at Stn 7B/C: North Camp for 2017-08-31 16:00 MST.	in	90%								
	31-08-17 17:10	OUT Alert 'NO2 Alert': NO2 conditions at Stn 7B/C: North Camp are normal.	out	100%								
	31-08-17 17:10	OUT Alert 'NO2 > 90% Alert': NO2 conditions at Stn 7B/C: North Camp are normal.	out	90%								
92	31-08-17 17:10	IN Alert 'PM10 > 90% Alert': PM10 (46.1 µg/m3) at Stn 7B/C: North Camp for 2017-08-31 17:00 MST.	in	90%	PM10	Station 7B	N	N/A	N	WSW	MCW contractor conducted visual inspection.	
	01-09-17 19:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	out	90%								
93	07-09-17 14:10	IN Alert 'PM10 > 90% Alert': PM10 (45.8 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-09-07 14:00 MST.	in	90%	PM10	Station 9	N	N/A	Y	SW, S		Event occurred during a Smoky Skies bulletin.
	07-09-17 17:10	IN Alert 'PM10 Alert': PM10 (51.5 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-09-07 17:00 MST.	in	100%								
	08-09-17 11:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	100%								
	08-09-17 13:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	90%								
94	07-09-17 14:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (23.2 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-09-07 14:00 MST.	in	90%	PM2.5	Station 9	N	N/A	Y	SW		Event occurred during a Smoky Skies bulletin.
	07-09-17 15:10	IN Alert 'PM2.5 Alert': PM2.5 (25.1 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-09-07 15:00 MST.	in	100%								
	08-09-17 17:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	100%								
	08-09-17 18:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	90%								
95	07-09-17 15:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (22.6 µg/m3) at Stn 8: Fort St. John Old Fort for 2017-09-07 15:00 MST.	in	90%	PM2.5	Station 8	N	N/A	Y	SW		Event occurred during a Smoky Skies bulletin.
	07-09-17 18:10	IN Alert 'PM2.5 Alert': PM2.5 (25.4 µg/m3) at Stn 8: Fort St. John Old Fort for 2017-09-07 18:00 MST.	in	100%								
	08-09-17 19:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 8: Fort St. John Old Fort are normal.	out	100%								
	08-09-17 20:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 8: Fort St. John Old Fort are normal.	out	90%								
96	07-09-17 16:10	IN Alert 'PM10 Alert': PM10 (54.4 µg/m3) at Stn 7B/C: North Camp for 2017-09-07 16:00 MST.	in	100%	PM10	Station 7B	N	N/A	Y	E, SW (highest conc)		Event occurred during a Smoky Skies bulletin.
	07-09-17 16:10	IN Alert 'PM10 > 90% Alert': PM10 (54.4 µg/m3) at Stn 7B/C: North Camp for 2017-09-07 16:00 MST.	in	90%								
	08-09-17 14:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	out	100%								
	08-09-17 16:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	out	90%								
97	07-09-17 16:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (22.7 µg/m3) at Stn 7B/C: North Camp for 2017-09-07 16:00 MST.	in	90%	PM2.5	Station 7B	N	N/A	Y	SE, SW(highest conc)		Event occurred during a Smoky Skies bulletin.
	07-09-17 20:10	IN Alert 'PM2.5 Alert': PM2.5 (26.3 µg/m3) at Stn 7B/C: North Camp for 2017-09-07 20:00 MST.	in	100%								
	08-09-17 16:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 7B/C: North Camp are normal.	out	100%								
	08-09-17 18:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 7B/C: North Camp are normal.	out	90%								
98	07-09-17 17:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (22.7 µg/m3) at Stn 1: Peace Valley Attachie Flat Upper Terrace for 2017-09-07 17:00 MST.	in	90%	PM2.5	Station 1	N	N/A	Y	SW, NE		Event occurred during a smoky skies bulletin / air quality advisory
	08-09-17 15:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 1: Peace Valley Attachie Flat Upper Terrace are normal.	out	100%								
	08-09-17 16:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 1: Peace Valley Attachie Flat Upper Terrace are normal.	out	90%								
99	08-09-17 1:10	IN Alert 'PM10 > 90% Alert': PM10 (45.9 µg/m3) at Stn 8: Fort St. John Old Fort for 2017-09-08 01:00 MST.	in	90%	PM10	Station 8	N	N/A	N	SW		Event occurred during a Smoky Skies bulletin.
	08-09-17 13:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 8: Fort St. John Old Fort are normal.	out	90%								
100	10-09-17 14:10	IN Alert 'PM10 Alert': PM10 (50.6 µg/m3) at Stn 7B/C: North Camp for 2017-09-10 14:00 MST.	in	100%	PM10	Station 7B	N	N/A	Y	WSW	On October 10 and 11, 2017, the MCW contractor applied 250,000 m^3 of calcium chloride to the main dam site construction roads (see Figure F-2 for application areas). Shortly after this event, BC Hydro issued a letter to the MCW contractor as a reminder of air quality mitigation obligations.	
	10-09-17 14:10	IN Alert 'PM10 > 90% Alert': PM10 (50.6 µg/m3) at Stn 7B/C: North Camp for 2017-09-10 14:00 MST.	in	90%								
	11-09-17 13:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	out	100%								
	11-09-17 13:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	out	90%								
101	15-09-17 7:10	IN Alert 'PM10 > 90% Alert': PM10 (46.3 µg/m3) at Stn 7B/C: North Camp for 2017-09-15 07:00 MST.	in	90%	PM10	Station 7B	Y	High measured PM10 concentrations caused by valley fog	N/A	N/A	N/A	
	15-09-17 8:10	IN Alert 'PM10 Alert': PM10 (74.8 µg/m3) at Stn 7B/C: North Camp for 2017-09-15 08:00 MST.	in	100%								
	16-09-17 8:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	out	100%								
	16-09-17 8:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	out	90%								
102	22-09-17 6:10	IN Alert 'PM10 > 90% Alert': PM10 (45.6 µg/m3) at Stn 7B/C: North Camp for 2017-09-22 06:00 MST.	in	90%	PM10	Station 7B	Y	High measured PM10 concentrations caused by valley fog	N/A	N/A	N/A	
	22-09-17 10:10	IN Alert 'PM10 Alert': PM10 (51.3 µg/m3) at Stn 7B/C: North Camp for 2017-09-22 10:00 MST.	in	100%								
	23-09-17 4:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	out	100%								
	23-09-17 5:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	out	90%								
103	29-09-17 10:10	IN Alert 'PM10 > 90% Alert': PM10 (46.2 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-09-29 10:00 MST.	in	90%	PM10	Station 9	N	N/A	N	SE	N/A	No work activities were being conducted at 85th Ave Industrial lands the week of Oct 25 -31, 2017; thus, this alert is not attributed to Site C construction activity.
	29-09-17 16:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	90%								

Event number	Date / Time Alert issued	Alert text	IN / OUT	90% / 100%	Contaminant	Station Name	Instrumental Error (Y/N)	Reason for Instrumental Error	Did a measured Exceedance / excursion occur?	Dominant wind direction during event	Site Response	Comment regarding current conditions / observations
104	15-10-17 13:10	IN Alert 'PM10 > 90% Alert': PM10 (45.4 µg/m3) at Stn 7B/C: North Camp for 2017-10-15 13:00 MST.	in	90%	PM10	Station 7B	N	N/A	Y	WSW	MCW contractor conducted visual inspection.	
	15-10-17 14:10	IN Alert 'PM10 Alert': PM10 (51.2 µg/m3) at Stn 7B/C: North Camp for 2017-10-15 14:00 MST.	in	100%								
	16-10-17 13:10	OUT Alert 'PM10 Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	out	100%								
	16-10-17 13:10	OUT Alert 'PM10 > 90% Alert': PM10 conditions at Stn 7B/C: North Camp are normal.	out	90%								
105	09-11-17 8:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (23.1 µg/m3) at Stn 7B/C: North Camp for 2017-11-09 08:00 MST.	in	90%	PM2.5	Station 7B	N	N/A	Y	E		Event occurred during a Smoky Skies bulletin.
	09-11-17 10:10	IN Alert 'PM2.5 Alert': PM2.5 (26 µg/m3) at Stn 7B/C: North Camp for 2017-11-09 10:00 MST.	in	100%								
	10-11-17 9:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 7B/C: North Camp are normal.	out	100%								
	10-11-17 11:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 7B/C: North Camp are normal.	out	90%								
106	09-11-17 9:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (23.1 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-11-09 09:00 MST.	in	90%	PM2.5	Station 9	N	N/A	N	W, WNW		Event occurred during a Smoky Skies bulletin.
	09-11-17 11:10	IN Alert 'PM2.5 Alert': PM2.5 (25.8 µg/m3) at Stn 9: Fort St. John 85th Ave for 2017-11-09 11:00 MST.	in	100%								
	10-11-17 6:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	100%								
	10-11-17 9:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 9: Fort St. John 85th Ave are normal.	out	90%								
107	09-11-17 13:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (24.3 µg/m3) at Stn 8: Fort St. John Old Fort for 2017-11-09 13:00 MST.	in	90%	PM2.5	Station 8	N	N/A	Y	SE		Event occurred during a Smoky Skies bulletin.
	09-11-17 14:10	IN Alert 'PM2.5 Alert': PM2.5 (26.6 µg/m3) at Stn 8: Fort St. John Old Fort for 2017-11-09 14:00 MST.	in	100%								
	10-11-17 11:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 8: Fort St. John Old Fort are normal.	out	100%								
	10-11-17 13:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 8: Fort St. John Old Fort are normal.	out	90%								
108	09-11-17 13:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (23.5 µg/m3) at Stn 1: Peace Valley Attachie Flat Upper Terrace for 2017-11-09 13:00 MST.	in	90%	PM2.5	Station 1	N	N/A	Y	ENE		Event occurred during a Smoky Skies bulletin.
	09-11-17 15:10	IN Alert 'PM2.5 Alert': PM2.5 (25.2 µg/m3) at Stn 1: Peace Valley Attachie Flat Upper Terrace for 2017-11-09 15:00 MST.	in	100%								
	10-11-17 1:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 1: Peace Valley Attachie Flat Upper Terrace are normal.	out	100%								
	10-11-17 4:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 1: Peace Valley Attachie Flat Upper Terrace are normal.	out	90%								
109	21-12-17 4:10	IN Alert 'PM2.5 > 90% Alert': PM2.5 (22.7 µg/m3) at Stn 1: Peace Valley Attachie Flat Upper Terrace for 2017-12-21 04:00 MST.	in	90%	PM2.5	Station 1	N	N/A	Y	SW	N/A	No work activities were occurring in this vicinity, and there was no concurrent alert at stations closer to work activities (e.g., at the north camp / dam site); thus, this alert is not attributed to Site C construction activity.
	21-12-17 5:10	IN Alert 'PM2.5 Alert': PM2.5 (25 µg/m3) at Stn 1: Peace Valley Attachie Flat Upper Terrace for 2017-12-21 05:00 MST.	in	100%								
	22-12-17 7:10	OUT Alert 'PM2.5 Alert': PM2.5 conditions at Stn 1: Peace Valley Attachie Flat Upper Terrace are normal.	out	100%								
	22-12-17 8:10	OUT Alert 'PM2.5 > 90% Alert': PM2.5 conditions at Stn 1: Peace Valley Attachie Flat Upper Terrace are normal.	out	90%								

E-1. Station 7B PM_{10} event on 2017-01-06

To assist with our understanding of this event which began on January 5, 2017 when an alert was issued for elevated PM_{10} concentrations at Site C, RWDI created some plots of the PM_{10} measurements in addition to the wind conditions. The time-series of this 2-day elevated PM_{10} event is plotted below in Figure E - 1. The figure shows that the event was characterized by a gradual increase in PM_{10} concentration at approximately 1700h on January 5. This was followed by a sharp increase on January 6 at 0900h leading to a maximum concentration of 582 $\mu g/m^3$. The 24-hour running average, as expected, showed a time lag from the peak hourly concentrations. Therefore, activities that may be responsible for the increased PM_{10} concentrations occurred during the high hourly readings in the late morning of January 6, 2017 not during the elevated 24-hour running averages.

The dominant winds during the time of the alert were from the north-northwest and east with wind speeds ranging from 1.0 and 8.0 m/s (Figure E - 2). The wind rose shows that the winds were quite variable. The highest concentrations were associated with winds from the east at wind speeds ranging from 2.0 to 3.0 m/s (Figure E - 3).

As there were no other alerts at other air quality monitoring stations in the region, it is likely that this event was caused by local emission sources at or near the dam site construction area.

This event did result in two 24-hour exceedances above the 24-hour BC Ambient Air Quality Objective (AAQO) for PM_{10} of 50 $\mu g/m^3$ on January 6 and 7, 2017

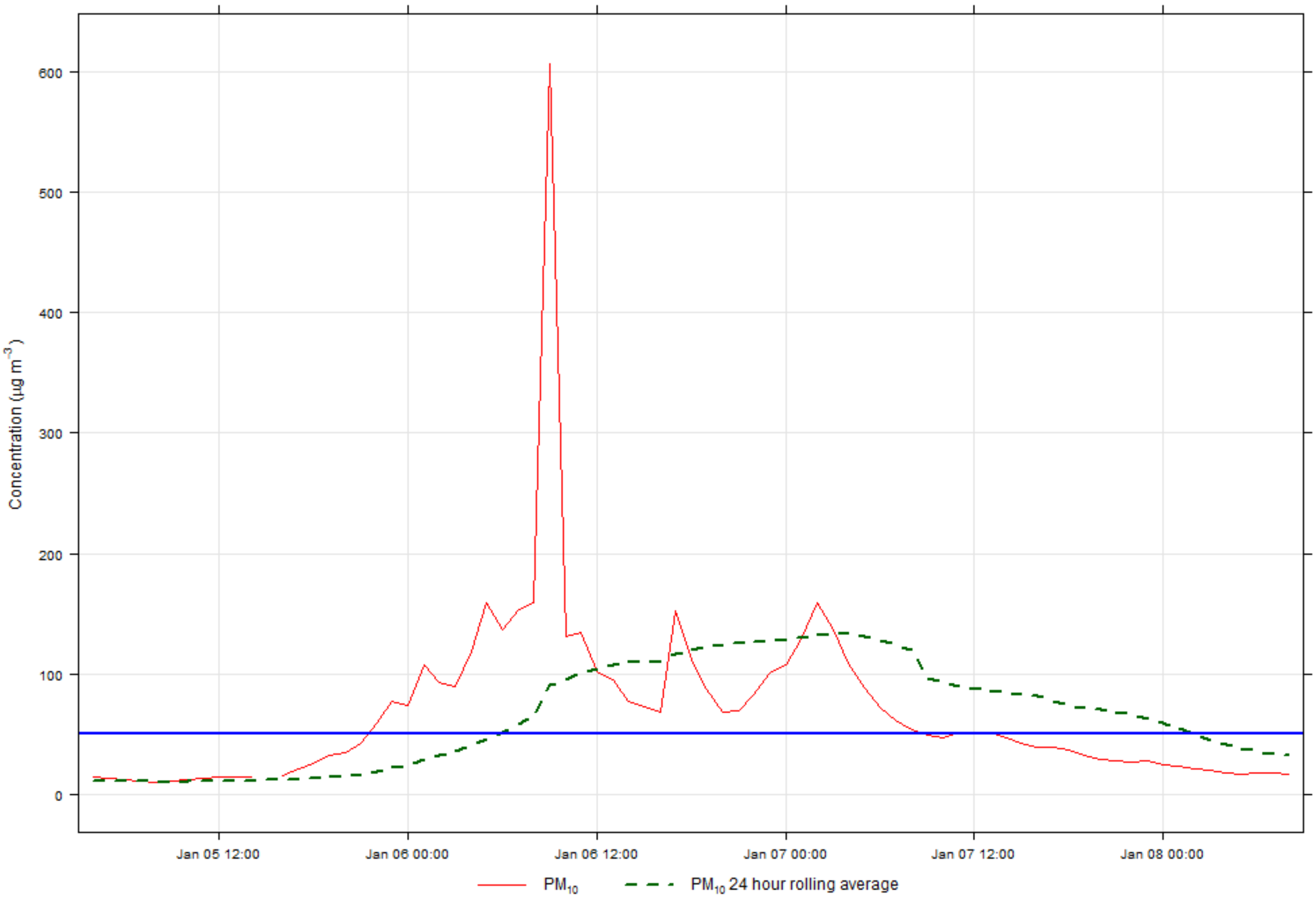


Figure E - 1: **PM_{10} time series plot. Blue line indicates 24-hour BC Ambient Air Quality Objective of 50 µg/m3.**

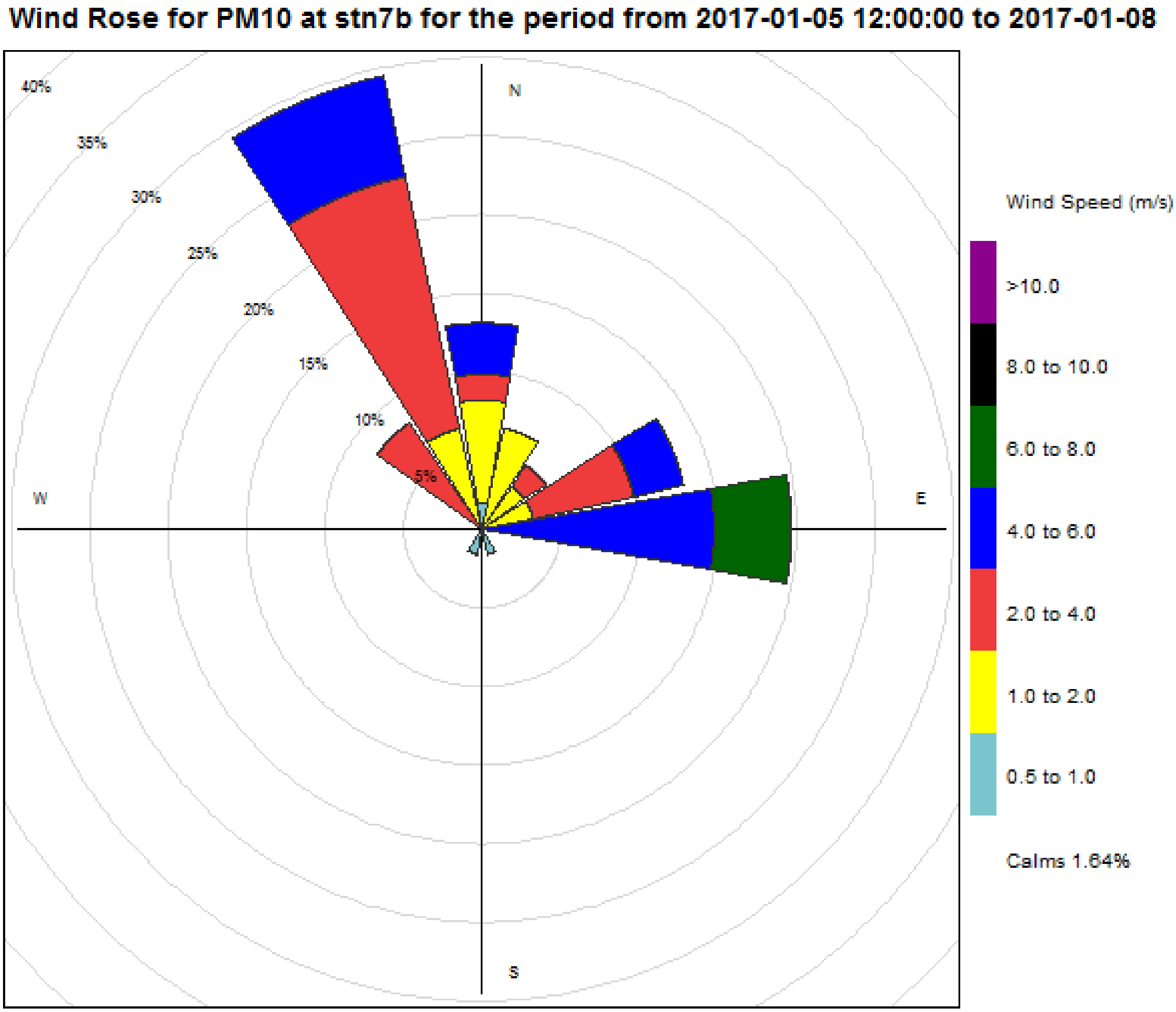


Figure E - 2: Wind rose during alert period, January 5 to 8, 2017.

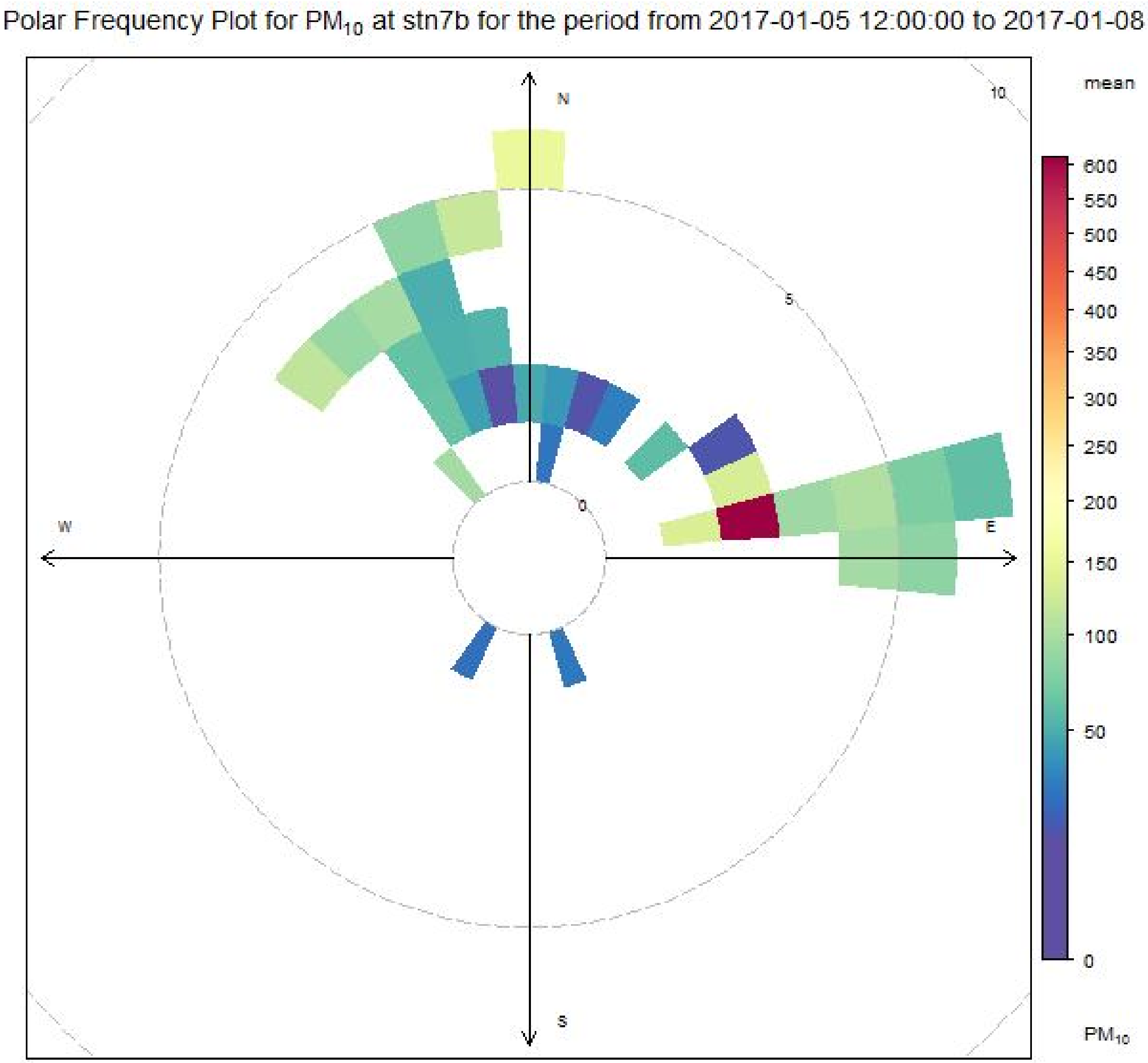


Figure E - 3: Polar frequency plot for PM_{10} during alert period, January 5 to 8, 2017.

E-2. Station 7B PM_{10} event on 2017-01-14

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 07:00 on January 14, 2017 until 13:00 on January 17, 2017 (see time series, Figure E - 4). The figure shows that this event was characterized by a series of sudden spikes to very high hourly concentrations, the first greater than 1000 µg/m^3. Hourly concentrations remained greater than the 50 µg/m^3 AAQO between the spikes for the most part as well.

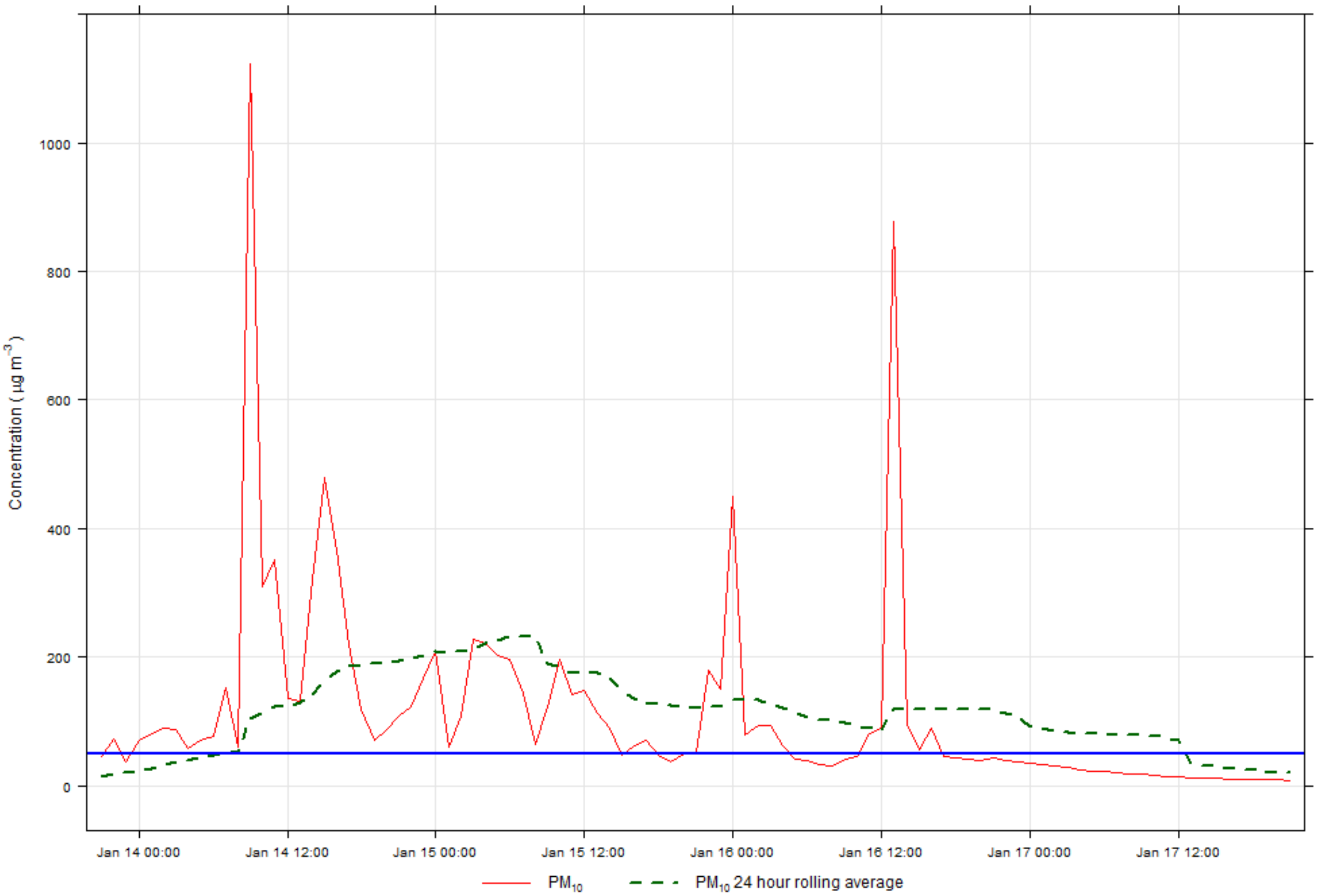


Figure E - 4: PM_{10} time series plot for the period, January 14 to 17, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind direction at the time of the event was almost exclusively from the west-southwest and wind speeds from 2 m/s to greater than 10 m/s were recorded (see wind rose, Figure E - 5). The greatest PM_{10} concentrations were observed at wind speeds of 11 and 12 m/s (see polar frequency plot, Figure E - 6). It should follow that the PM emission source was likely located to the west-southwest and could have been at some distance. Given the high wind speeds, any loose particulate matter on the snow surface could also have been transported to the particulate monitor and contributed to the high reading.

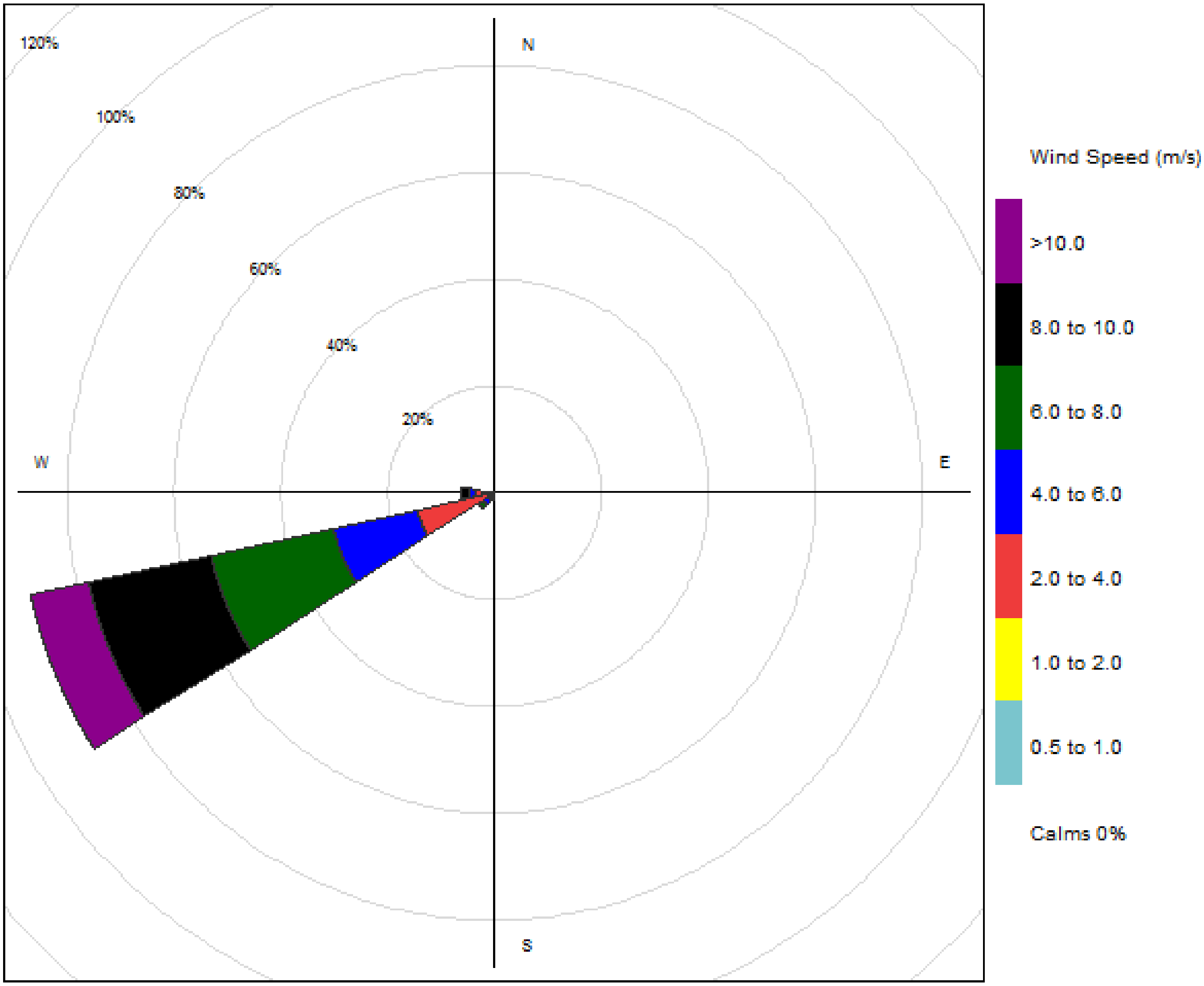


Figure E - 5: Wind rose during alert event period, January 14 to 17, 2017.

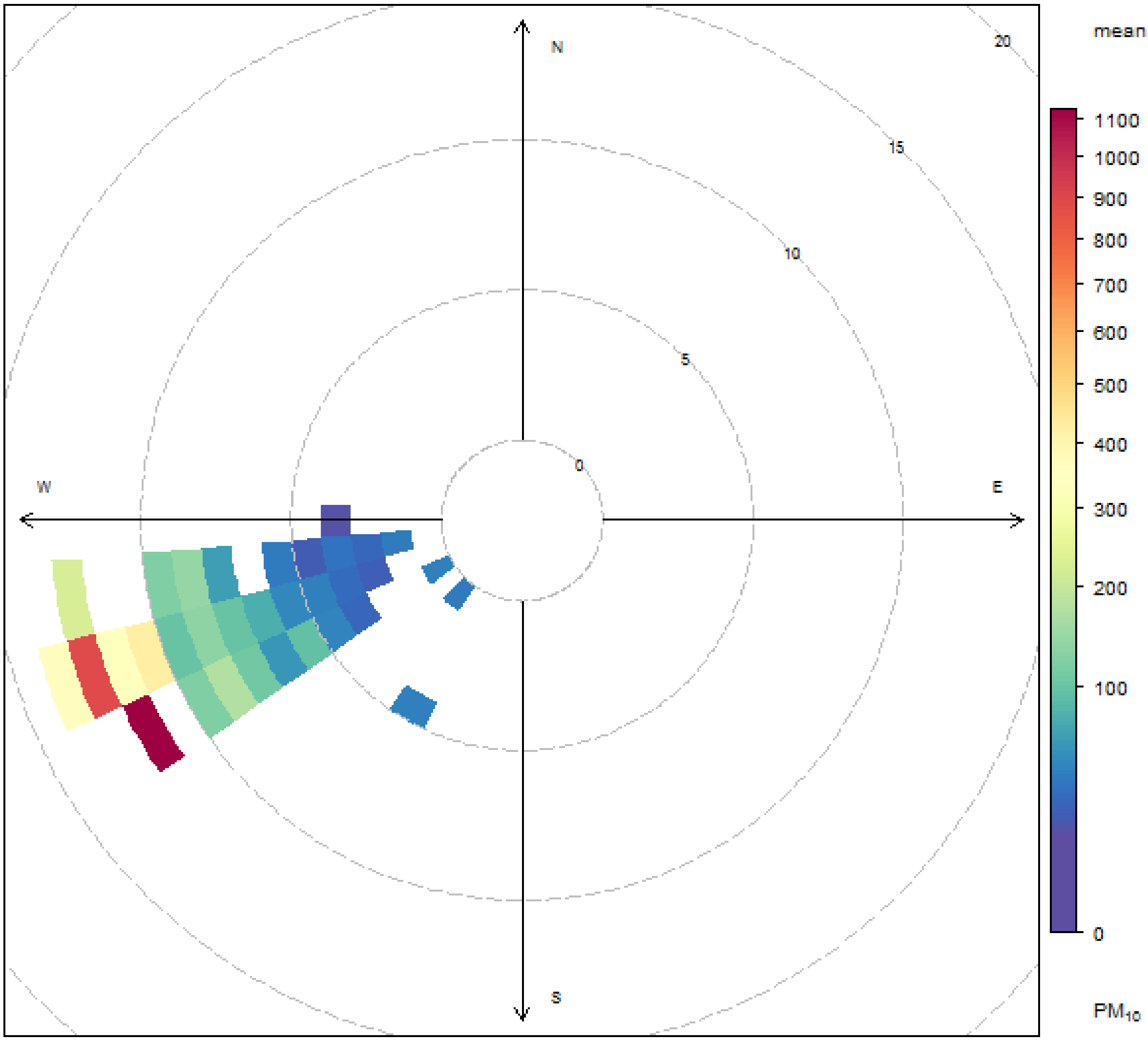


Figure E - 6: Polar frequency plot for $PM_{2.5}$ during alert event period, January 14 to 17, 2017.

E-3. Station 7B PM_{10} event on 2017-02-08

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 20:00 on February 8, 2017 until 06:00 on February 10, 2017 (see time series, Figure E - 7). The figure shows that this event was characterized by a series of sudden spikes to very high hourly concentrations (greater than 300 µg/m^3) in the afternoon of February 8 and morning of February 9 followed by a gradual decline over the following 36 hours.

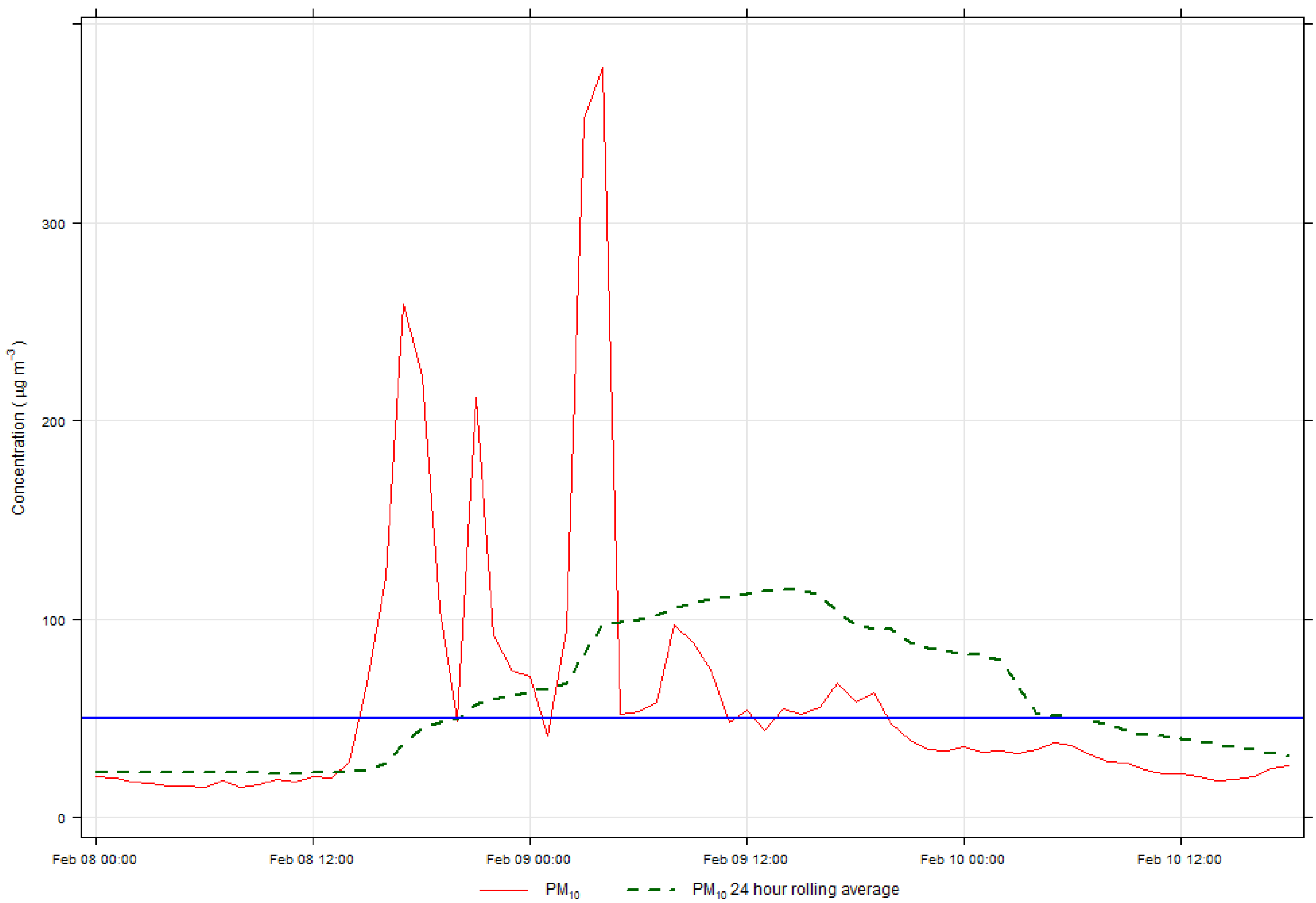


Figure E - 7: PM_{10} time series plot for the period, February 8 to 10, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were from the west and west-southwest as well and the east-northeast. Wind speeds were recorded from 0.5 to 6 m/s (see wind rose, Figure E - 8). The greatest PM_{10} concentrations were observed at low wind speeds from the east and northwest (see polar frequency plot, Figure E - 9).

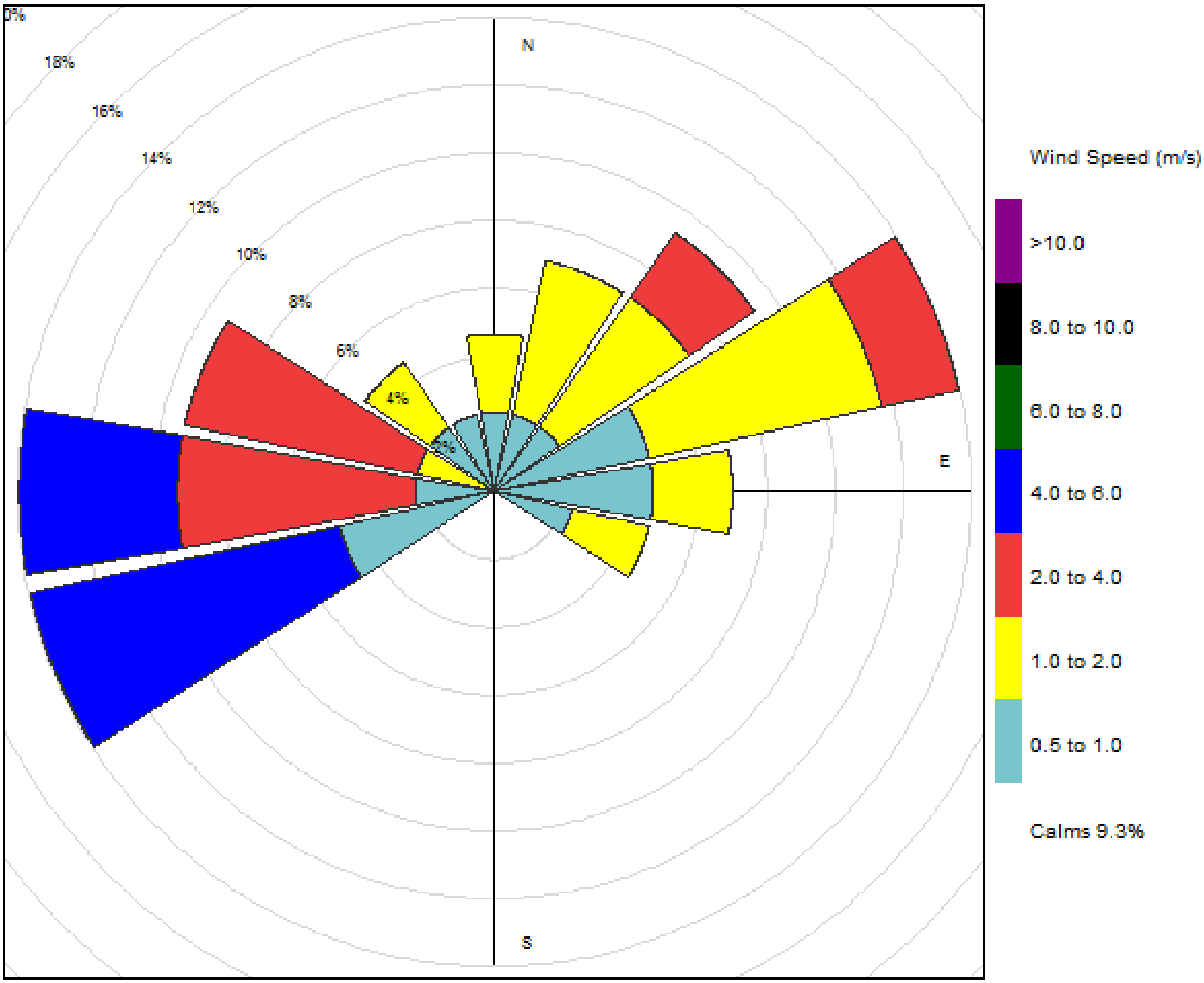


Figure E - 8: Wind rose during alert event period, February 8 to 10, 2017.

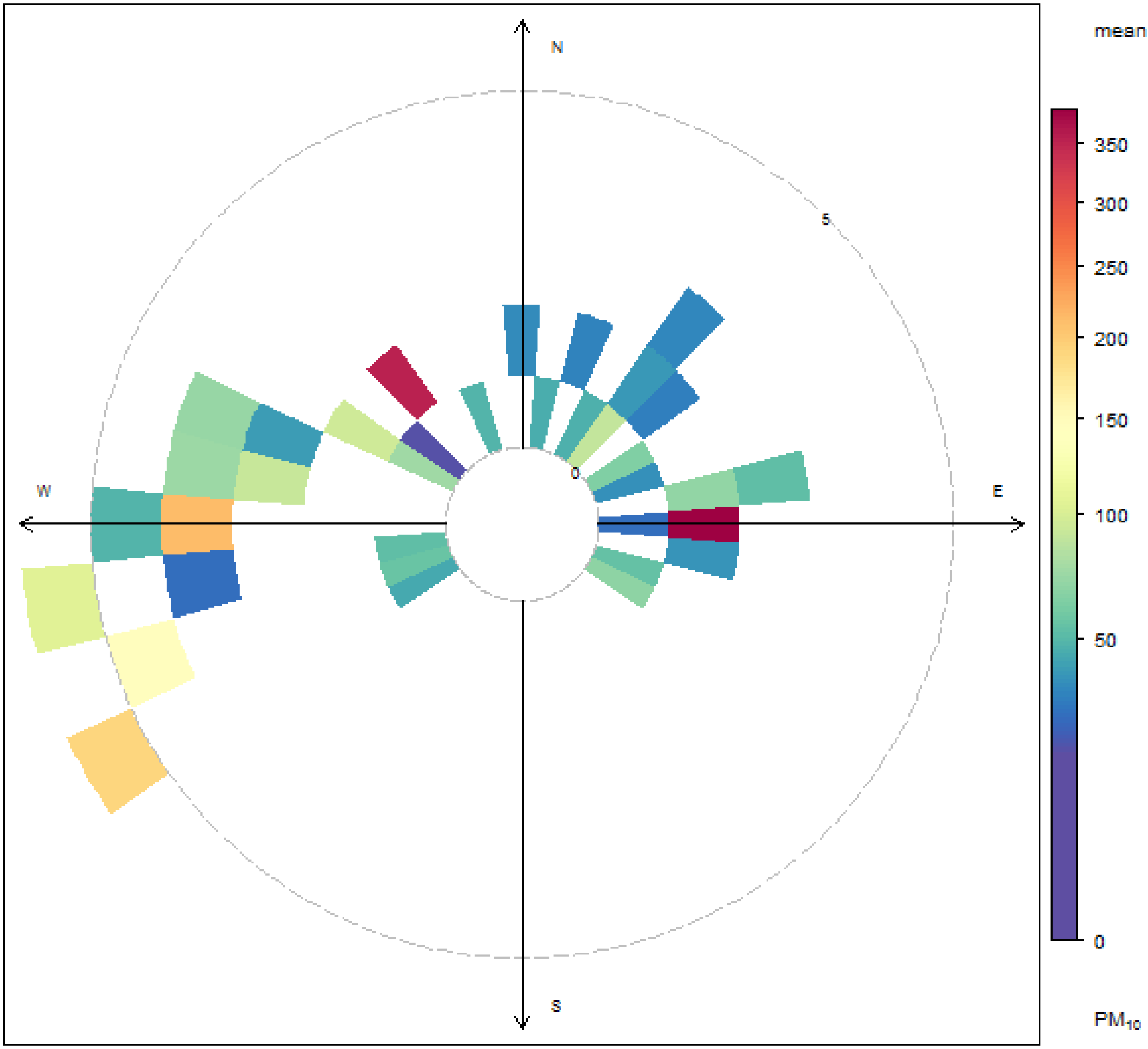


Figure E - 9: Polar frequency plot for $PM_{2.5}$ during alert event period, February 8 to 10, 2017.

E-4. Station 7B PM_{10} event on 2017-02-11

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 11:00 on February 11, 2017 until 05:00 on February 14, 2017 (see time series, Figure E - 10). The figure shows that this event was characterized by a few spikes of very high hourly concentrations (greater than 1500 µg/m^3) interspersed with periods of generally elevated PM_{10} concentrations (> 100 µg/m^3).

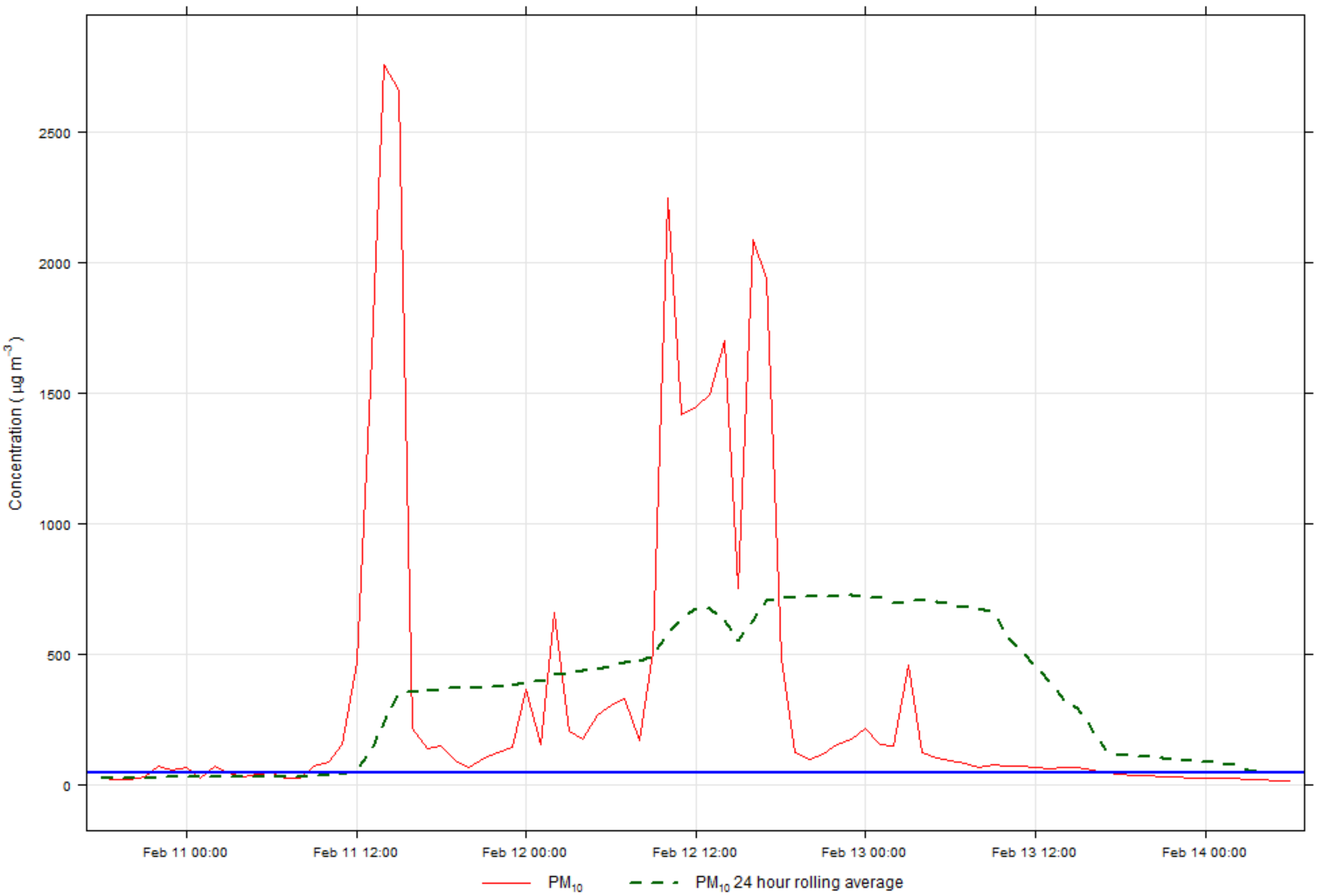


Figure E - 10: PM_{10} time series plot for the period, February 11 to 13, 2017, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the west-southwest. Wind speeds were recorded from 2 to greater than 10 m/s (see wind rose, Figure E - 11). The greatest PM_{10} concentrations were observed during high wind speeds from the west-southwest (see polar frequency plot, Figure E - 12).

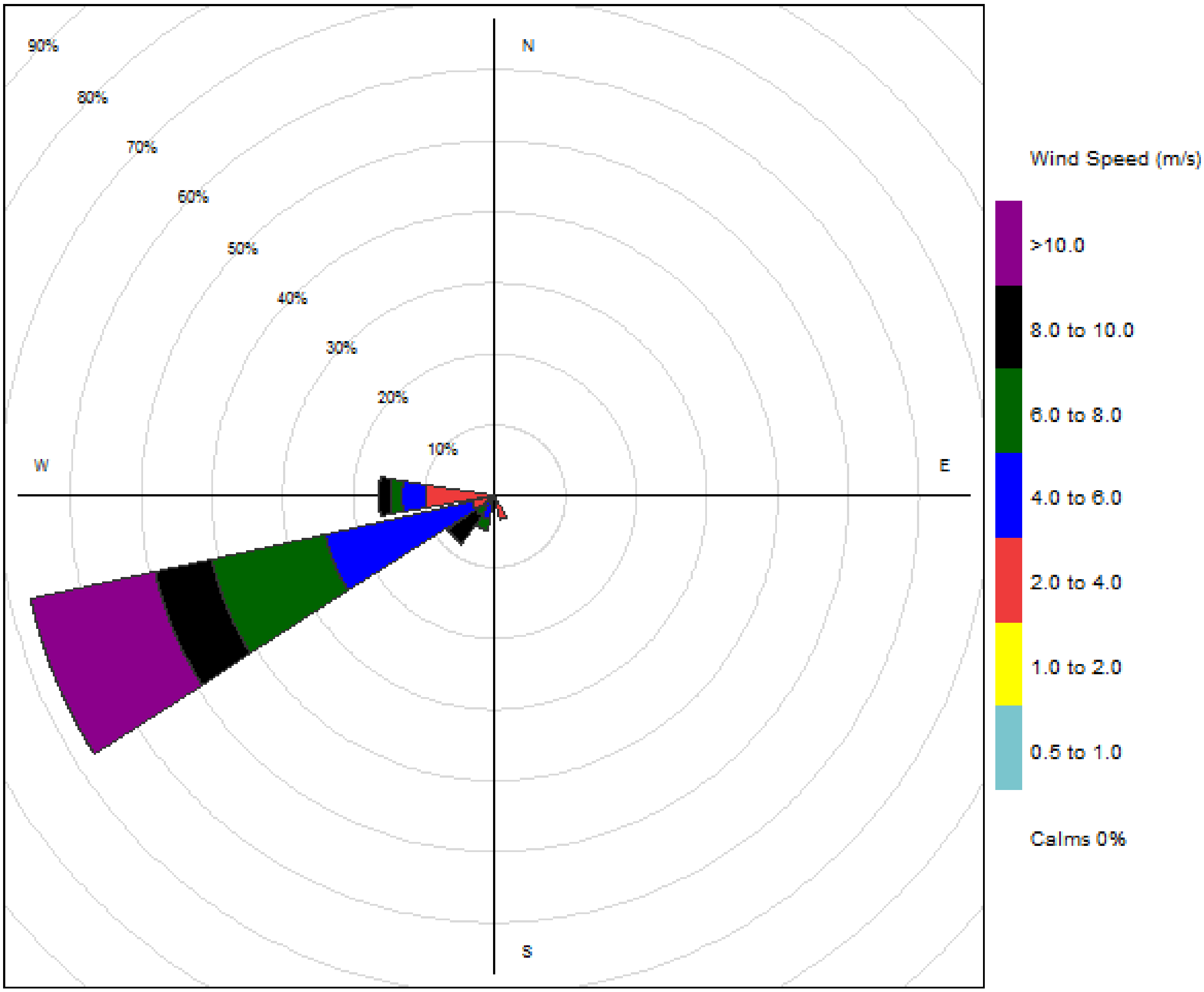


Figure E - 11: Wind rose during alert event period, February 11 to 13, 2017, 2017.

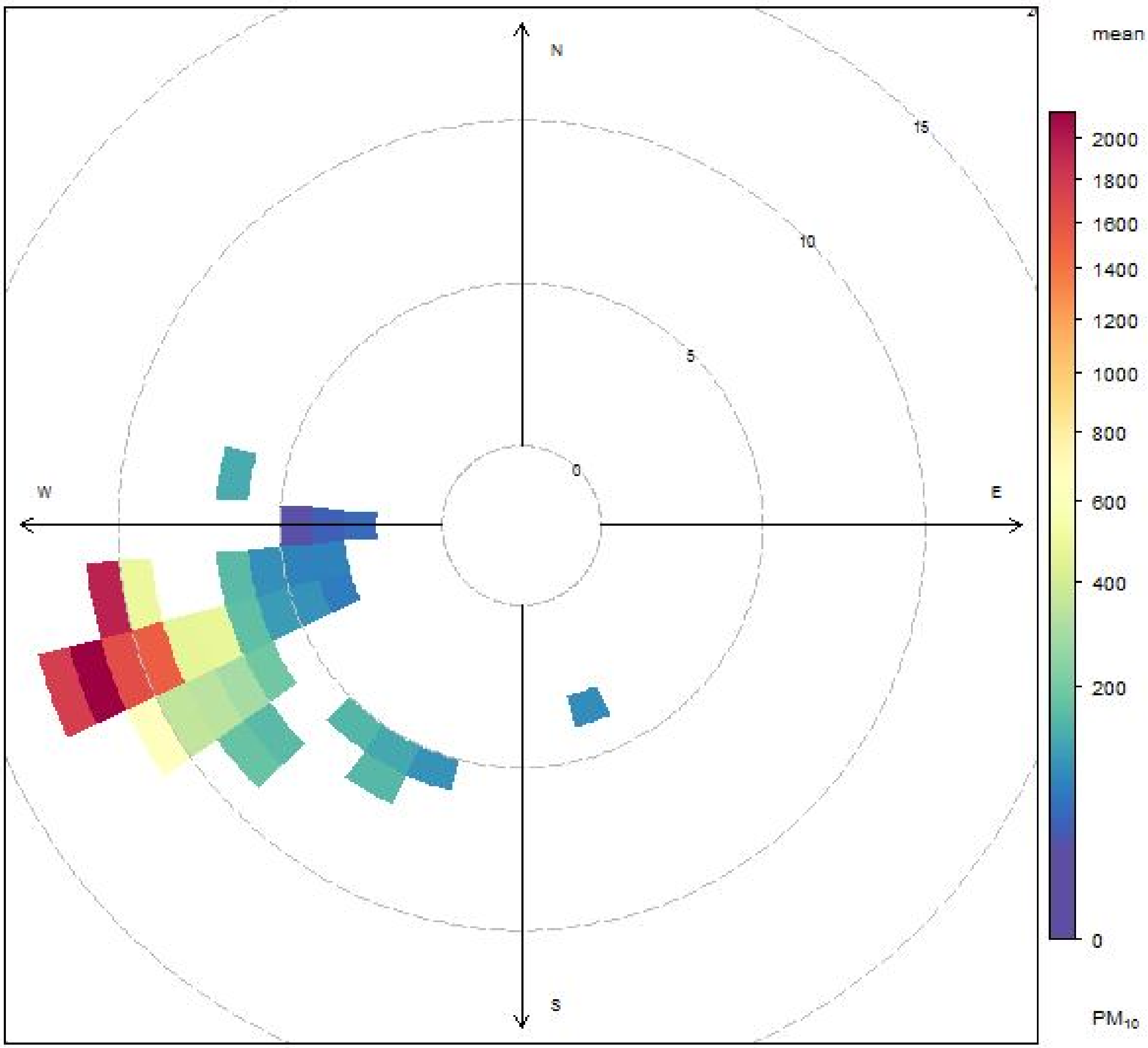


Figure E - 12: Polar frequency plot for $PM_{2.5}$ during alert event period, February 11 to 13, 2017.

E-5. Station 7B $PM_{2.5}$ event on 2017-02-12

The 24 hour rolling average $PM_{2.5}$ concentrations at Station 7B were greater than the BC MOE 24-hourAAQO of 25 µg/m^3 from 16:00 on February 12, 2017 until 09:00 on February 13, 2017 (see time series, Figure E - 13). The figure shows that this event was characterized by an 8-hour period of sustained elevated hourly concentrations (greater than 60 µg/m^3).

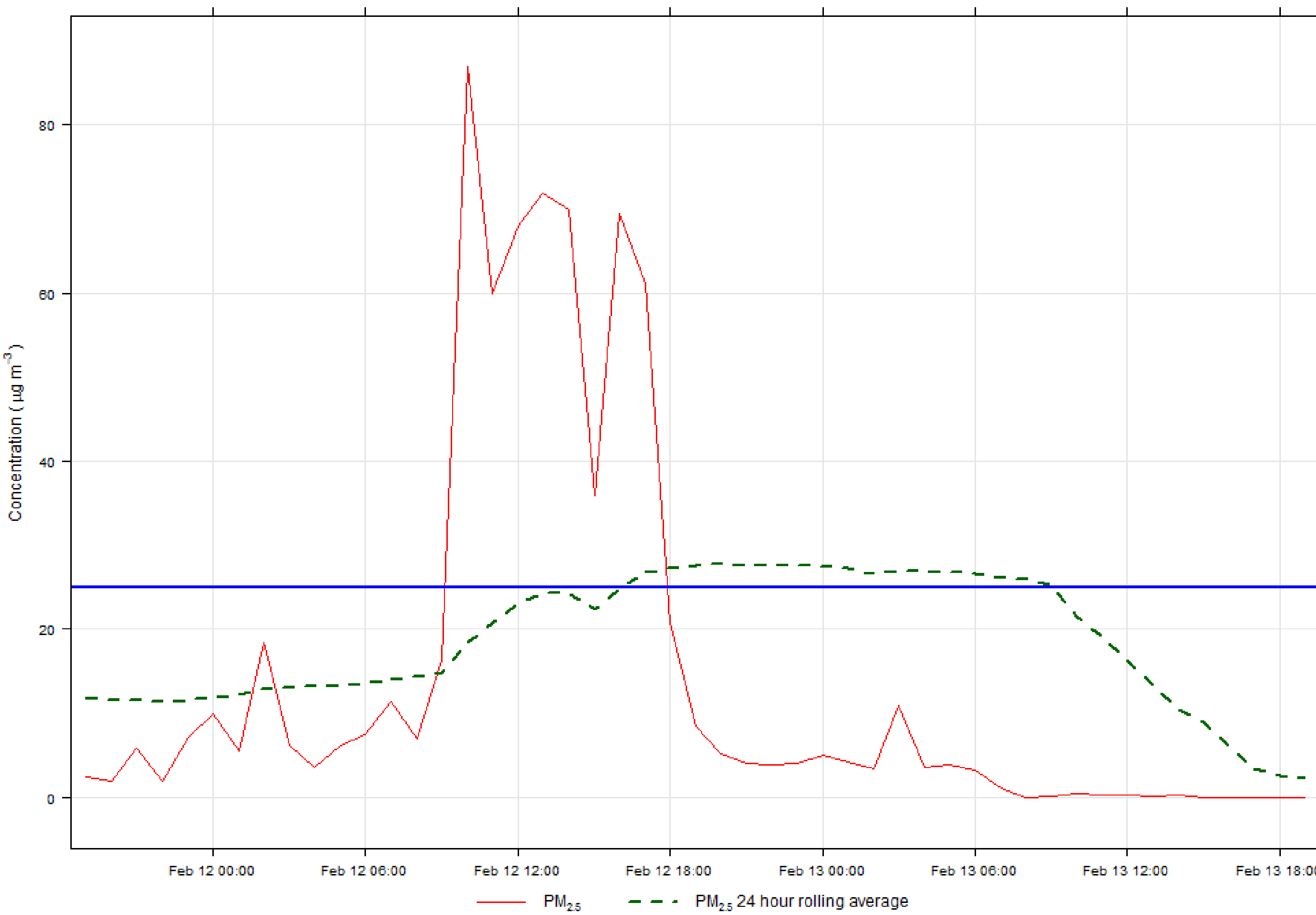


Figure E - 13: $PM_{2.5}$ time series plot for the period, February 12, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m^3

Wind directions at the time of the event were predominantly from the west-southwest. Wind speeds were recorded from 6 to greater than 10 m/s (see wind rose, Figure E - 14). The greatest $PM_{2.5}$ concentrations were observed during the high wind speeds from the west-southwest (see polar frequency plot, Figure E - 15).

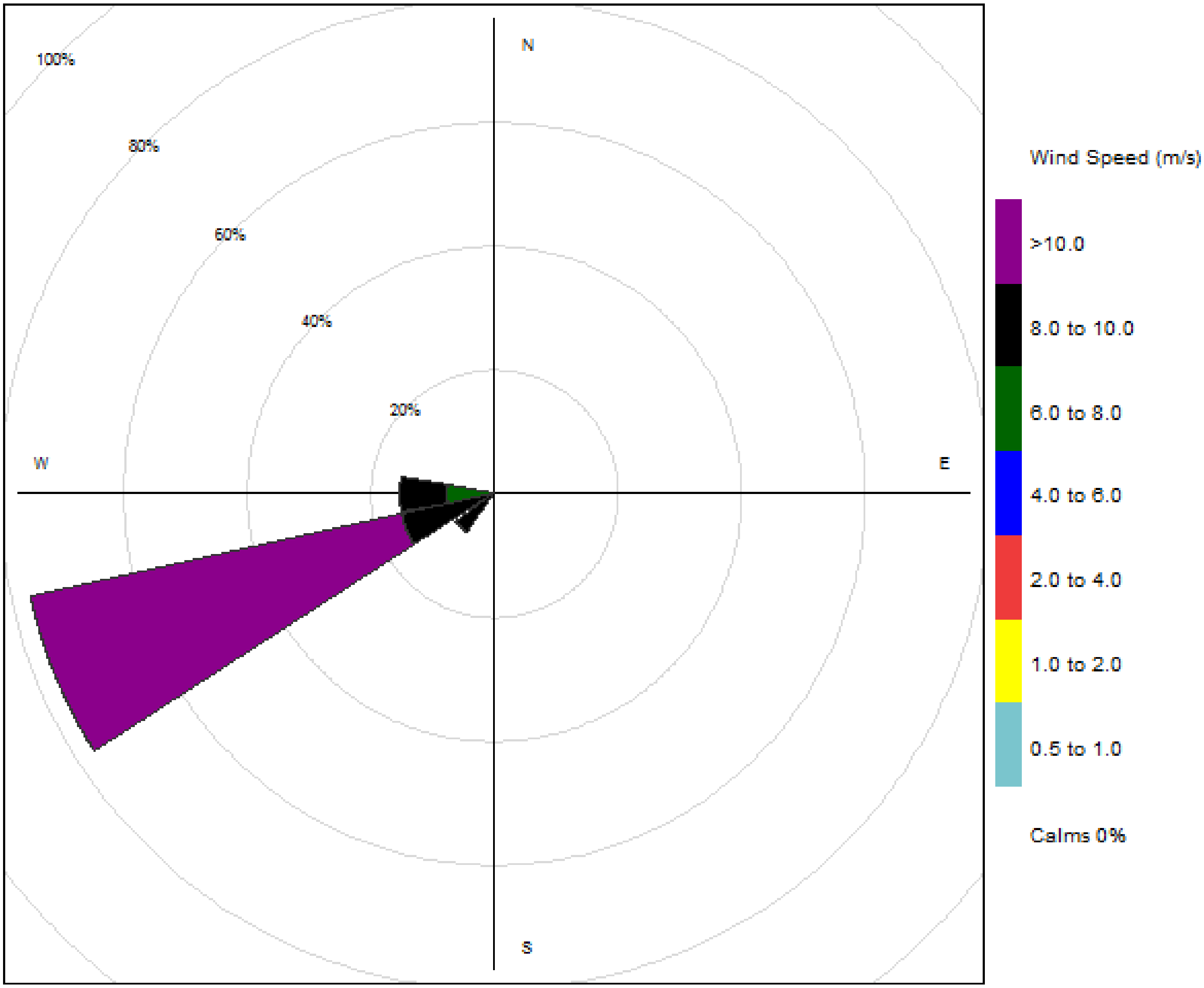


Figure E - 14: Wind rose during alert event period, February 12 to February 13, 2017.

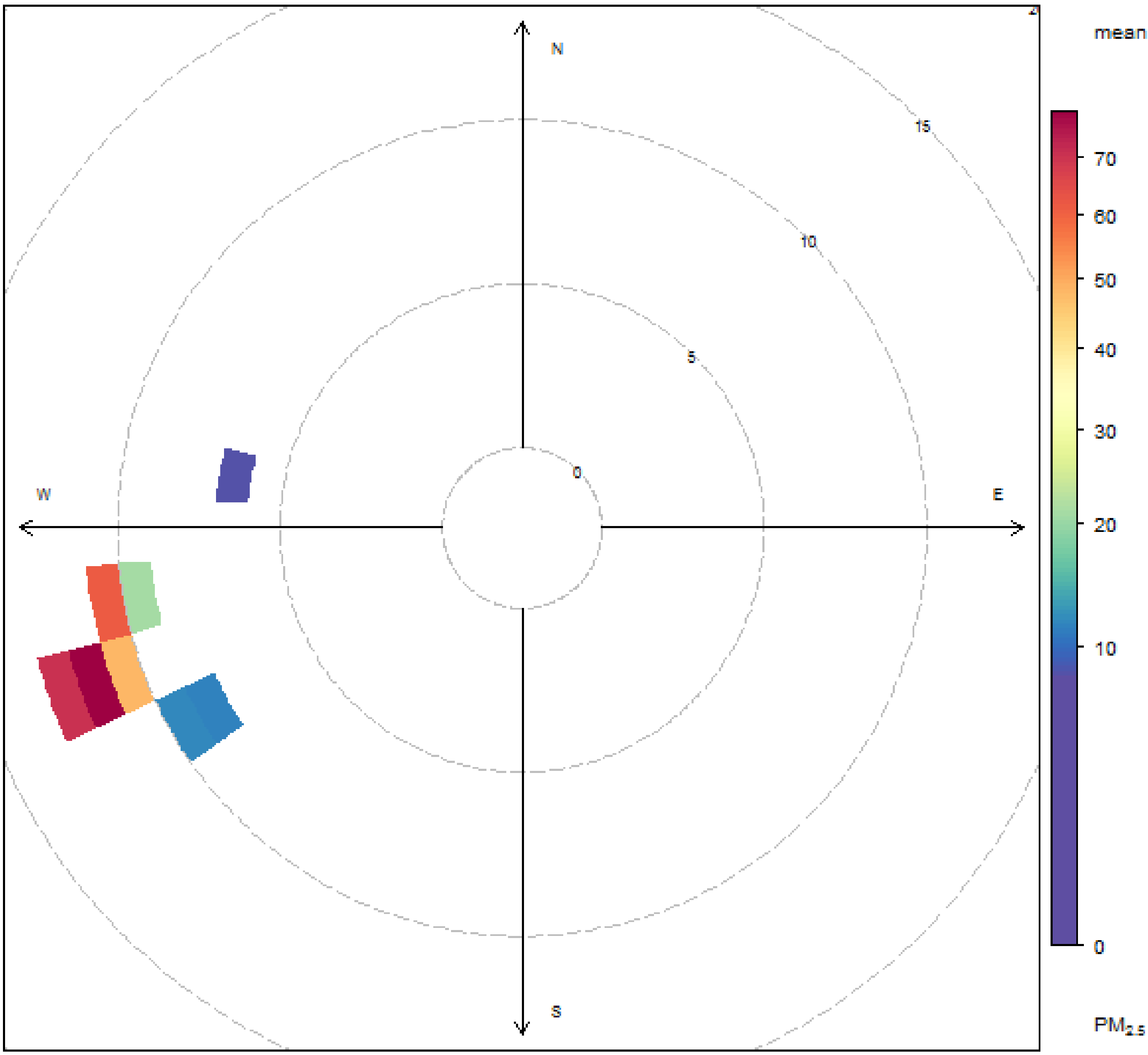


Figure E - 15: Polar frequency plot for $PM_{2.5}$ during alert event period, February 12 to February 13, 2017.

E-6. Station 7B PM_{10} event on 2017-02-15

Due to interruptions in data collection by this instrument around the time of the event, a rolling 24-hour average of PM_{10} concentrations could not be calculated for the time when the excursion began. However, the event that would have caused the alerting system to activate can still be identified based on the trends in the hourly averages as beginning at Station 7B at 14:00 on February 15 and ending at 13:00 on February 16 (see time series, Figure E - 16). The figure shows that this event was characterized by an initial spike of very high hourly concentrations (greater than 400 µg/m^3) followed by a gradual decline over the next 24 hours to below the AAQO.

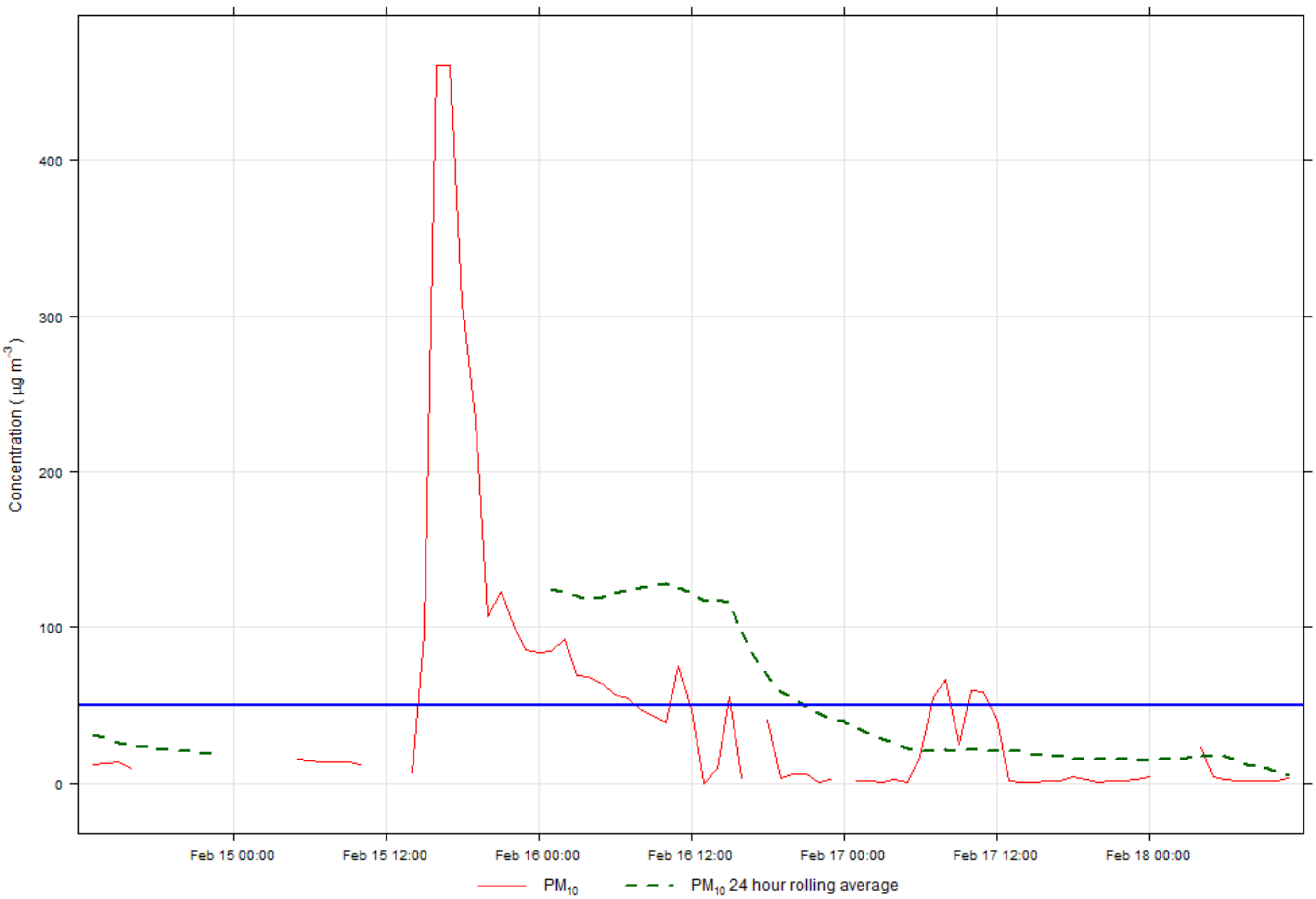


Figure E - 16: PM_{10} time series plot for the period, February 15 to February 17, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the west-southwest and southwest. Wind speeds were recorded from 0.5 to greater than 10 m/s (see wind rose, Figure E - 17). The greatest PM_{10} concentrations were observed at high wind speeds from the west-southwest (see polar frequency plot, Figure E - 18).

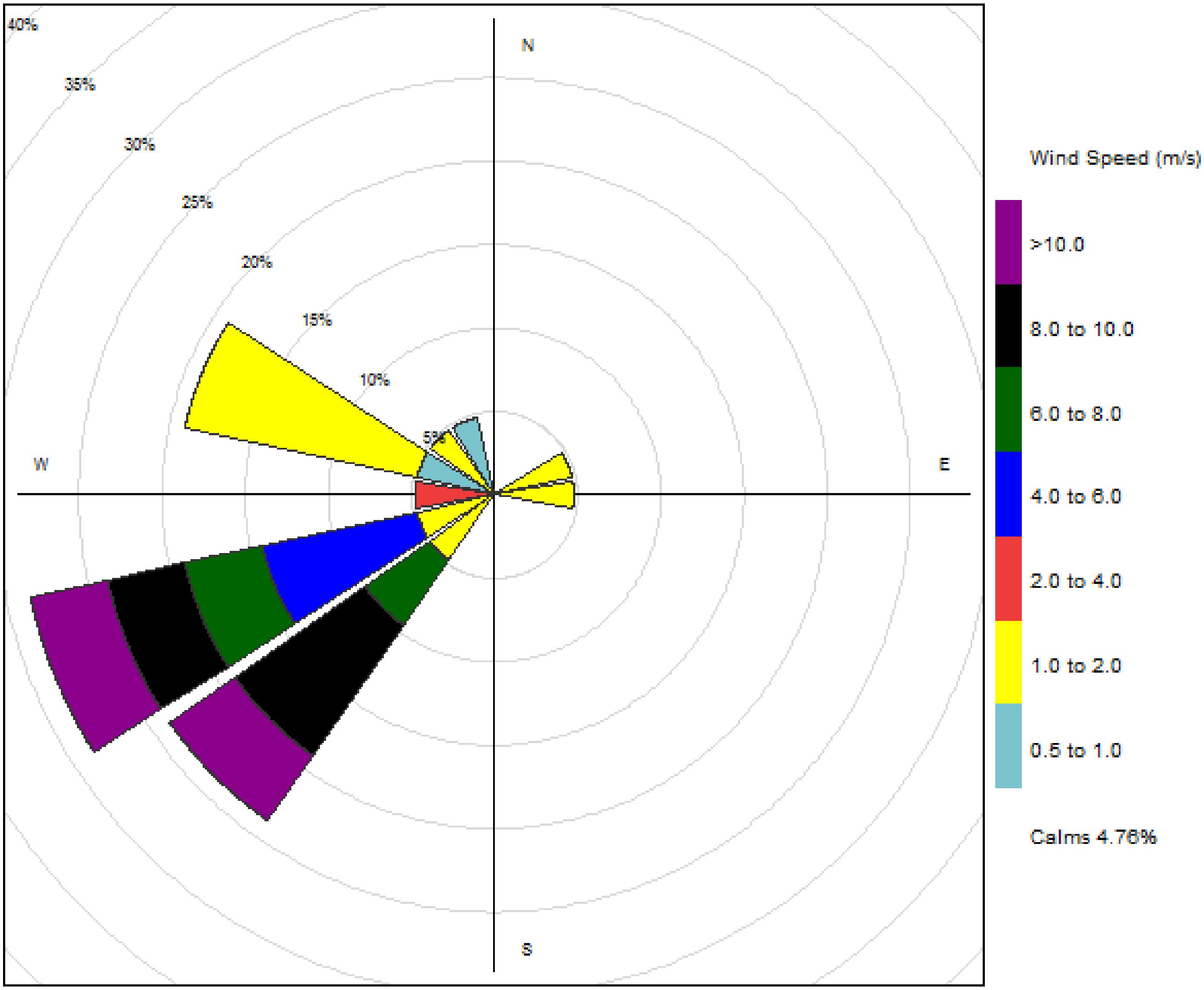


Figure E - 17: Wind rose during the alert event period, February 15 to February 17, 2017.

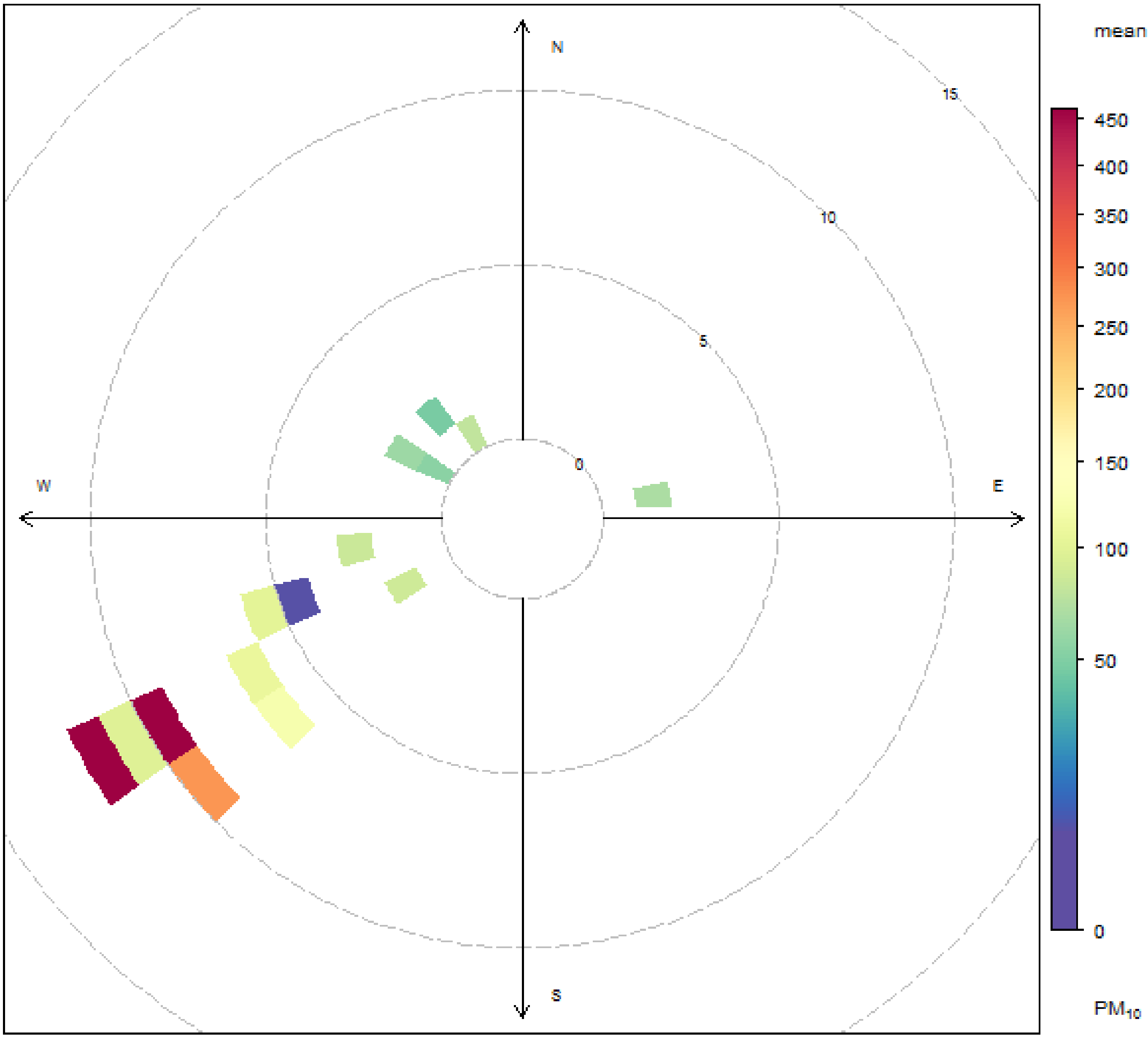


Figure E - 18: Polar frequency plot for PM_{10} during the alert event period, February 15 to February 17, 2017.

E-7. Station 7B PM_{10} event on 2017-02-24

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 21:00 on February 24, 2017, until 08:00 on February 26, 2017 (see time series, Figure E - 19). The figure shows that this event was characterized by an initial spike of very high hourly concentrations (greater than 200 µg/m^3) followed by lower concentrations and then another spike of even higher hourly concentrations (greater than 400 µg/m^3).

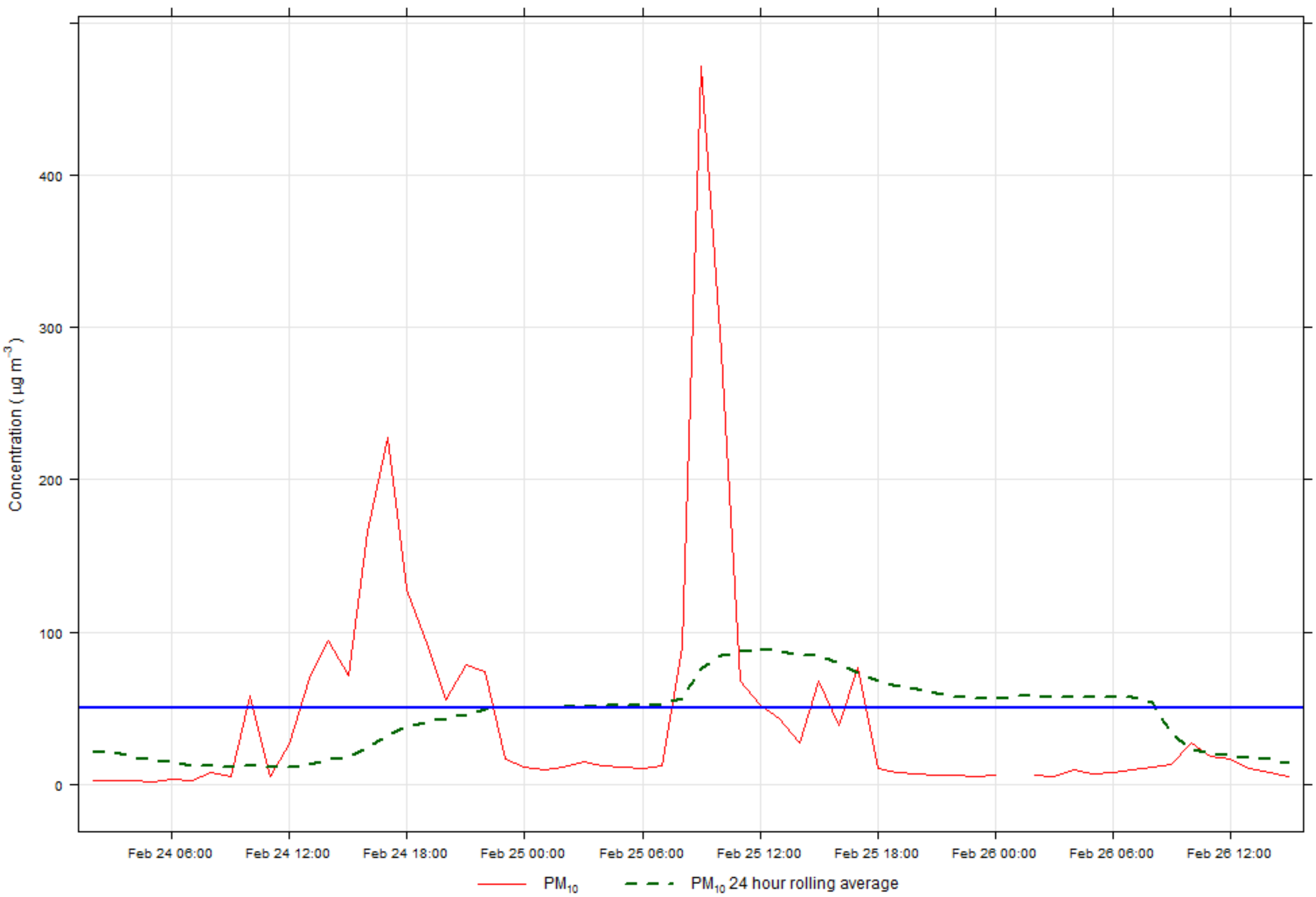


Figure E - 19: PM_{10} time series plot for the period, February 24 to February 26, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the northwest and the southwest. Wind speeds were recorded from 0.5 to 6 m/s (see wind rose, Figure E - 20). The greatest PM_{10} concentrations were observed at low wind speeds from the west-northwest and additional high concentrations were observed at low to moderate wind speeds from the west-southwest (see polar frequency plot, Figure E - 21). This indicated that the two spikes in Figure E - 19 likely originated from different sources.

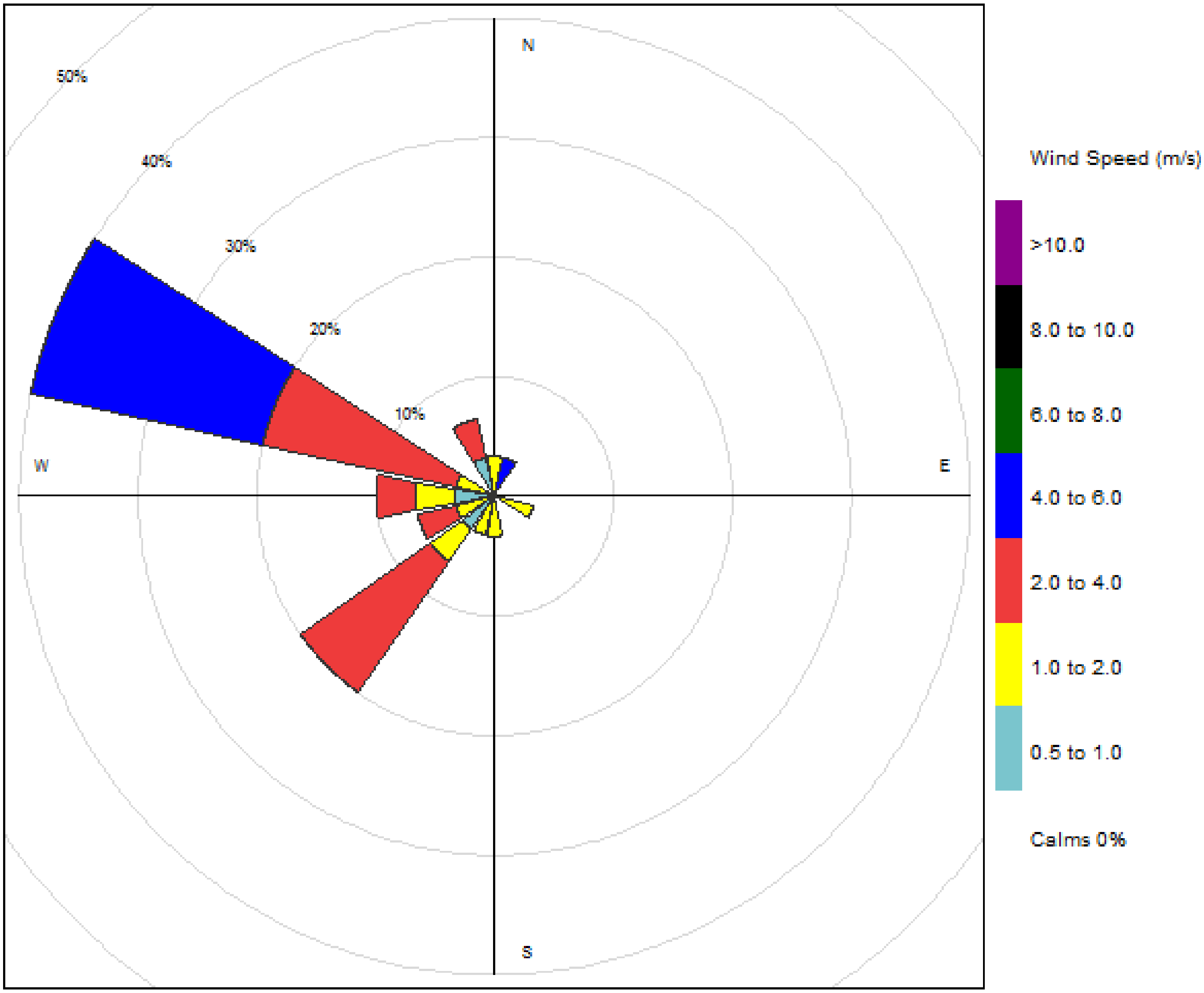


Figure E - 20: Wind rose during the alert event period, February 24 to February 26, 2017.

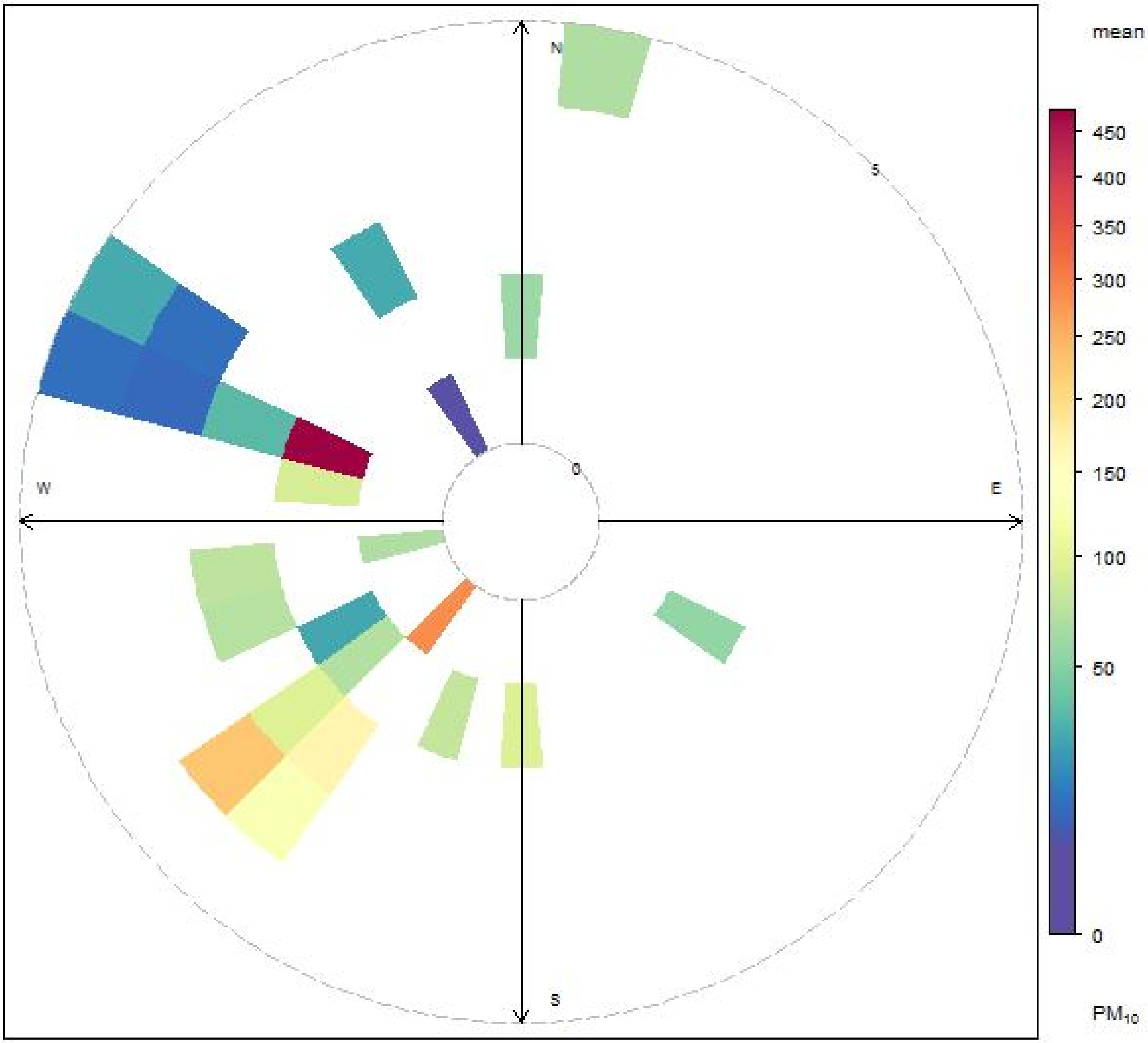


Figure E - 21: Polar frequency plot for PM_{10} during the alert event period, February 24 to February 26, 2017.

E-8. Station 7B PM_{10} event on 2017-04-04

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 18:00 on April 04, 2017, until 01:00 on April 06, 2017 (see time series, Figure E - 22). The figure shows that this event was characterized by a spike of very high hourly concentrations (greater than 300 µg/m^3) followed by lower concentrations and then another longer lived increase to higher concentrations (> 150 µg/m^3) which rapidly decreased to below the AAQO (50 µg/m^3). A dust advisory issued by BC MOE and Northern Health was in effect at the time of this event.

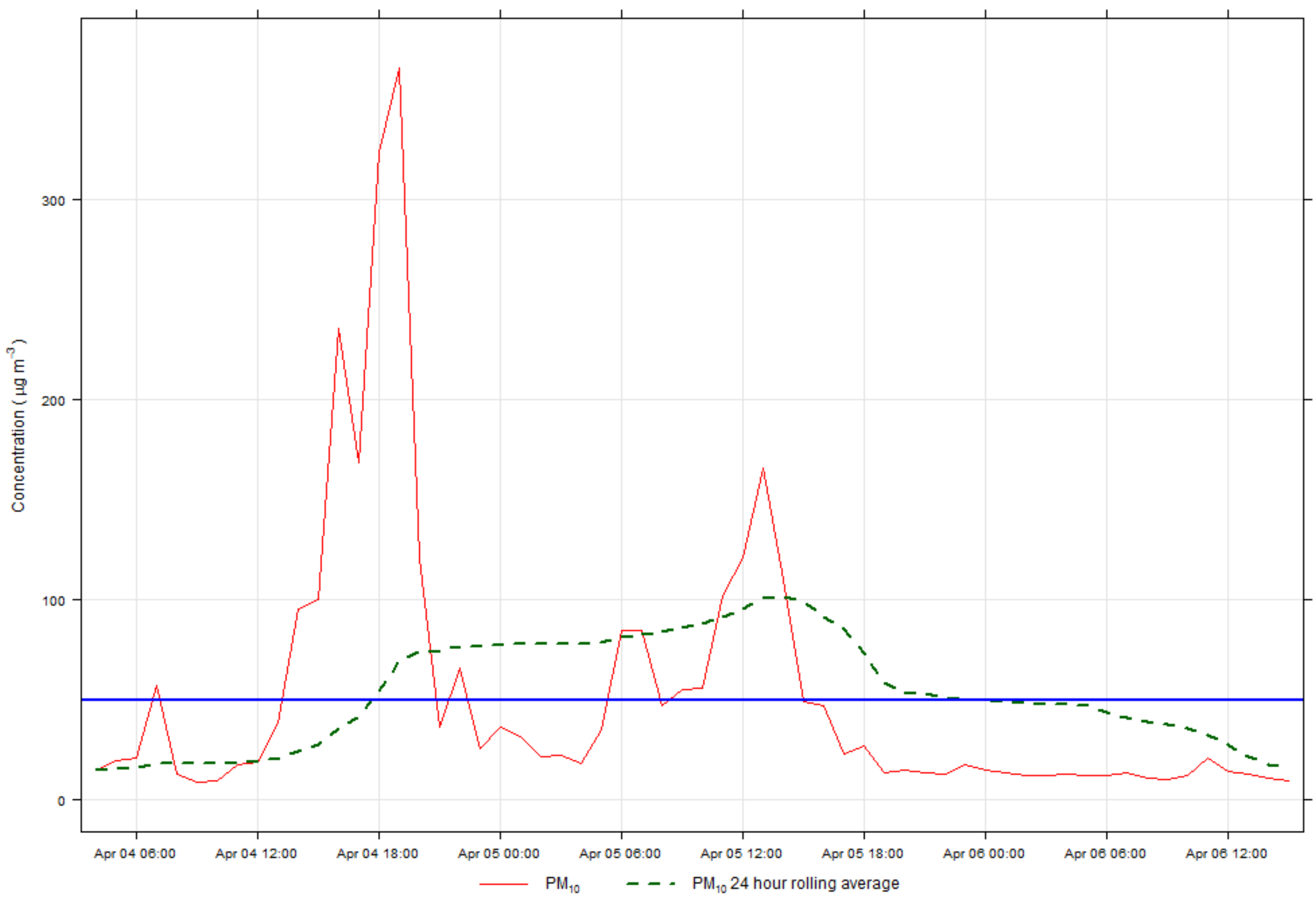


Figure E - 22: PM_{10} time series plot for the period, April 04 to April 06, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were from the east. Wind speeds were recorded from 2 to 6 m/s (see wind rose, Figure E - 23). The greatest PM_{10} concentrations were observed at wind speeds of 5 to 6 m/s from the east (see polar frequency plot, Figure E - 24).

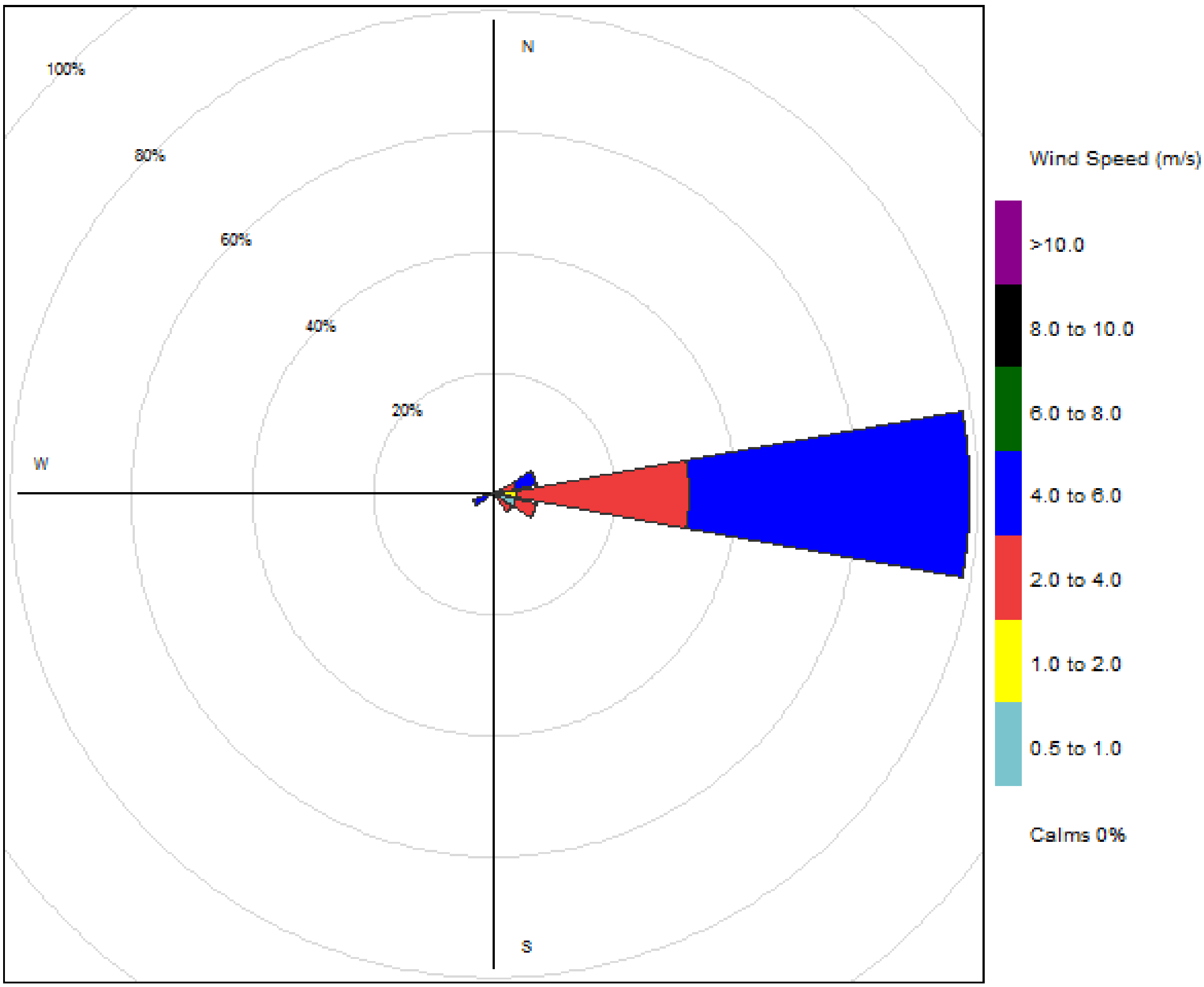


Figure E - 23: Wind rose during the alert event period, April 04 to April 06, 2017.

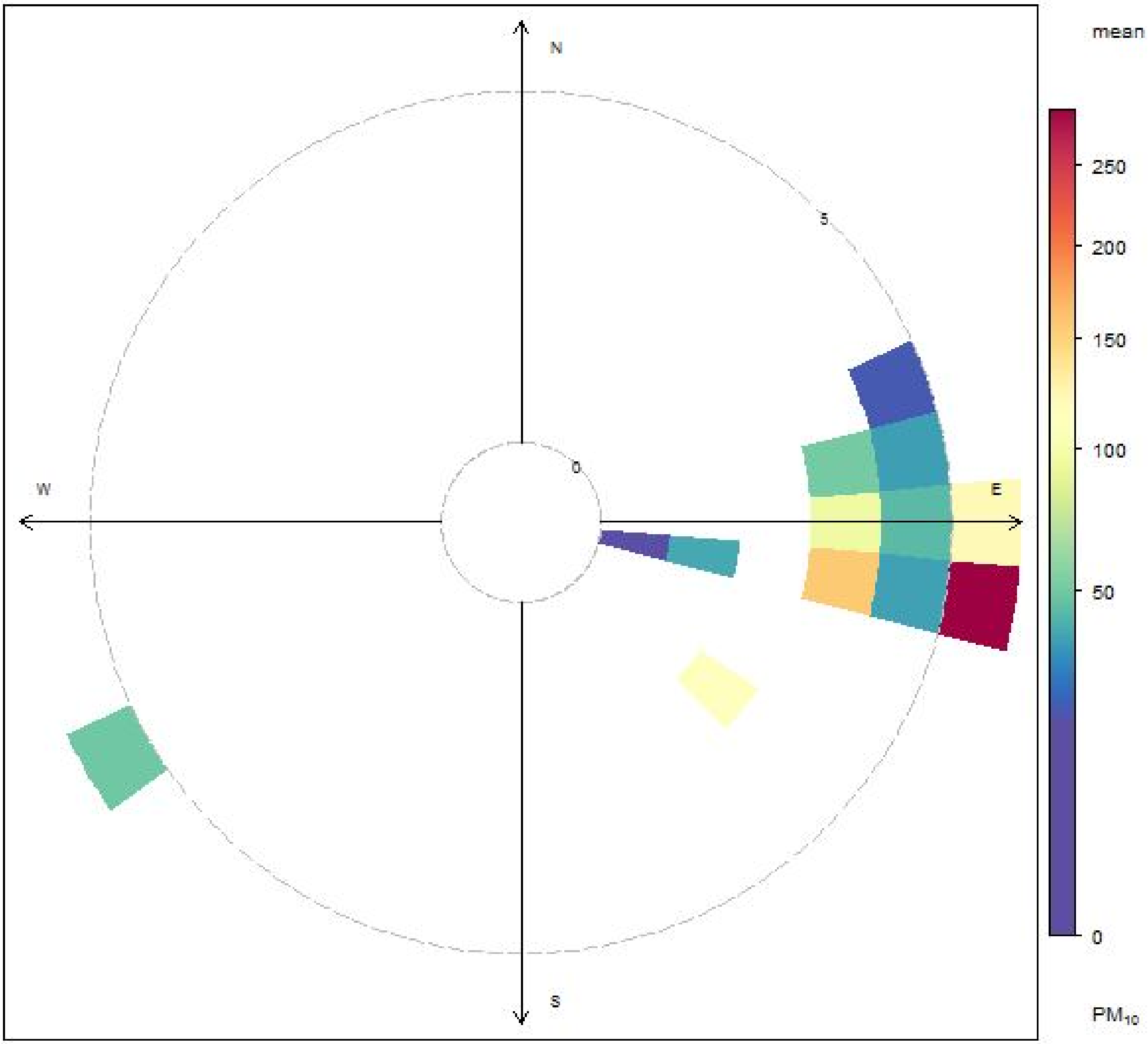


Figure E - 24: Polar frequency plot for PM_{10} during the alert event period, April 04 to April 06, 2017.

E-9. Station 7B PM_{10} event on 2017-04-07

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 04:00 on April 07, 2017, until 08:00 on April 08, 2017 (see time series, Figure E - 25). The figure shows that this event was characterized by a first short-lived spike of high hourly concentrations (greater than 250 µg/m^3) followed by lower PM_{10} concentrations in the early morning of February 7 and then a 6 hour period of elevated concentrations (> 100 µg/m^3). A dust advisory issued by BC MOE and Northern Health was in effect at the time of this event.

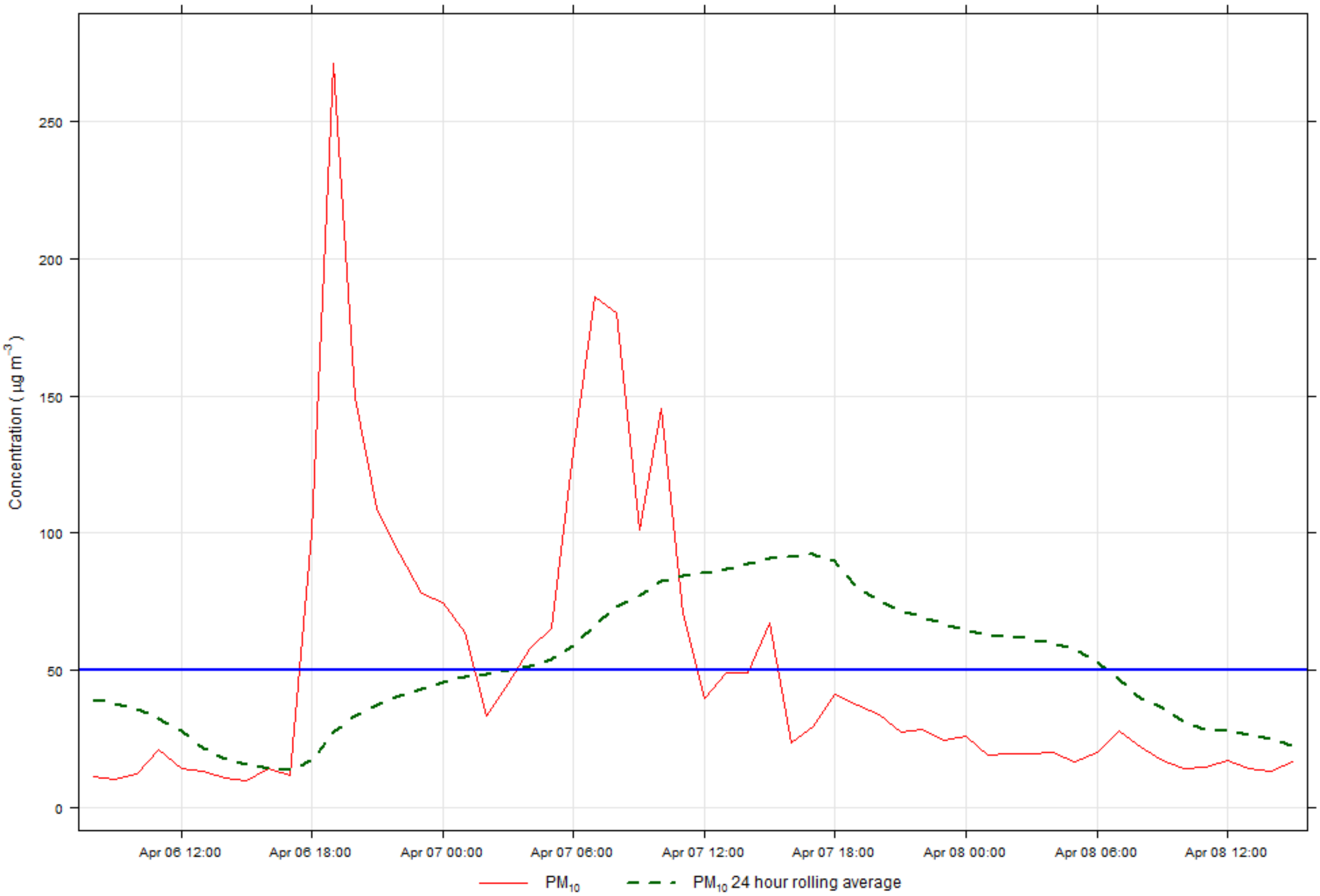


Figure E - 25: PM_{10} time series plot for the period, April 07 to April 08, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the northeast and the east-southeast. Wind speeds were recorded from 0.5 to 8 m/s during this event (see wind rose, Figure E - 26). The greatest PM_{10} concentrations were observed at high wind speeds from the east (see polar frequency plot, Figure E - 27).

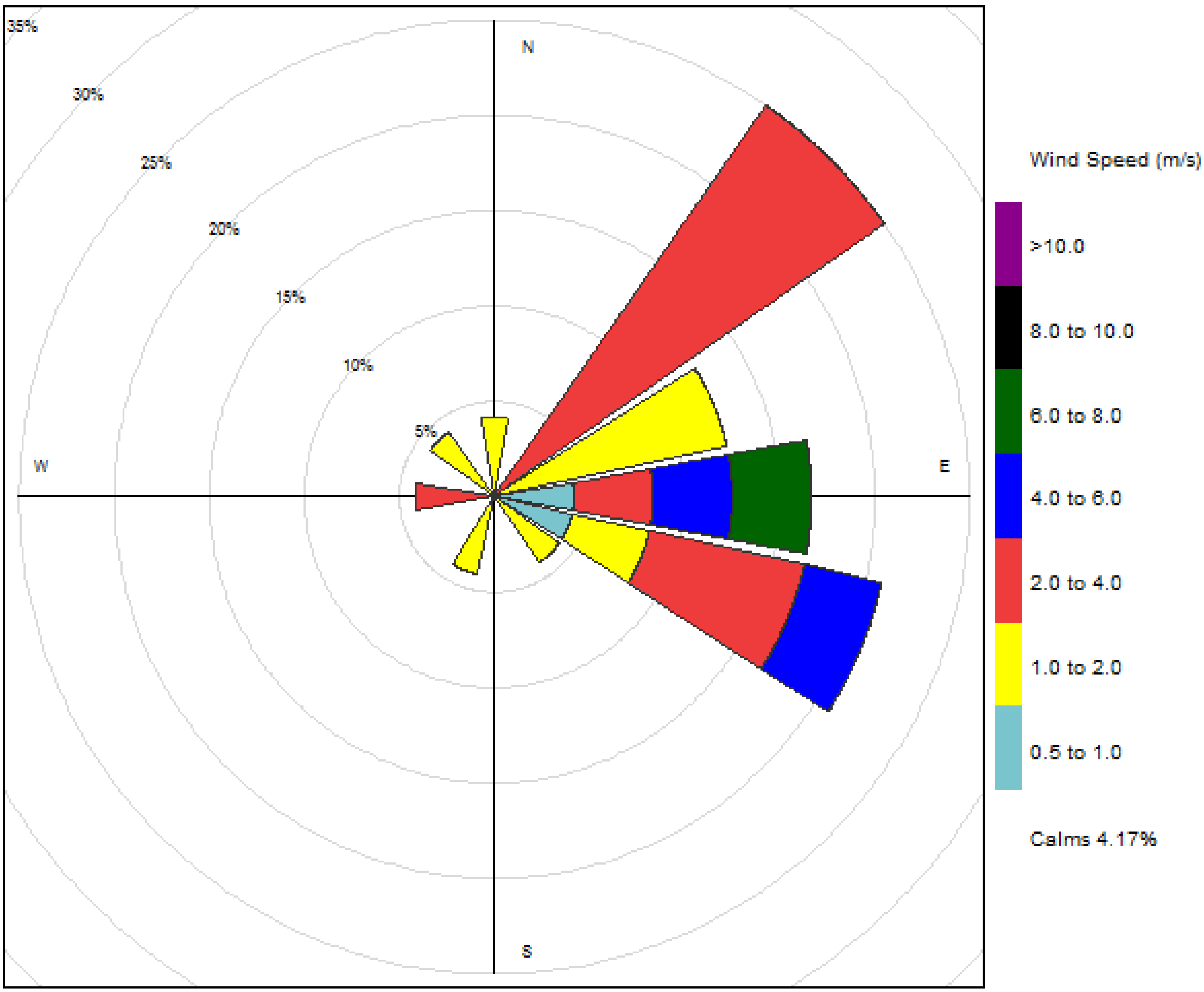


Figure E - 26: Wind rose during the alert event period, April 07 to April 08, 2017.

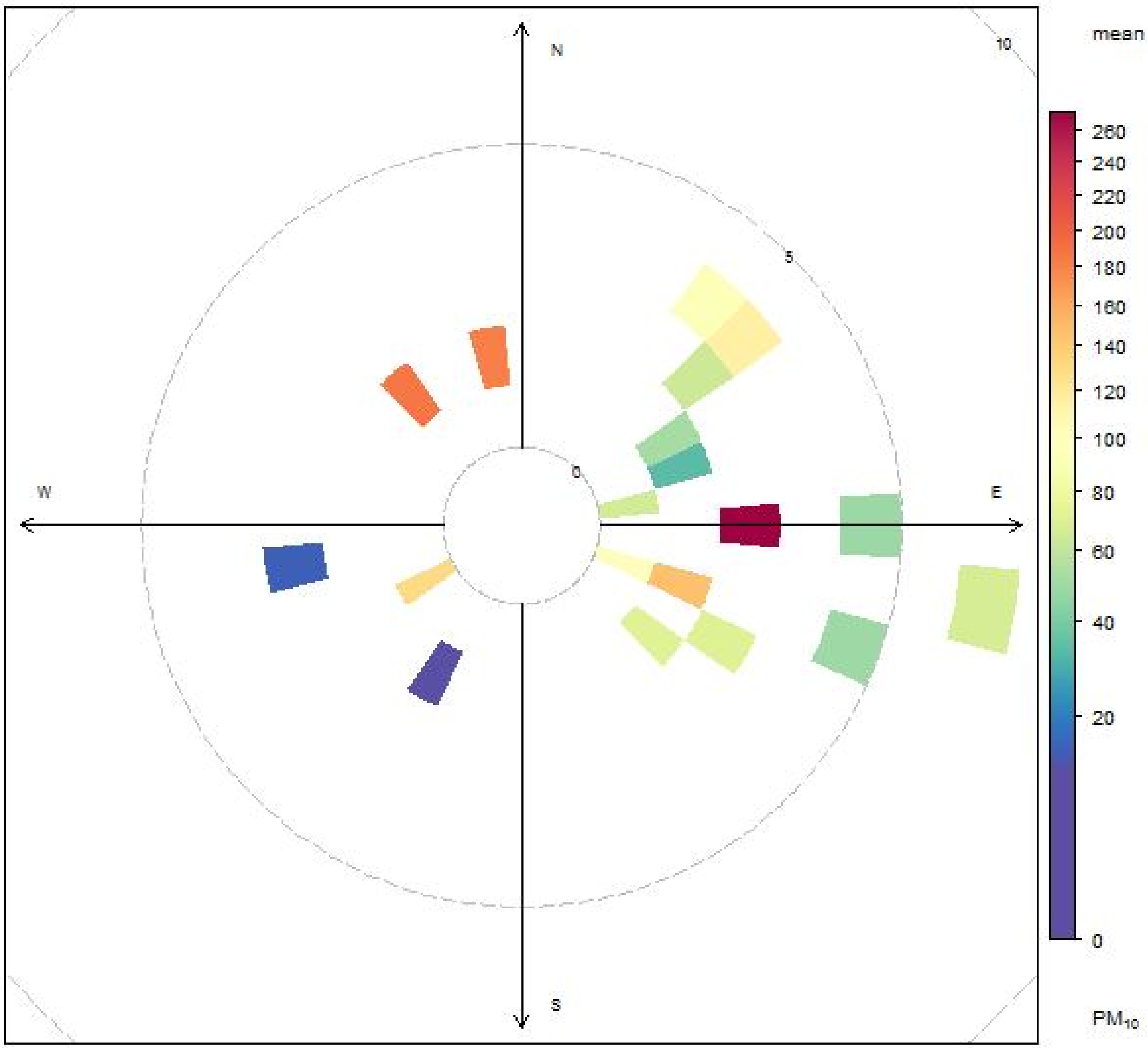


Figure E - 27: Polar Frequency plot during the alert event period, April 07 to April 08, 2017.

E-10. Station 7B PM_{10} event on 2017-04-23

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 03:00 on April 24, 2017, until 07:00 on April 24, 2017 (see time series, Figure E - 28). The figure shows that this event was characterized by an initial gradual increase of hourly PM_{10} to concentrations greater than the AAQO followed by a more rapid increase to peak PM_{10} concentrations (> 180 µg/m^3) and an equally rapid decline to lower concentrations.

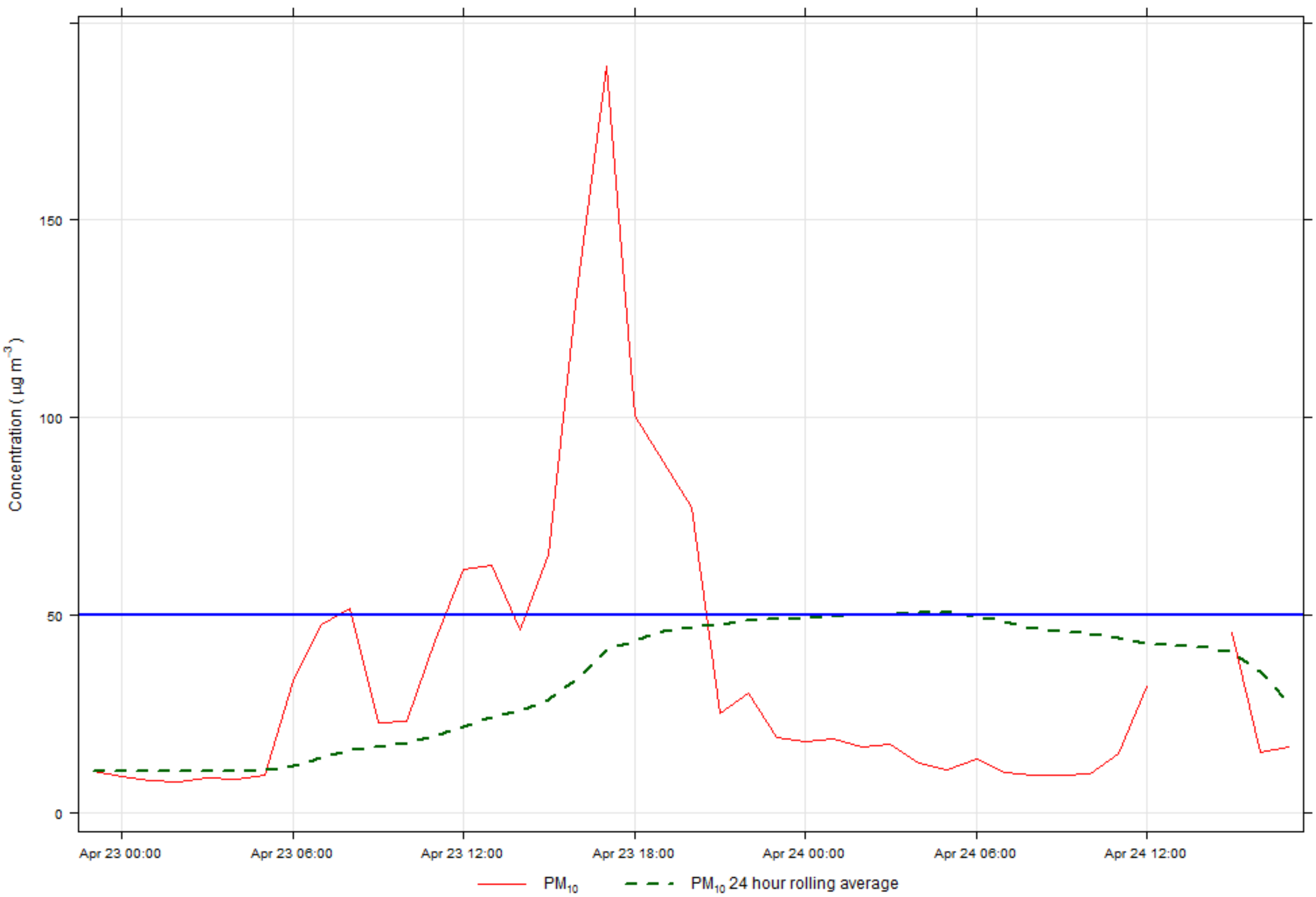


Figure E - 28: PM_{10} time series plot for the period, April 23 to April 24, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the east. Wind speeds were recorded from 2 to 6 m/s (see wind rose, Figure E - 29). The greatest PM_{10} concentrations were observed at wind speeds of 2 to 3 m/s from the east (see polar frequency plot, Figure E - 30).

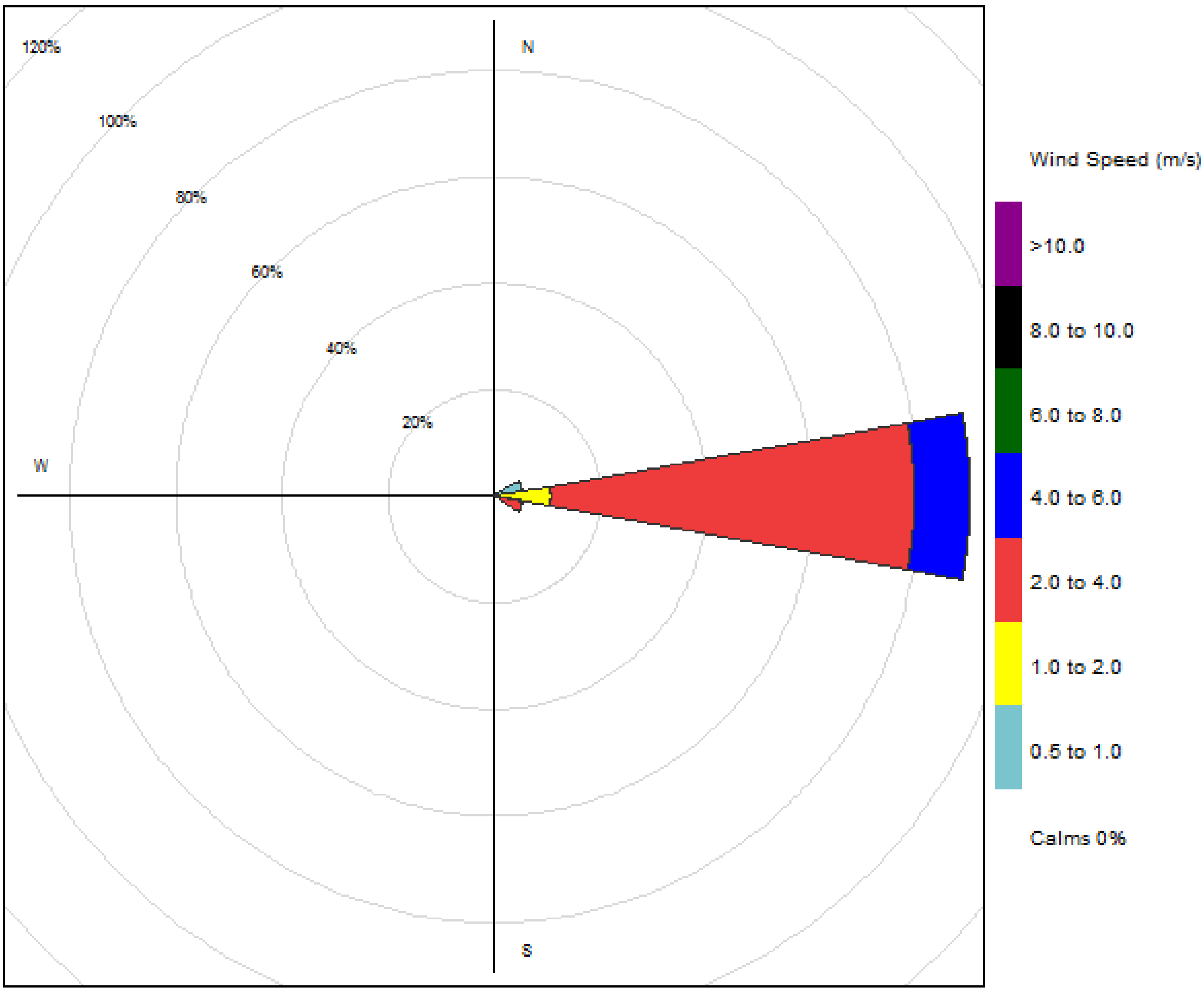


Figure E - 29: Wind rose during the alert event period, April 23 to April 24, 2017.

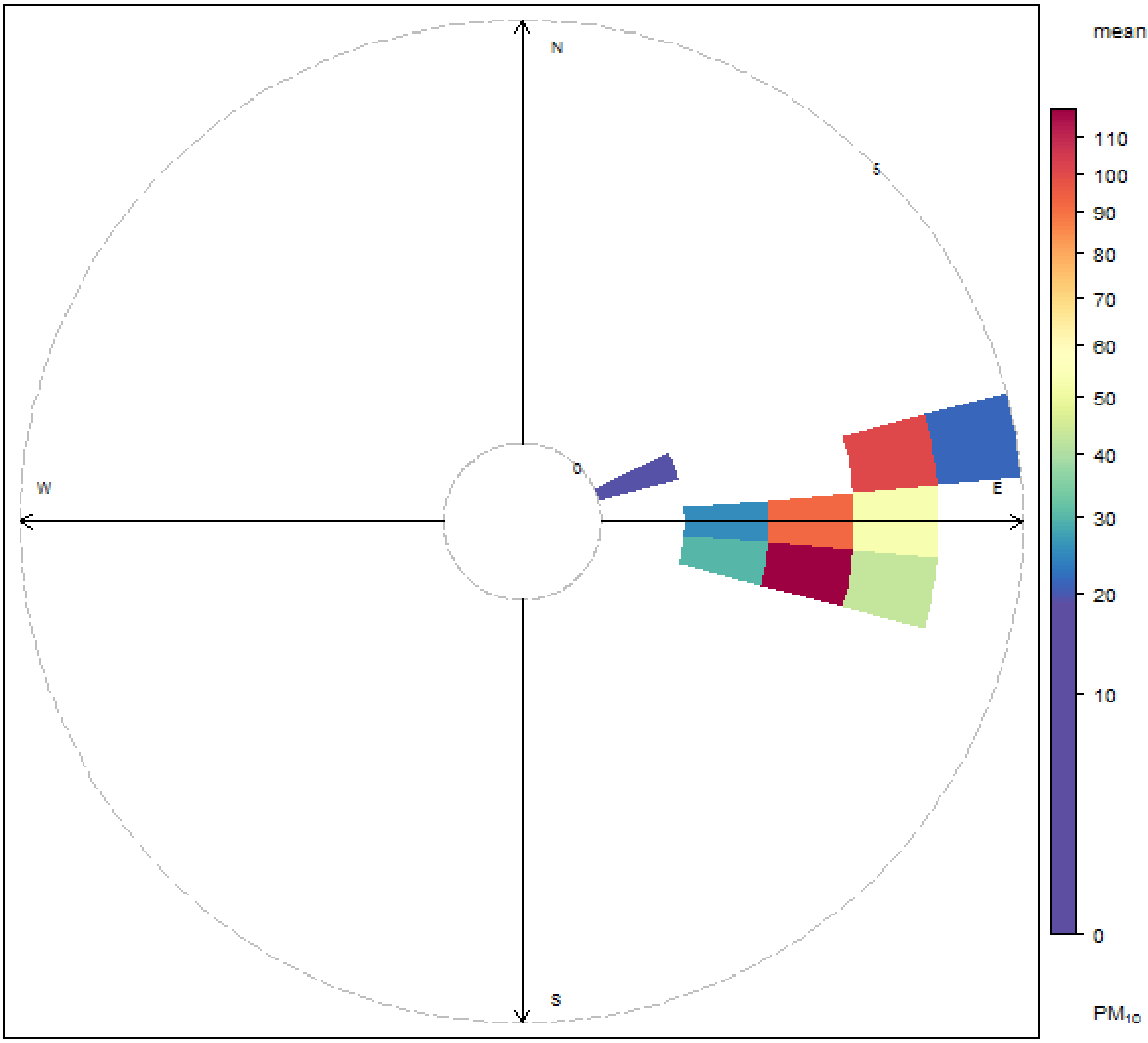


Figure E - 30: Polar frequency plot for PM_{10} during the alert event period, April 23 to April 24, 2017.

E-11. Station 7B PM_{10} event on 2017-04-25

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 10:00 on April 25, 2017, until 12:00 on April 27, 2017 (see time series, Figure E - 31). The figure shows that this event was characterized by multiple 2 to 6 hour spikes to concentrations greater than 100 µg/m^3 interspersed by periods of lower PM_{10} concentrations (< 30 µg/m^3).

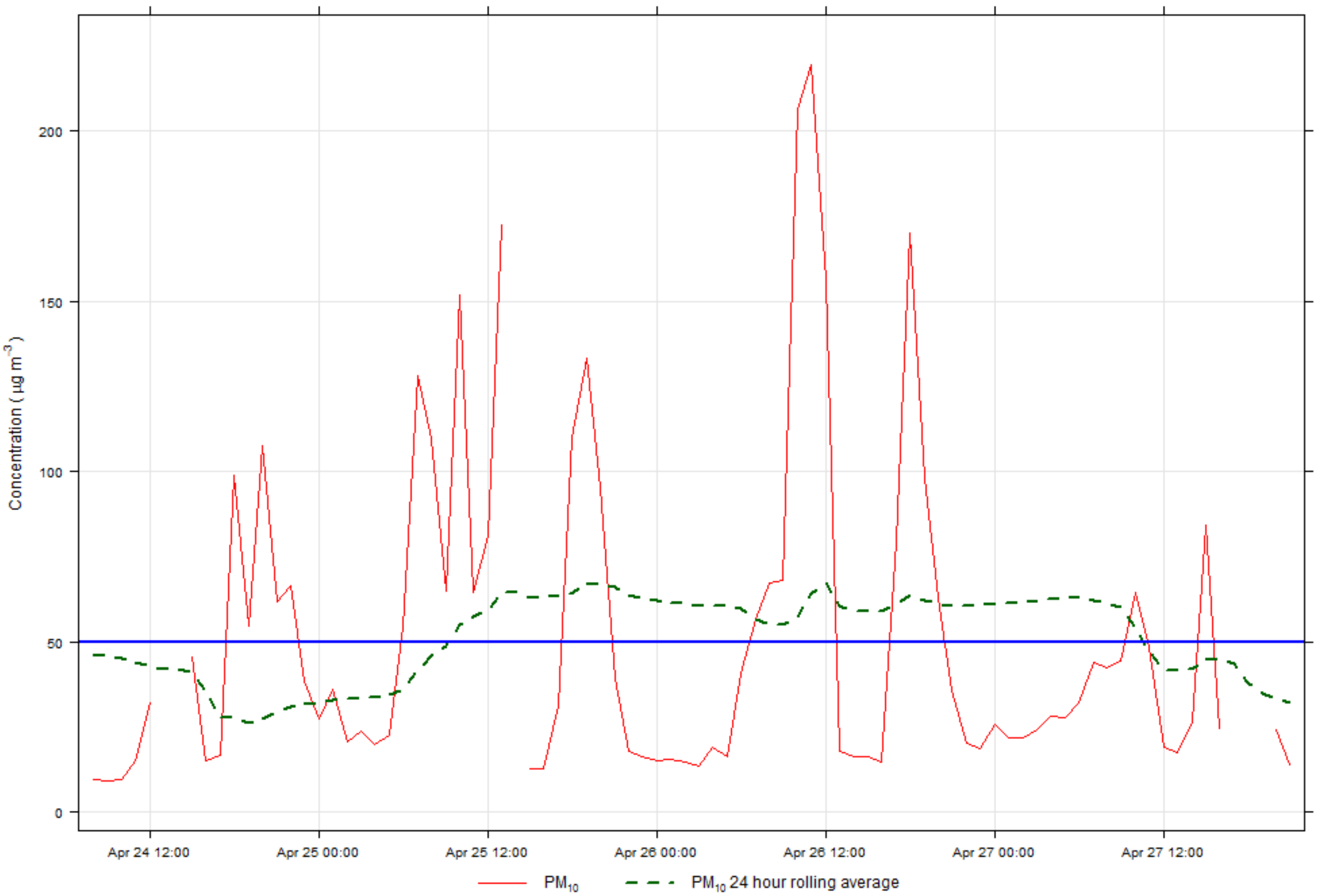


Figure E - 31: PM_{10} time series plot for the period, April 25 to April 27, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the east. Wind speeds were recorded from 2 to 6 m/s (see wind rose, Figure E - 32). The greatest PM_{10} concentrations were observed at moderate wind speeds from the east (see polar frequency plot, Figure E - 33). Secondary maxima were observed from the east-northeast and east-southeast at wind speeds between 3 and 6 m/s.

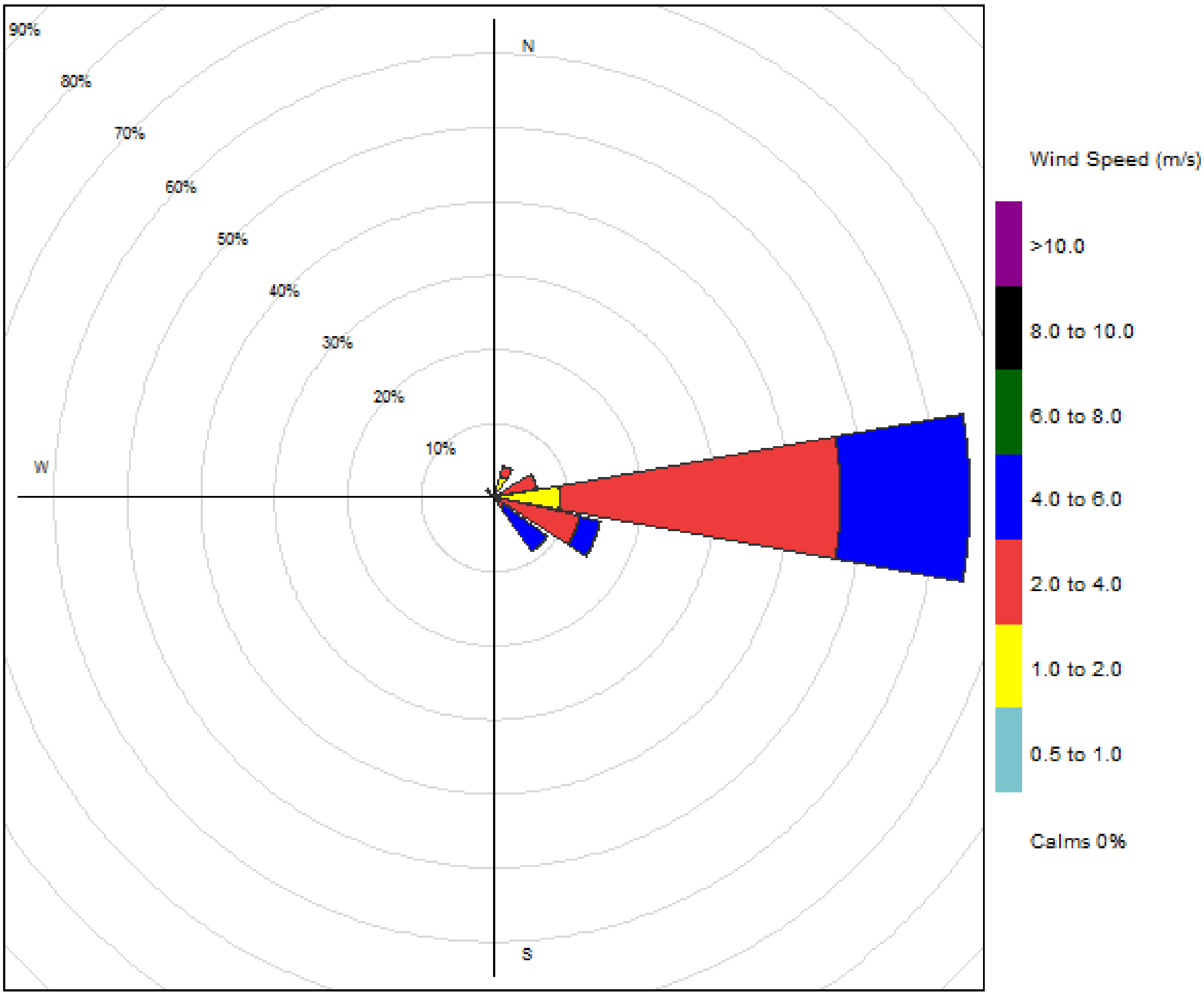


Figure E - 32: Wind rose during the alert event period, April 25 to April 27, 2017.

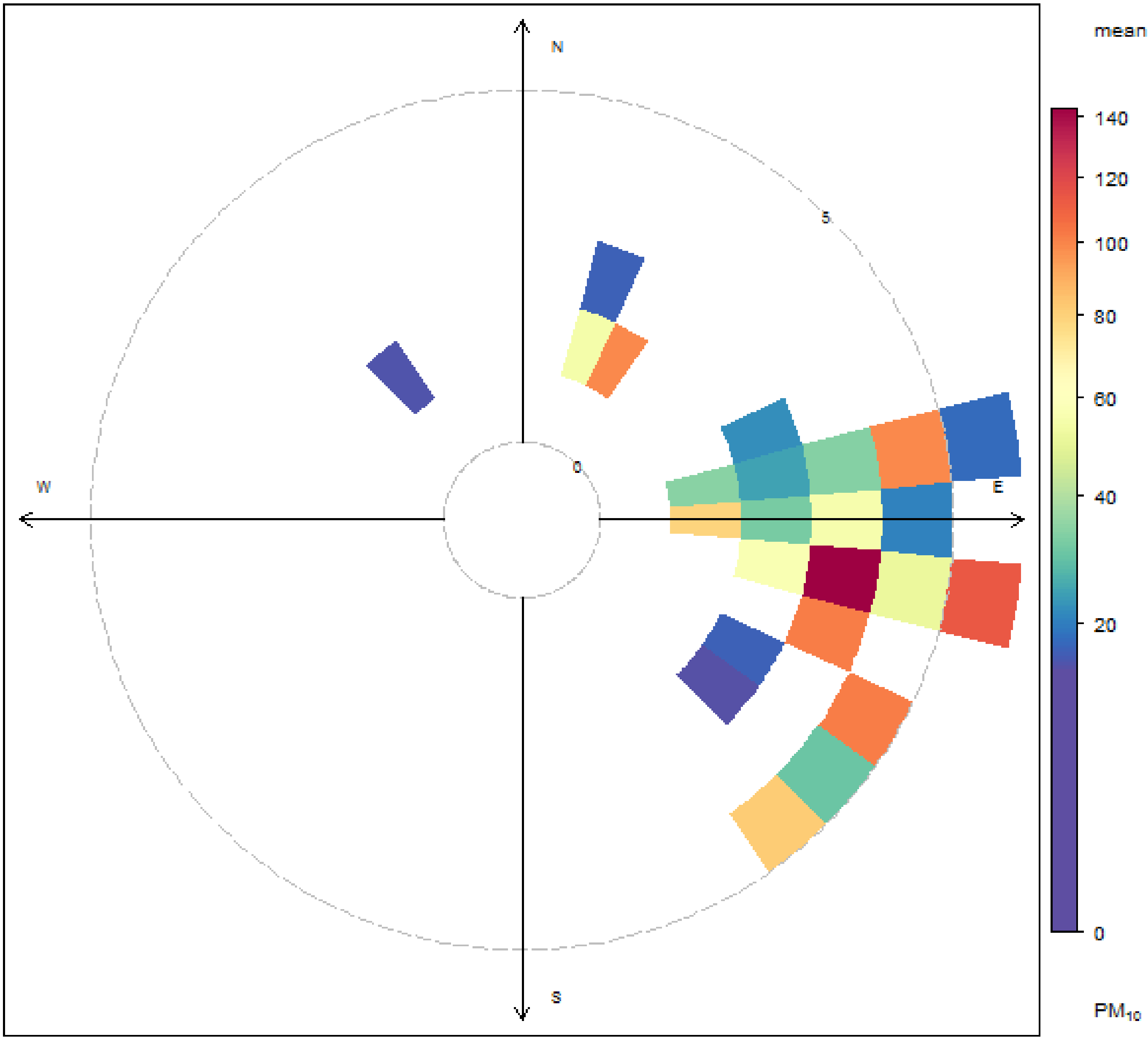


Figure E - 33: Polar frequency plot for PM_{10} during the alert event period, April 25 to April 27, 2017.

E-12. Station 7B PM_{10} event on 2017-05-03

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hourAAQO of 50 µg/m^3 from 14:00 on May 03, 2017, until 16:00 on May 04, 2017 (see time series, Figure E - 34). The figure shows that this event was characterized by a series of spikes of high hourly concentrations (up to 200 µg/m^3) interspersed with periods of lower concentrations (< 50 µg/m^3). A dust advisory issued by BC MOE and Northern Health was in effect at the time of this event.

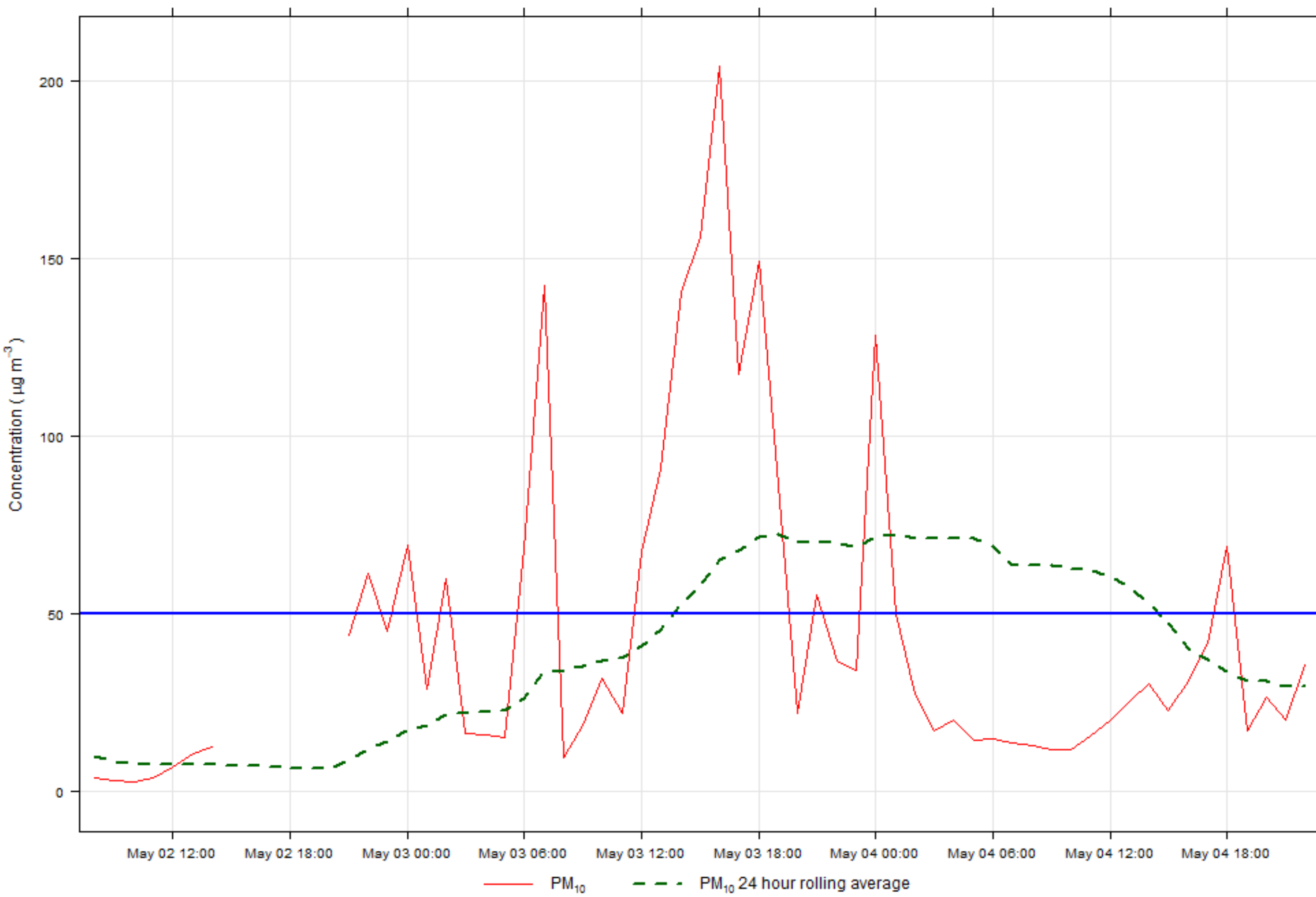


Figure E - 34: PM_{10} time series plot for the period, May 03 to May 04, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the west-southwest. Wind speeds were recorded from 2 to greater than 10 m/s (see wind rose, Figure E - 35). The greatest PM_{10} concentrations were observed at wind speeds 10 to 11 m/s from the west-southwest (see polar frequency plot, Figure E - 36).

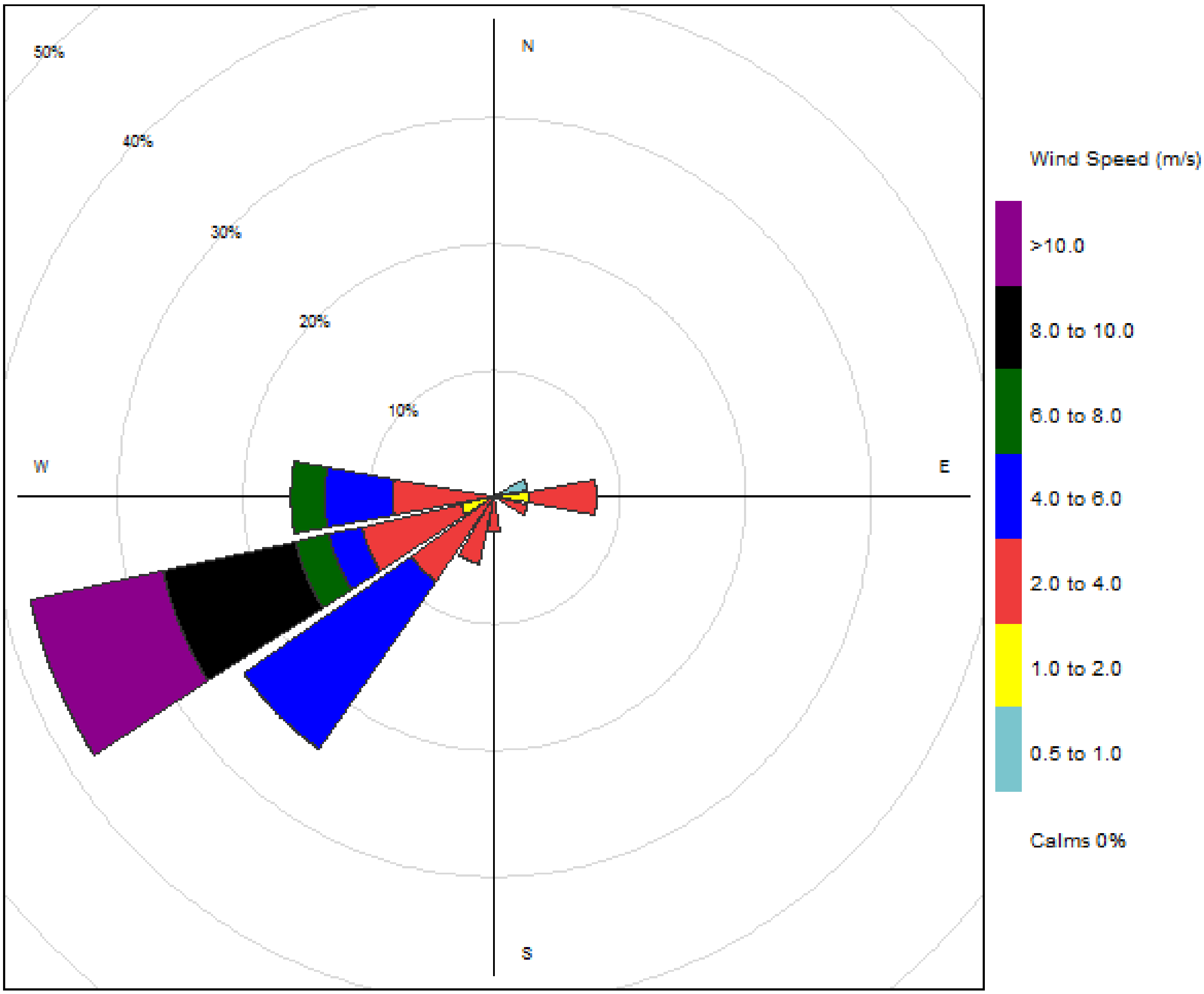


Figure E - 35: Wind rose during the alert event period, May 03 to May 04, 2017.

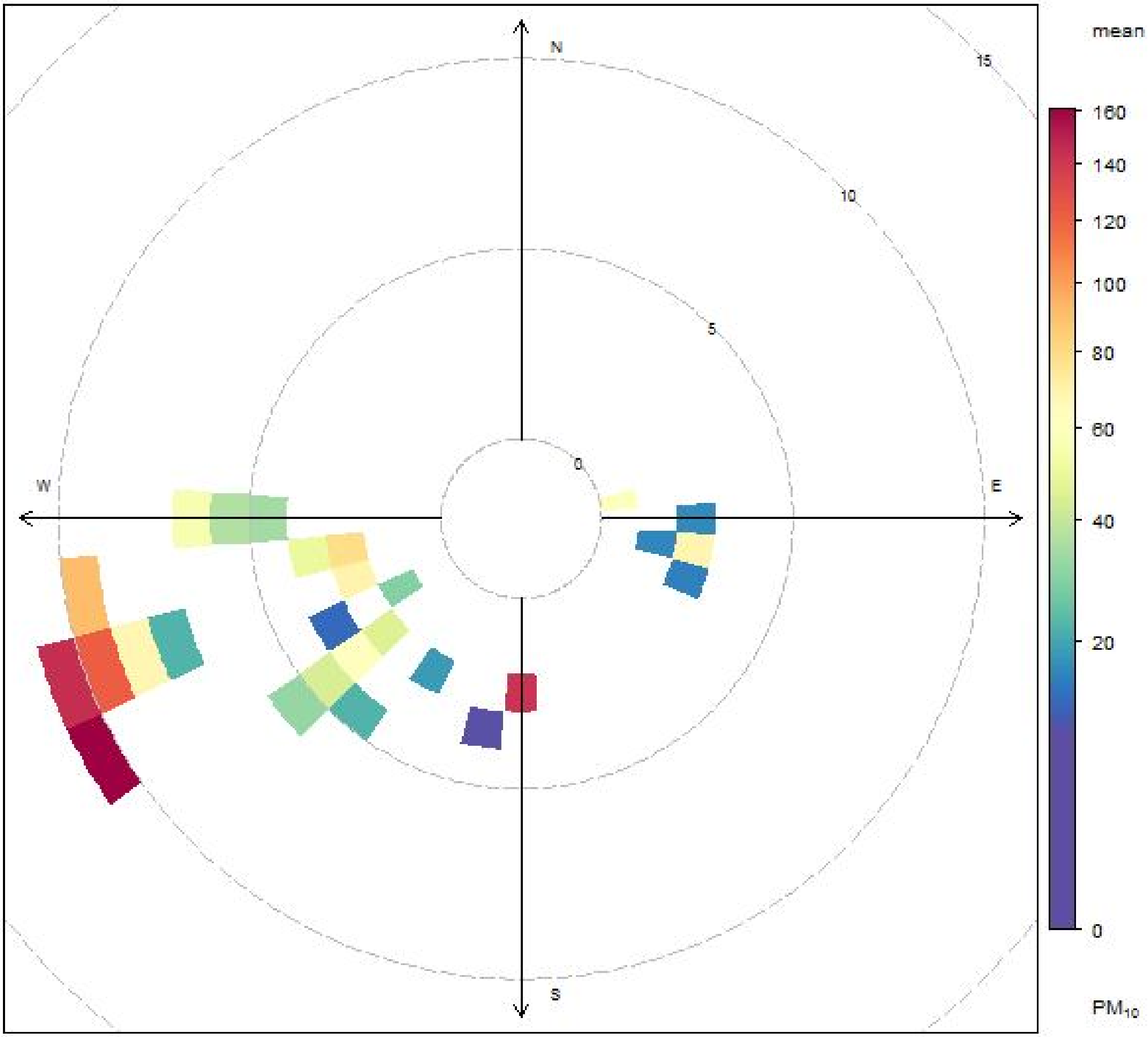


Figure E - 36: Polar frequency plot for PM_{10} during the alert event period, May 03 to May 04, 2017.

E-13. Station 7B PM_{10} event on 2017-05-07

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 00:00 on May 08, 2017, until 18:00 on May 10, 2017 (see time series, Figure E - 37). The figure shows that this event was characterized by a series of spikes of short duration and very high hourly concentrations (greater than 200 µg/m^3) interspersed with periods of lower PM_{10} concentrations (< 50 µg/m^3).

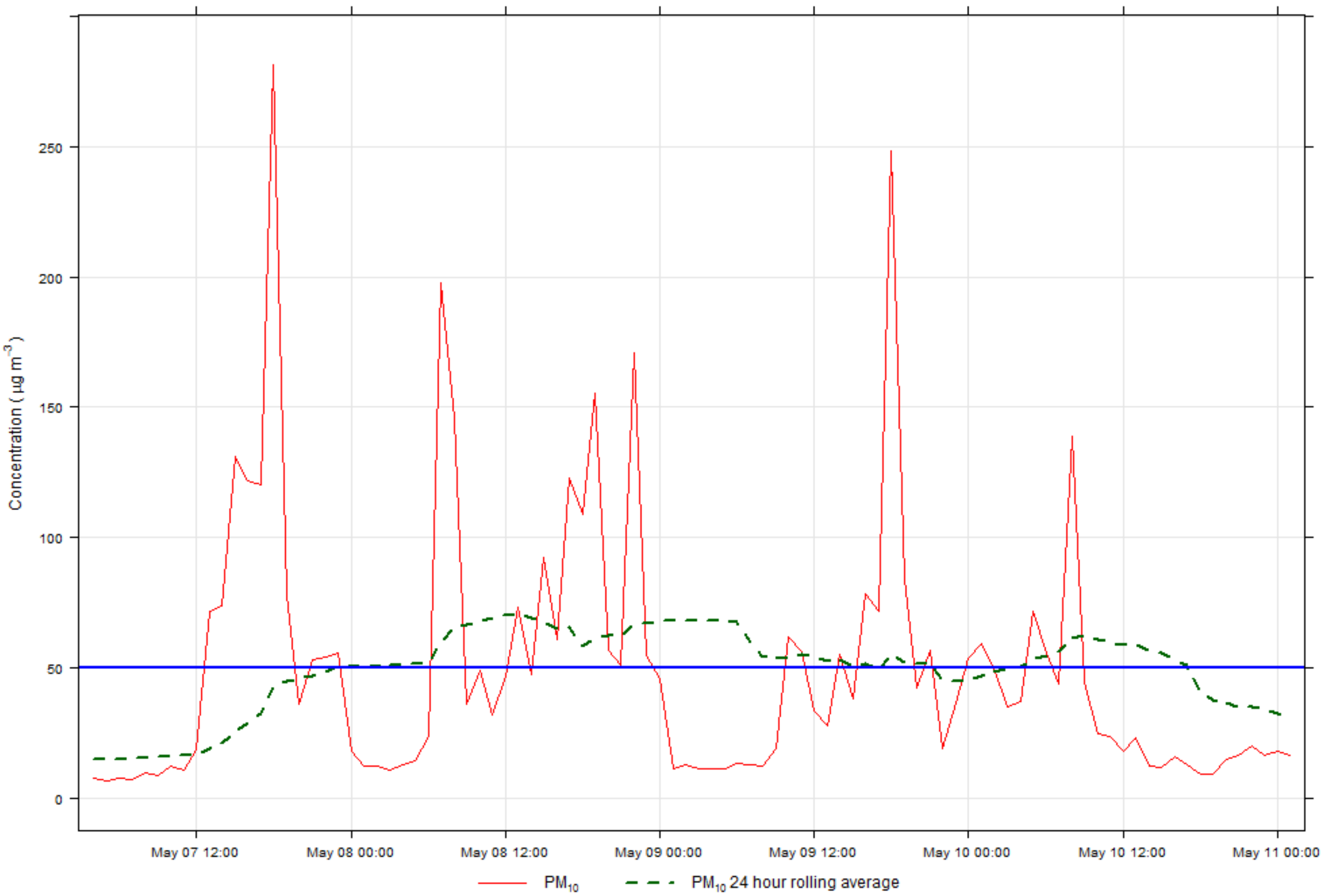


Figure E - 37: PM_{10} time series plot for the period, May 07 to May 10, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the west-southwest. Wind speeds were recorded from 1 to 10 m/s (see wind rose, Figure E - 38). The greatest PM_{10} concentrations were observed at low wind speeds from the east. A secondary maximum was observed at high wind speeds from the west-southwest (see polar frequency plot, Figure E - 39).

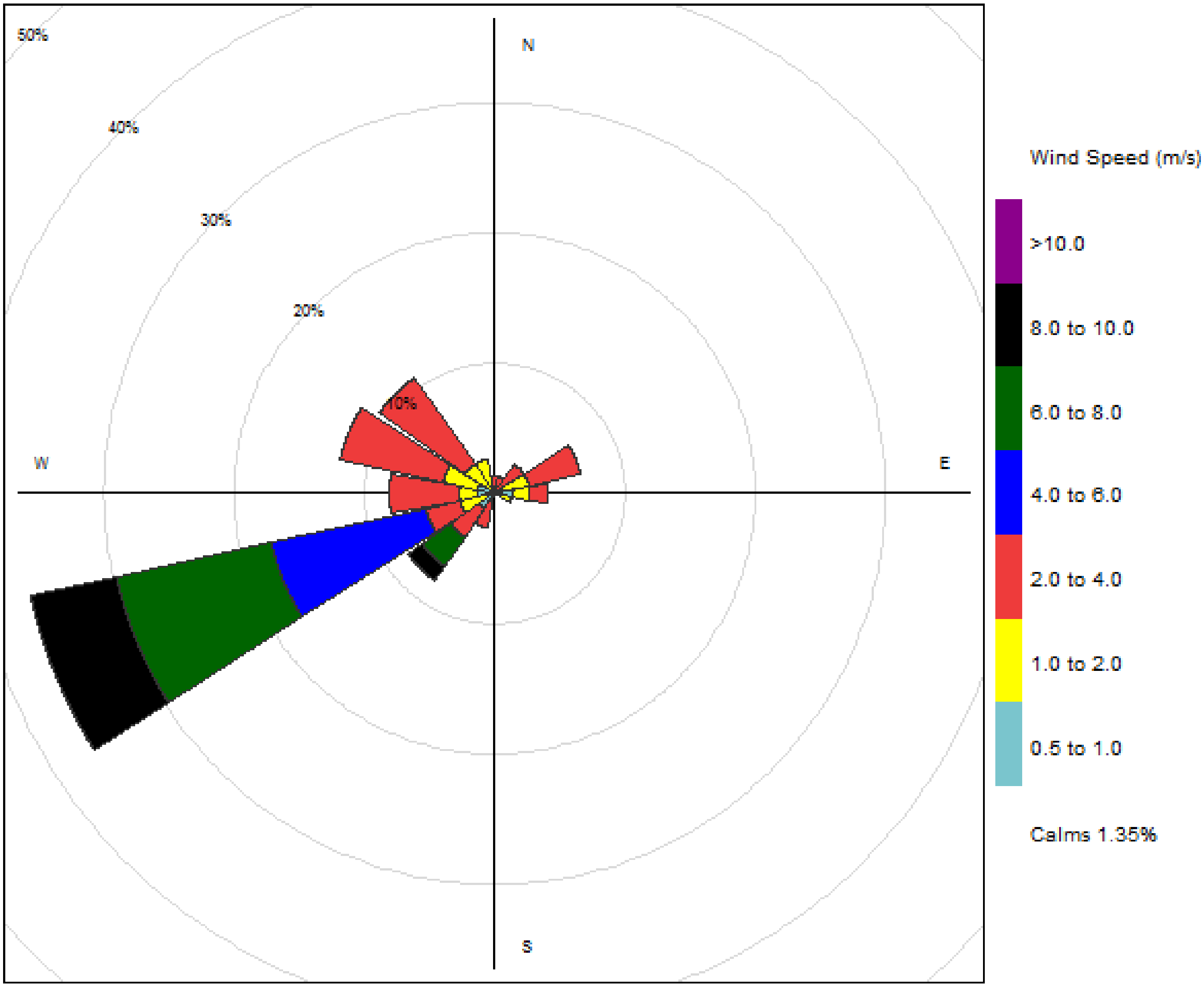


Figure E - 38: Wind rose during the alert event period, May 07 to May 10, 2017.

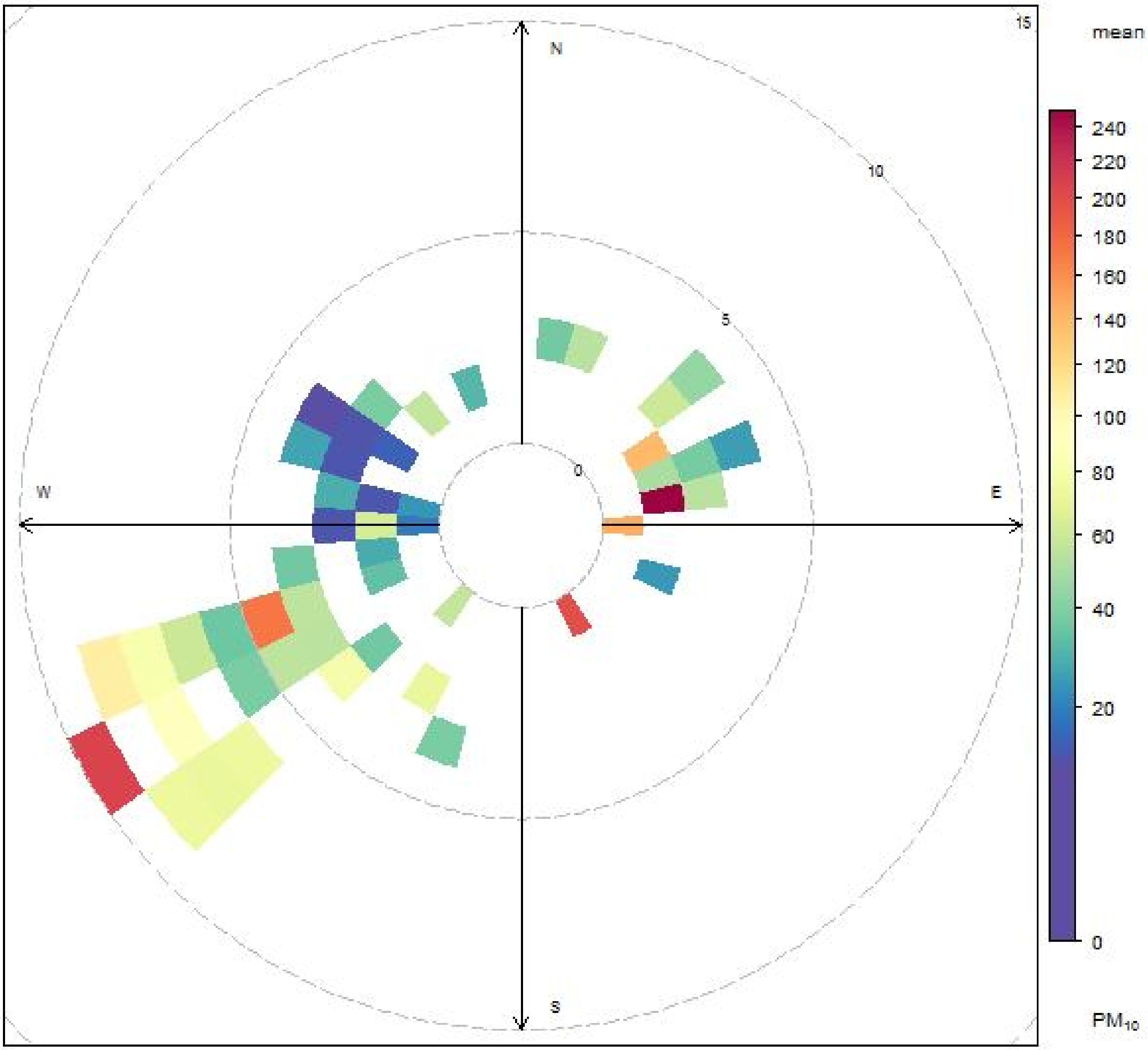


Figure E - 39: Polar frequency plot for PM_{10} during the alert event period, May 07 to May 10, 2017.

E-14. Station 7B PM_{10} event on 2017-05-18

The 24 hour rolling average PM_{10} concentrations at Station 7B increased to greater than the BC MOE 24-hour AAQO of 50 µg/m^3 on 04:00 on May 18, 2017. An interruption in data collection from this instrument caused there to be insufficient data to calculate a 24 hour rolling average concentration for the time when it would have decreased below 50 µg/m^3. However, the hourly data in the timeseries (Figure E - 40) shows that the event was of short duration and high intensity (maximum greater than 1000 µg/m^3). It was over by 09:00 on May 18.

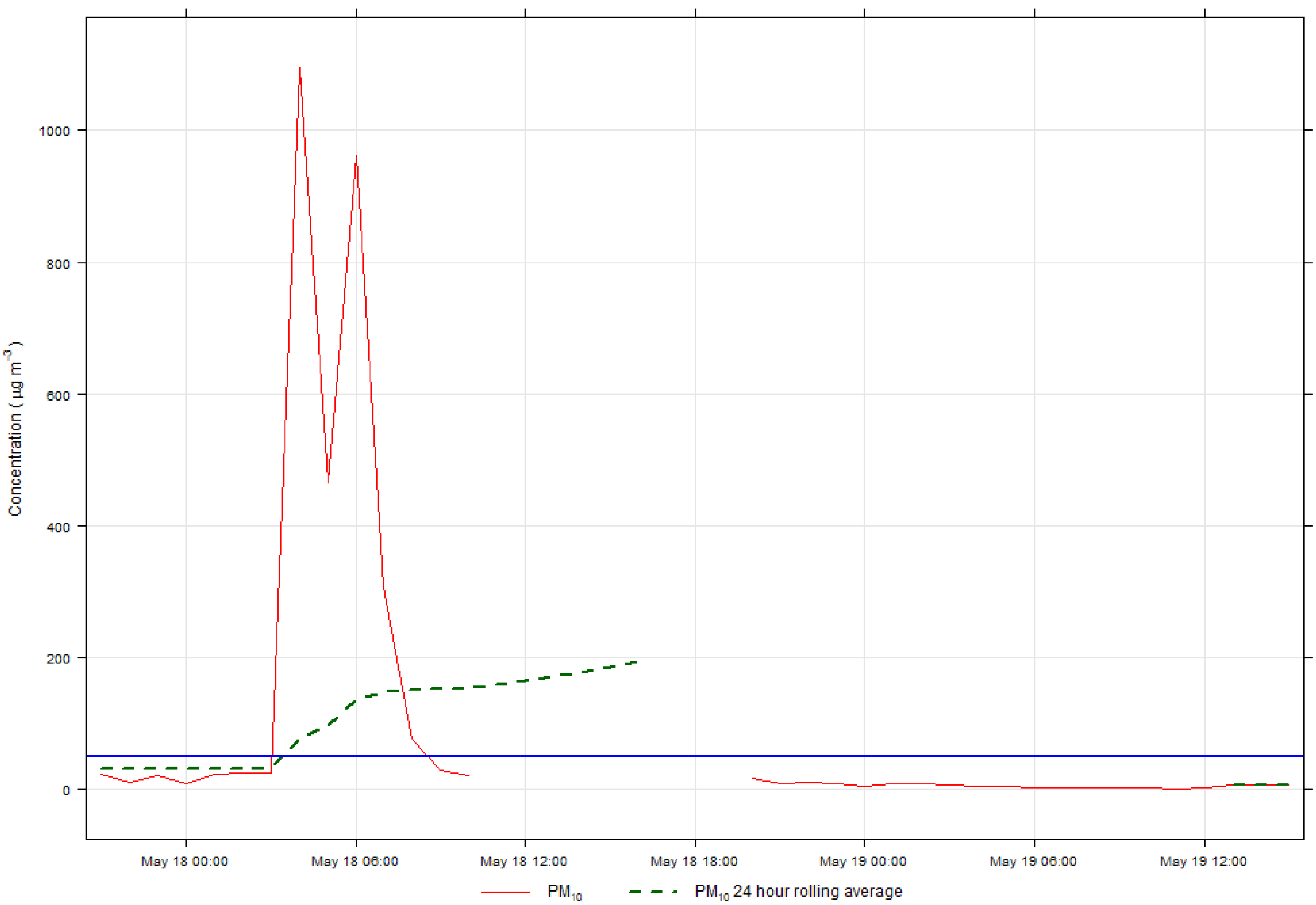


Figure E - 40: PM_{10} time series plot for the period, May 18 to May 19, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were light and variable originating from the west, north-northwest, east-northeast and east-southeast. Wind speeds were recorded from 0.5 to 2 m/s (see wind rose, Figure E - 41). The greatest PM_{10} concentrations were observed at low wind speeds from the north (see polar frequency plot, Figure E - 42). A secondary maximum was observed from the west.

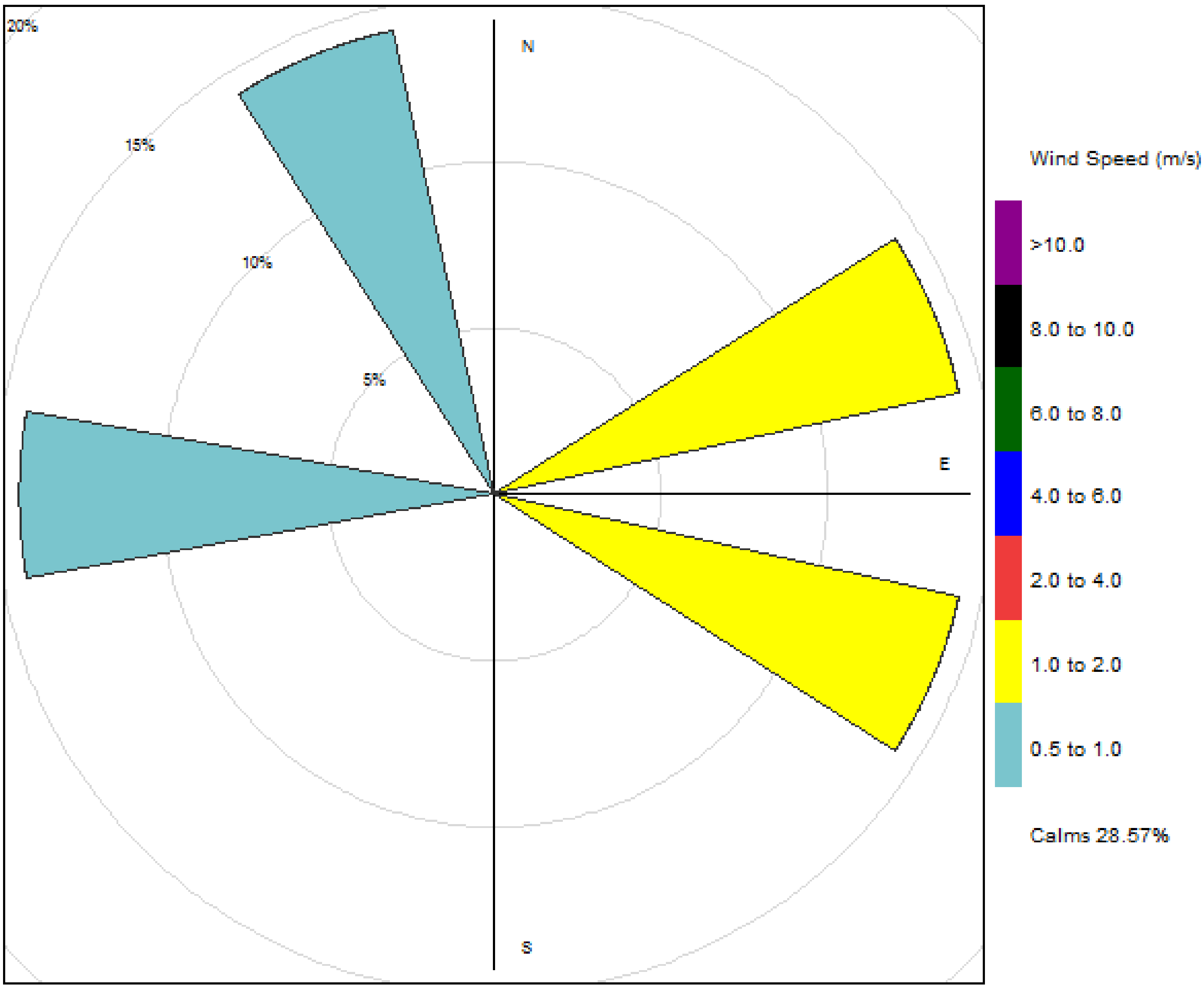


Figure E - 41: Wind rose during the alert event period, May 18 to May 19, 2017.

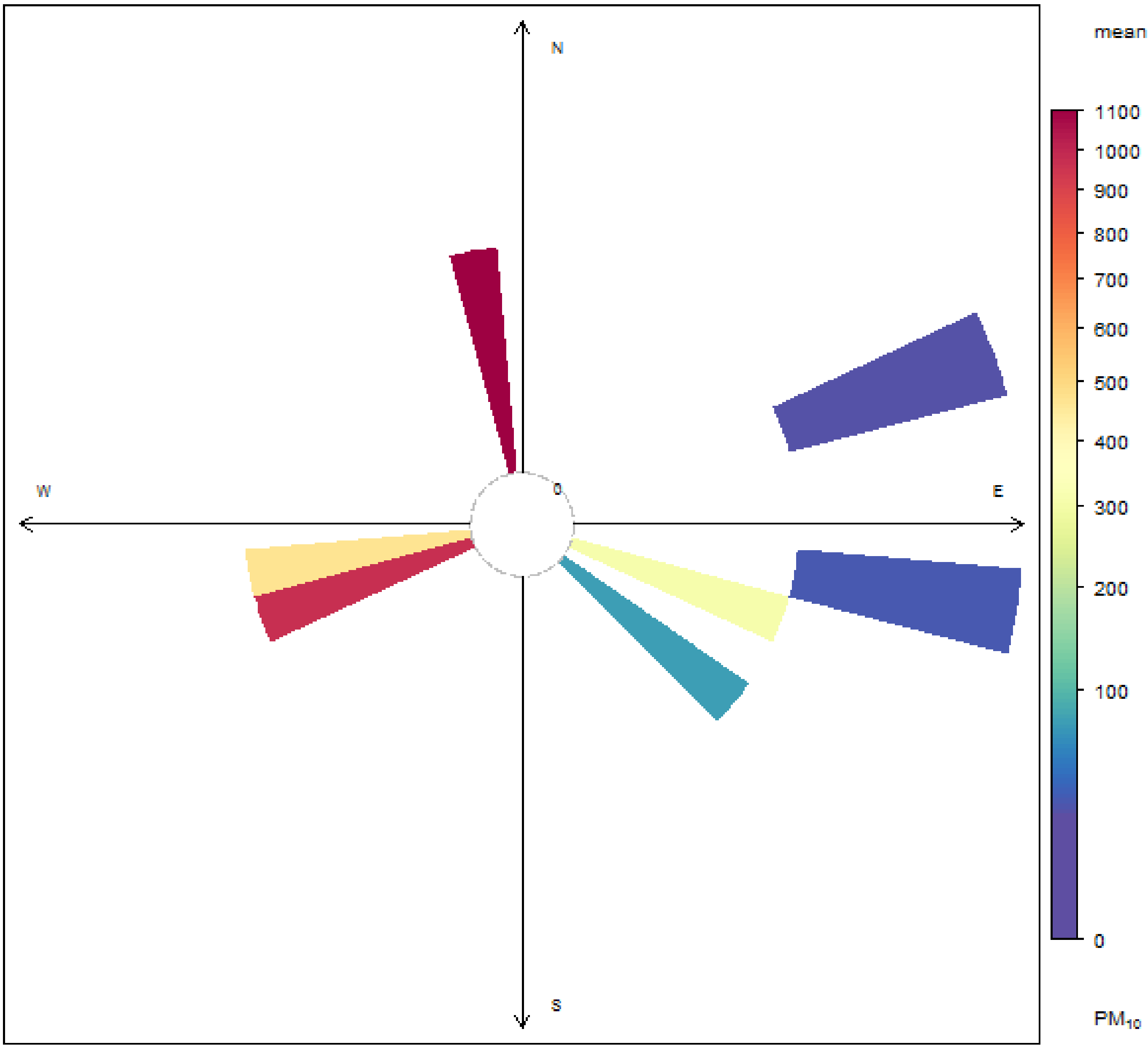


Figure E - 42: Polar frequency plot for PM_{10} during the alert event period, May 18 to May 19, 2017.

E-15. Station 7B PM_{10} event on 2017-05-22

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hourAAQO of 50 µg/m^3 from 13:00 on May 23, 2017, until 14:00 on May 24, 2017 (see time series, Figure E - 43). The figure shows that this event was characterized by a long period (36 hours) of elevated concentrations followed by a spike of short duration and very high hourly concentrations (greater than 900 µg/m^3).

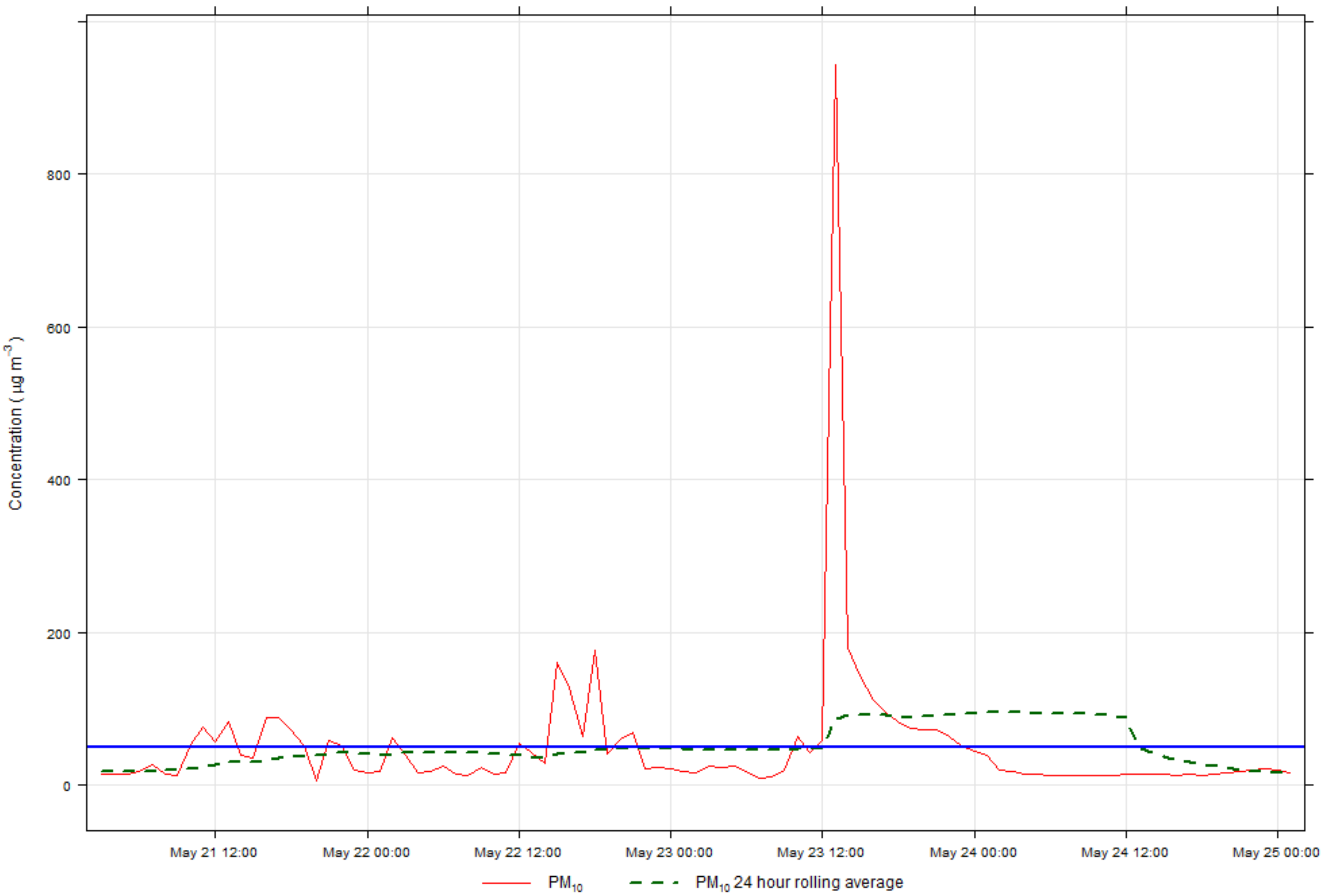


Figure E - 43: PM_{10} time series plot for the period, May 22 to May 24, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the west-southwest. Wind speeds were recorded from 2 to 10 m/s (see wind rose, Figure E - 44). The greatest PM_{10} concentrations were observed at wind speeds of 5 to 6 m/s from the southwest (see polar frequency plot, Figure E - 45).

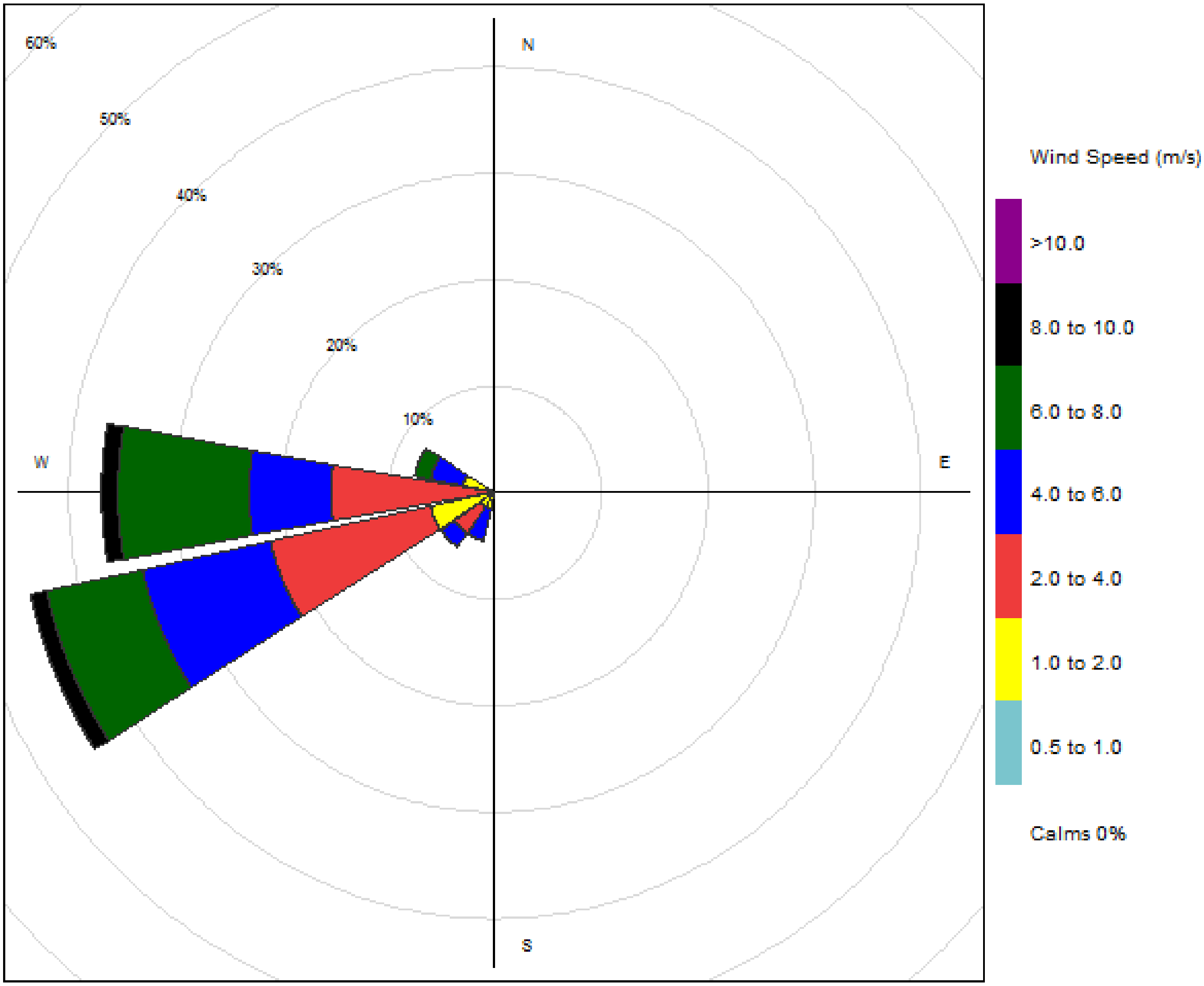


Figure E - 44: Wind rose during the alert event period, May 22 to May 24, 2017.

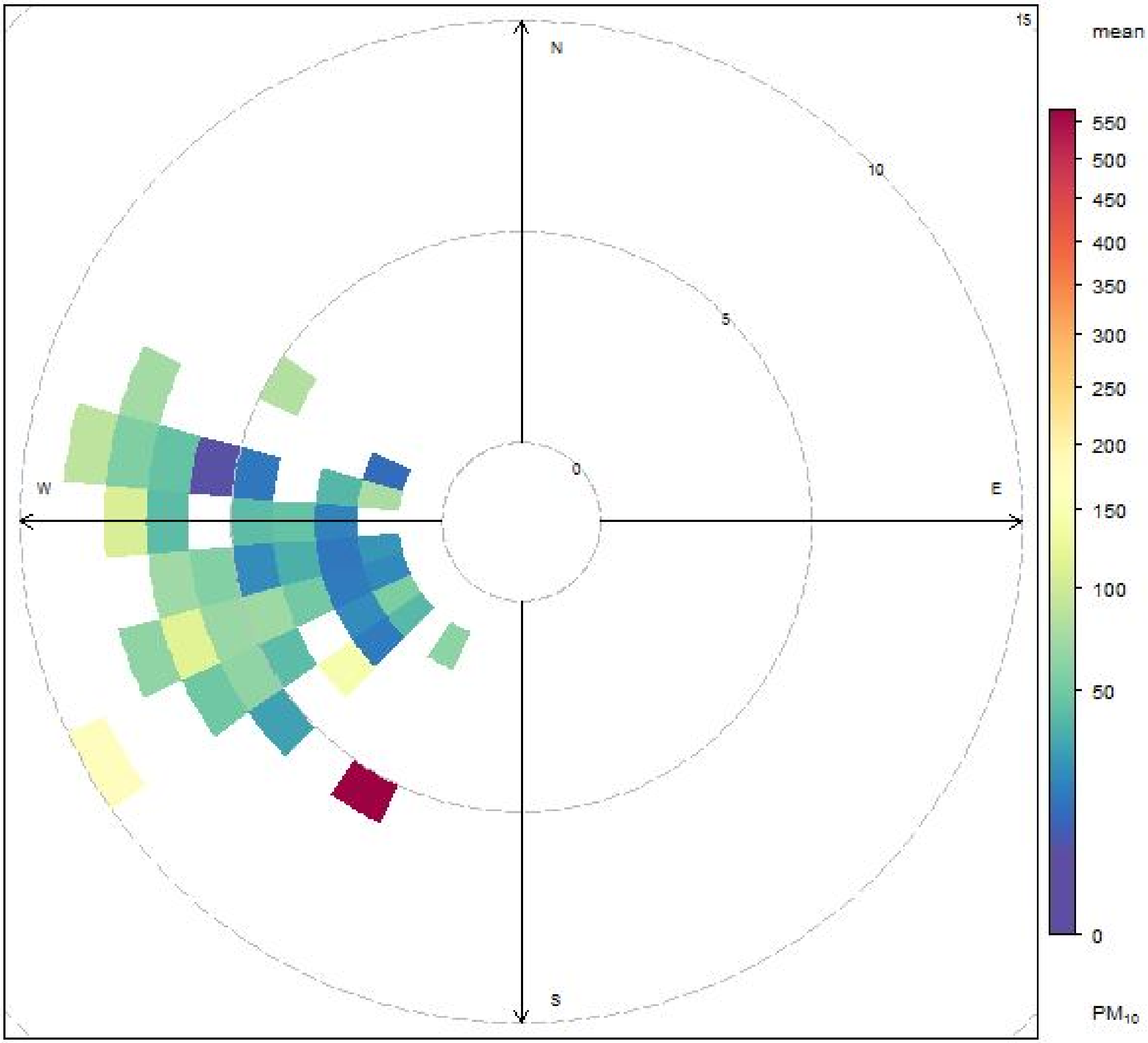


Figure E - 45: Polar frequency plot for PM_{10} during the alert event period, May 22 to May 24, 2017.

E-16. Station 7B PM_{10} event on 2017-05-28

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 19:00 on May 28, 2017 until 17:00 on June 1, 2017 and again from June 3, 2017, until 19:00 on June 09, 2017 (see time series, Figure E - 46). The figure shows that this event was characterized by a generally elevated baseline concentration for several days, a high intensity, short duration increase in concentration (> 2000 µg/m^3) and another long period of generally elevated PM_{10} concentrations before eventually tapering off. A dust advisory issued by BC MOE and Northern Health was in effect at the time of this event.

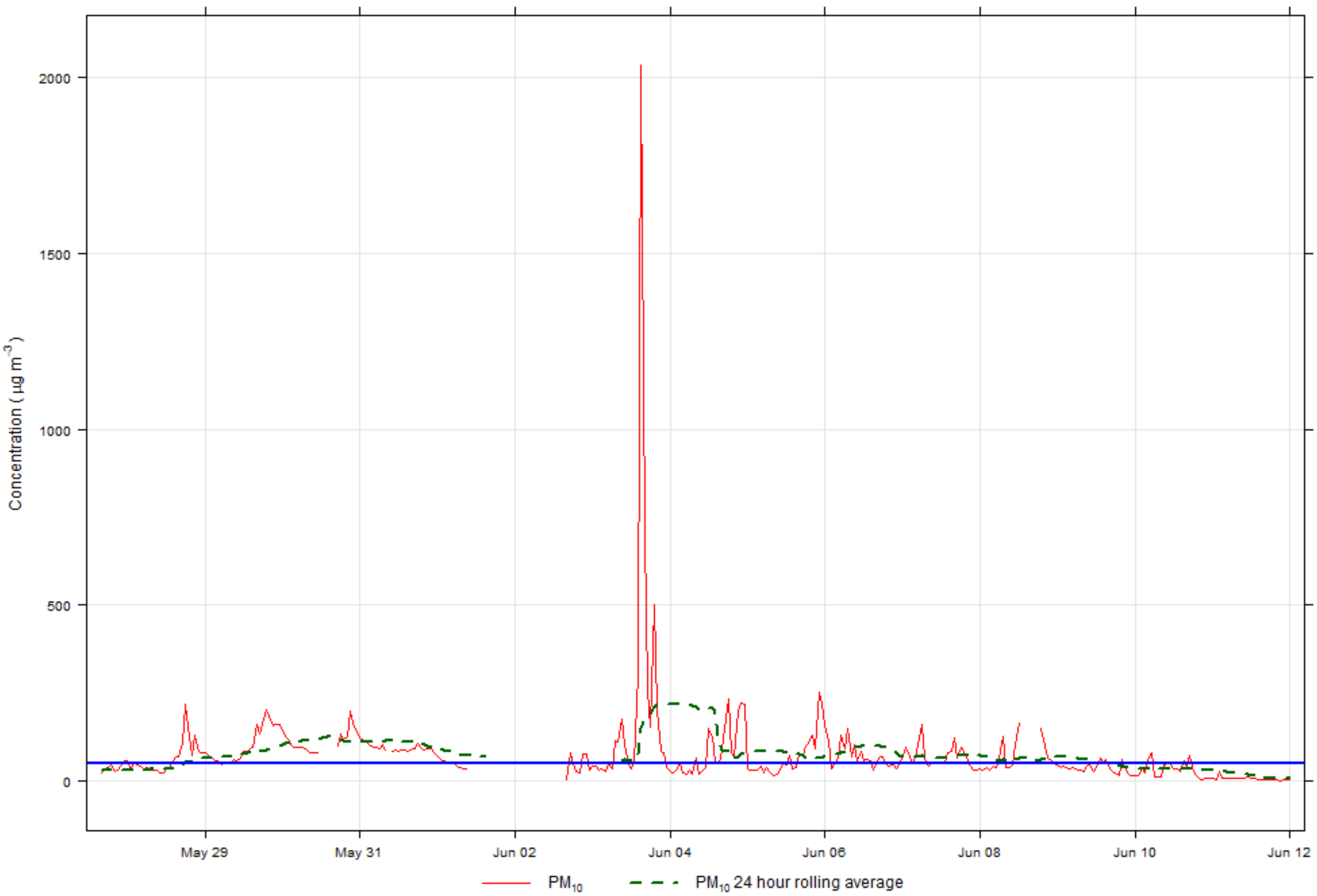


Figure E - 46: PM_{10} Time series plot for the period, May 28 to June 09, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the east and southwest. Wind speeds were recorded from 2 to greater than 10 m/s (see wind rose, Figure E - 47). The greatest PM_{10} concentrations were observed at high wind speeds from the southwest (see polar frequency plot, Figure E - 48).

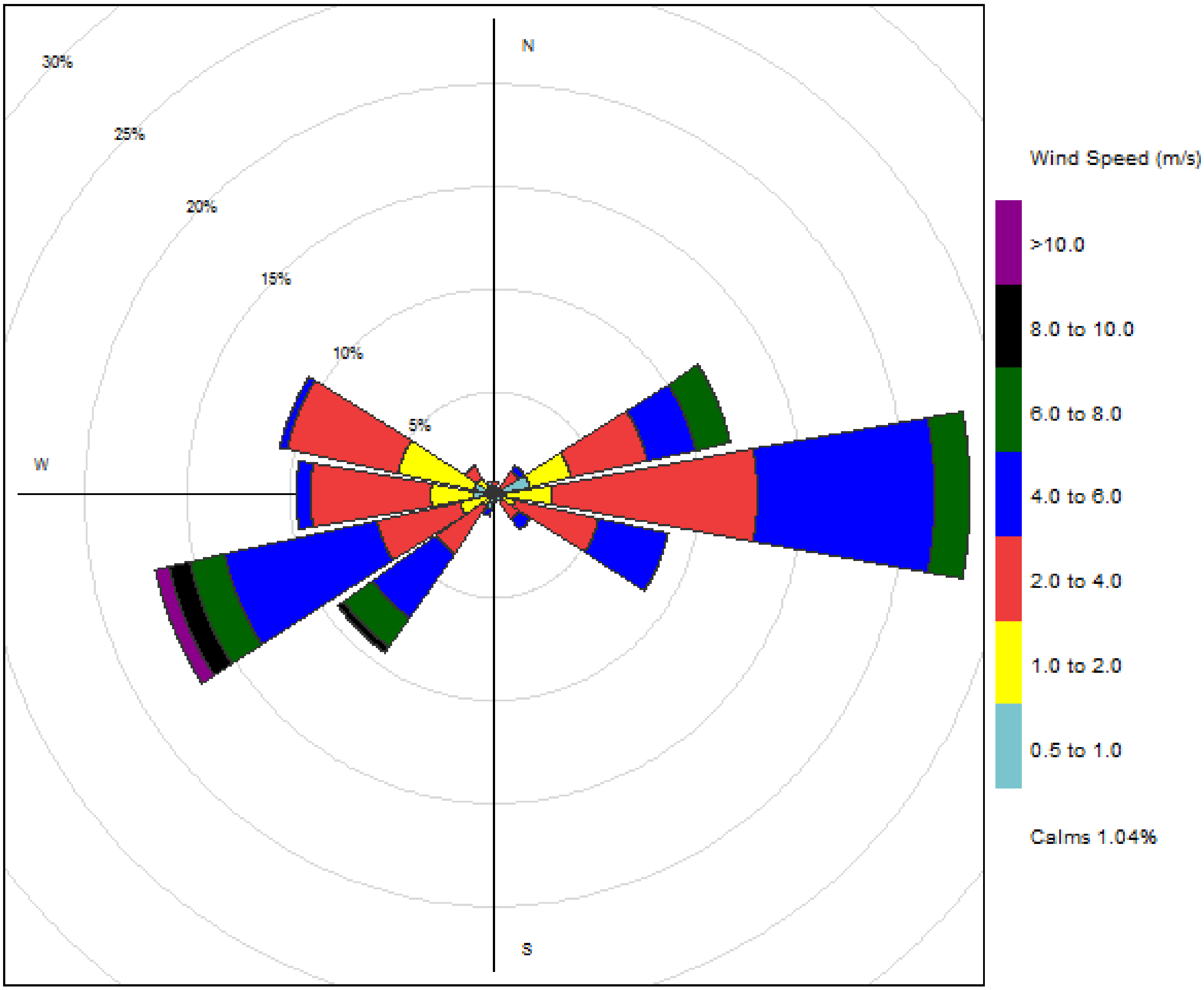


Figure E - 47: Wind rose during the alert event period, May 28 to June 09, 2017.

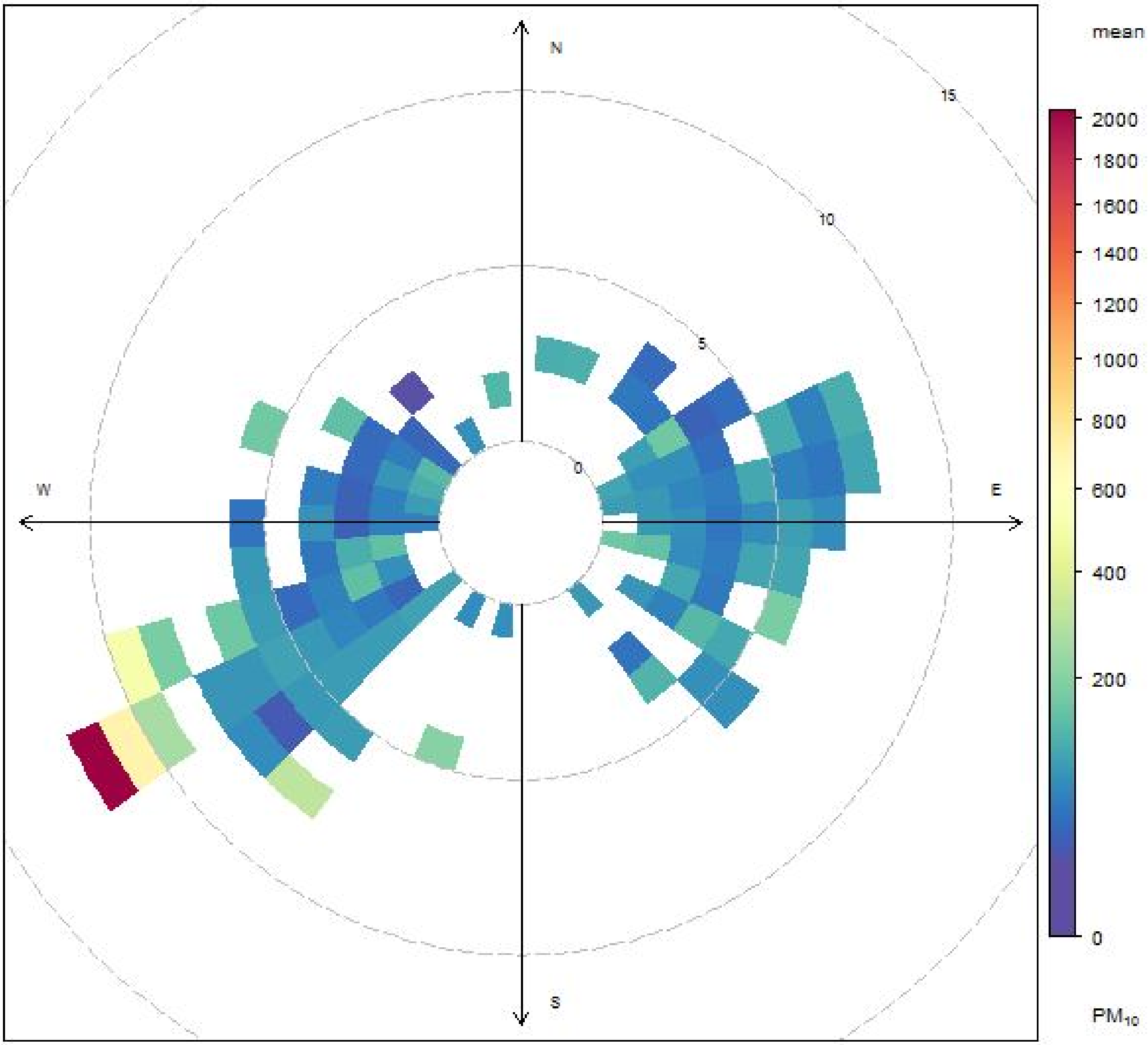


Figure E - 48: Polar frequency plot during the alert event period, May 28 to June 09, 2017.

E-17. Station 7B $PM_{2.5}$ event on 2017-05-30

The 24 hour rolling average $PM_{2.5}$ concentrations at Station 7B were greater than the BC MOE 24-hourAAQO of 25 µg/m^3 from 11:00 on May 30, 2017, until 01:00 on May 31, 2017 (see time series, Figure E - 49). The figure shows that this event was characterized by 2 short duration spikes of high hourly concentrations (greater than 60 µg/m^3) interspersed with periods of generally elevated $PM_{2.5}$ concentrations (> 15 µg/m^3). A dust advisory issued by BC MOE and Northern Health was in effect at the time of this event.

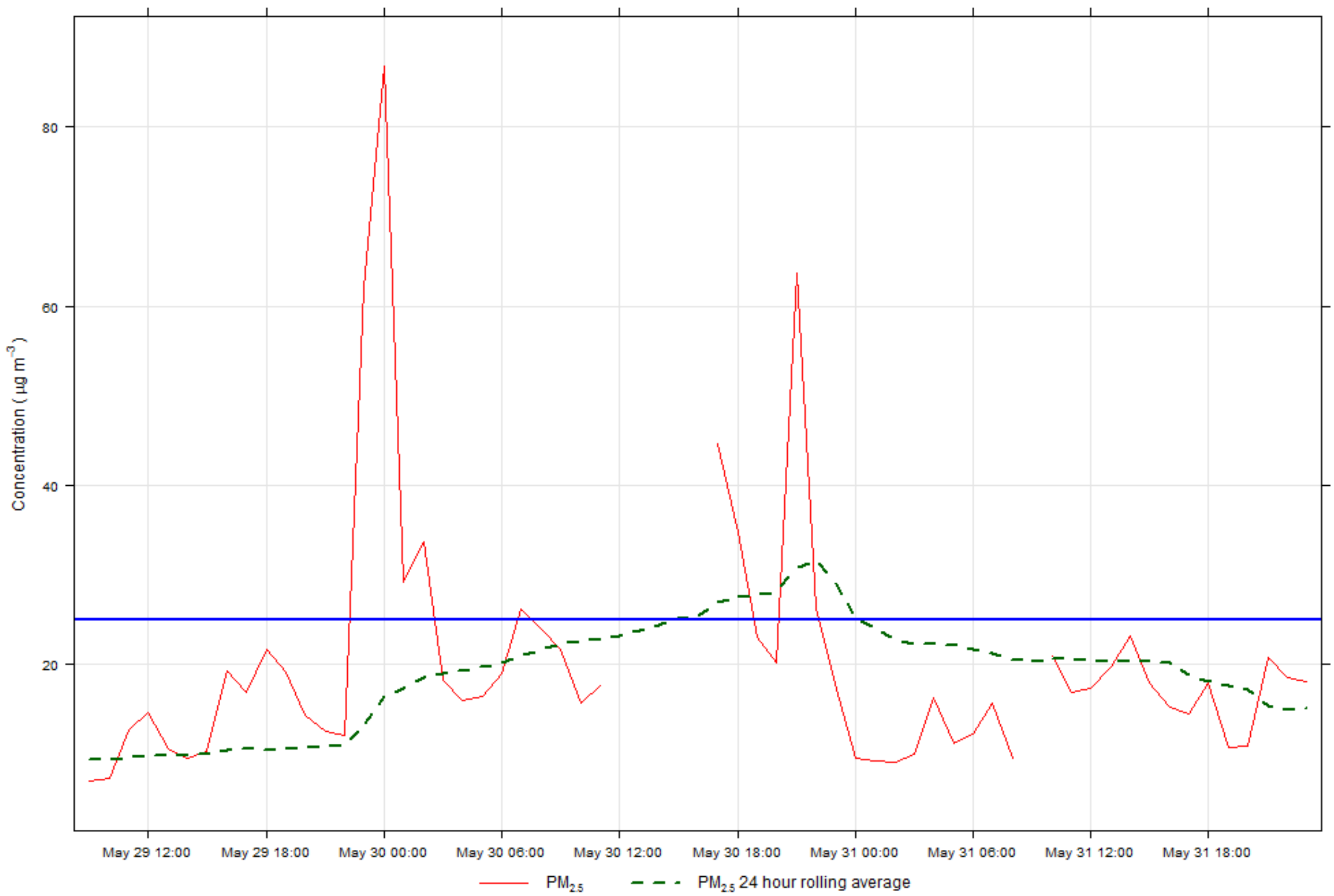


Figure E - 49: $PM_{2.5}$ time series plot for the period, May 30 to May 31, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m^3

Wind directions at the time of the event were predominantly from the east-southeast. Wind speeds were recorded from 1 to 6 m/s (see wind rose, Figure E - 50). The greatest $PM_{2.5}$ concentrations were observed at wind speeds of 4 to 5 m/s from the southwest (see polar frequency plot, Figure E - 51). A secondary maximum was observed from the east at wind speeds of 4 to 5 m/s.

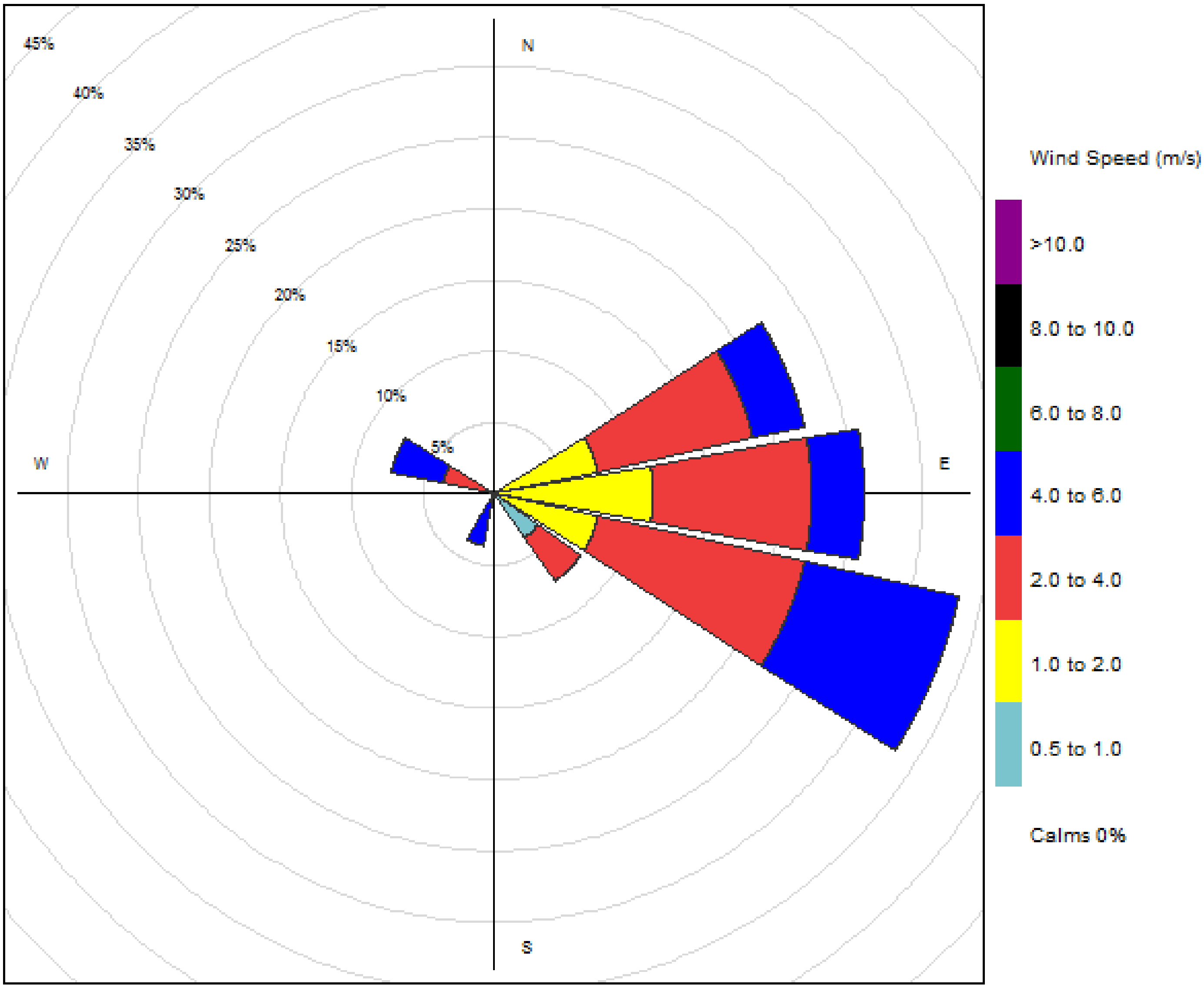


Figure E - 50: Wind rose during the alert event period, May 30 to May 31, 2017.

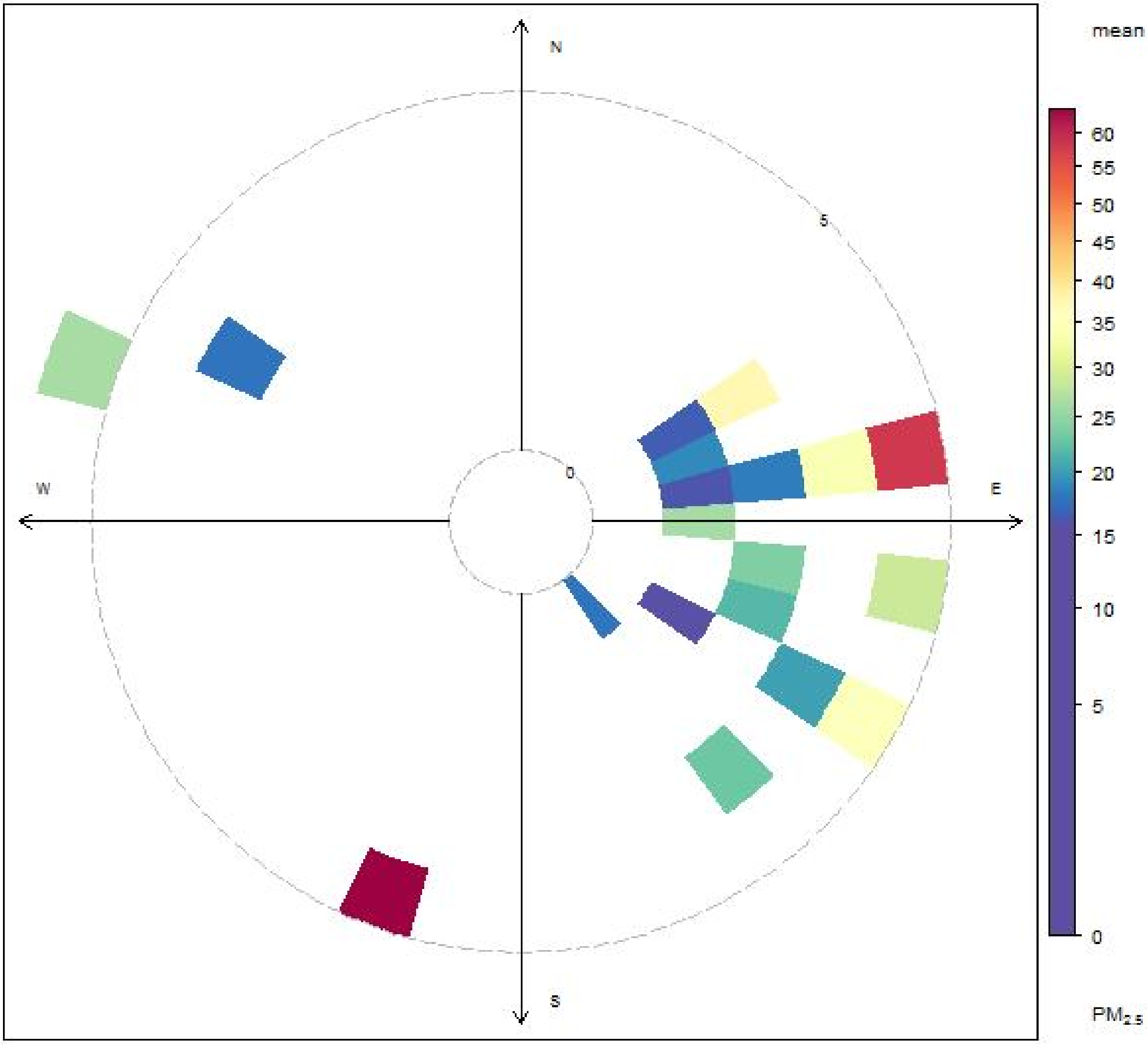


Figure E - 51: Polar frequency plot during the alert event period, May 30 to May 31, 2017.

E-18. Station 7B PM_{10} event on 2017-06-20

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 16:00 on June 20, 2017, until 17:00 on June 21, 2017 (see time series, Figure E - 52). The figure shows that this event was characterized by a very rapid increase to high hourly concentrations (greater than 600 µg/m^3) followed by a rapid decline (4 hours) to baseline concentrations.

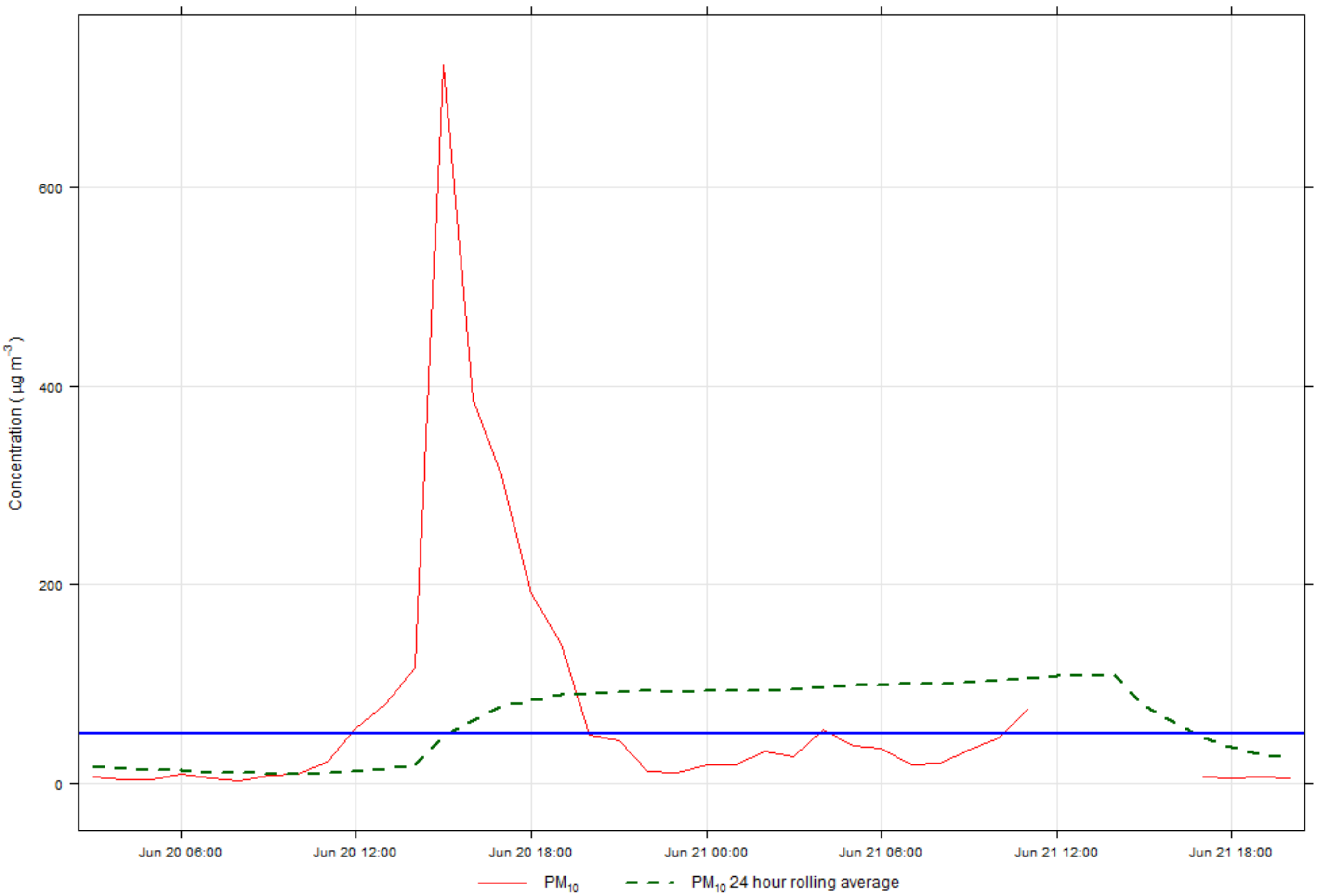


Figure E - 52: PM_{10} time series plot for the period, June 20 to June 21, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the west. Wind speeds were recorded ranging from 2 to 10 m/s (see wind rose, Figure E - 53). The greatest PM_{10} concentrations were observed at wind speeds from 8 to 9 m/s from the west-southwest (see polar frequency plot, Figure E - 54).

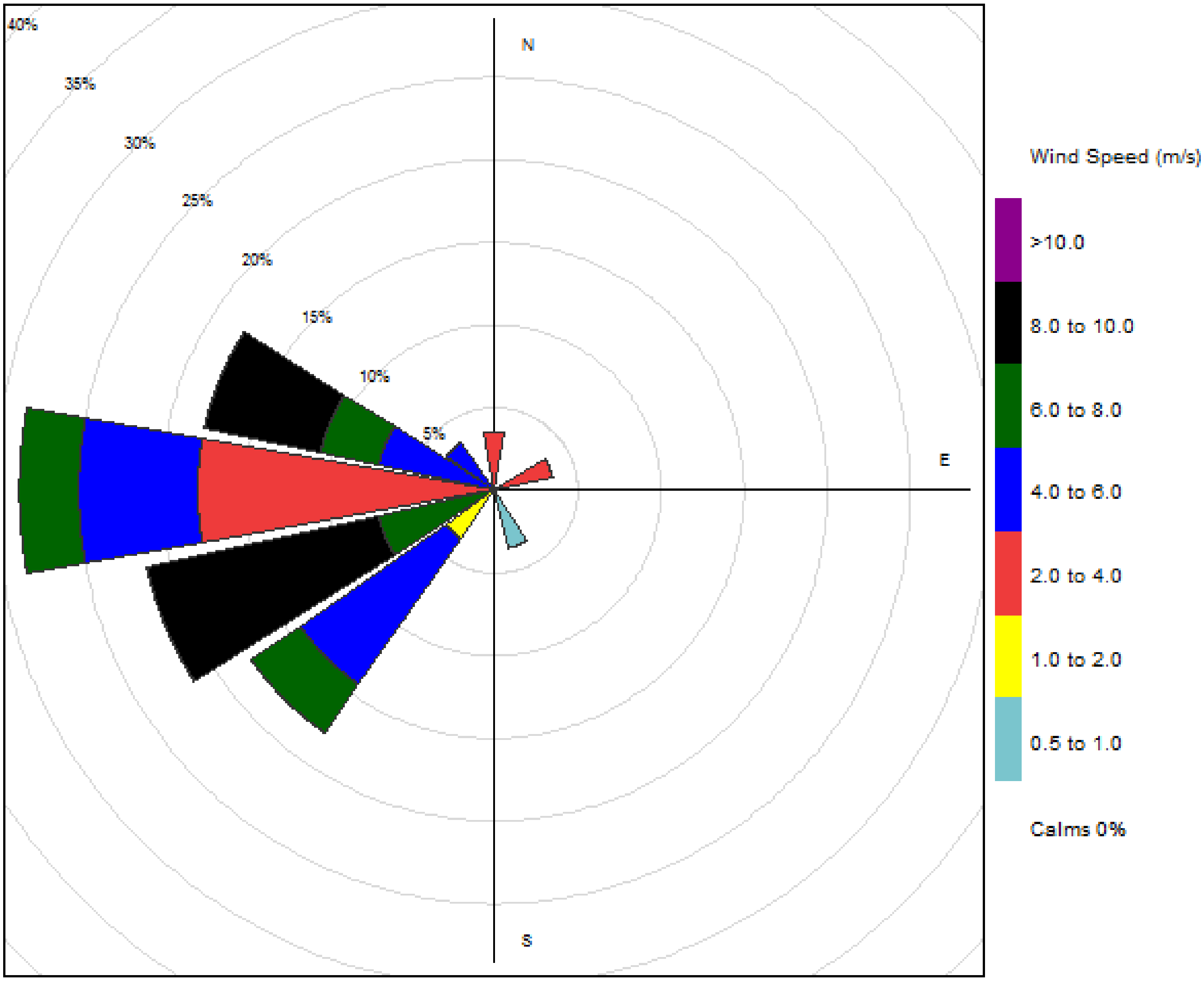


Figure E - 53: Wind rose during the alert event period, June 20 to June 21, 2017.

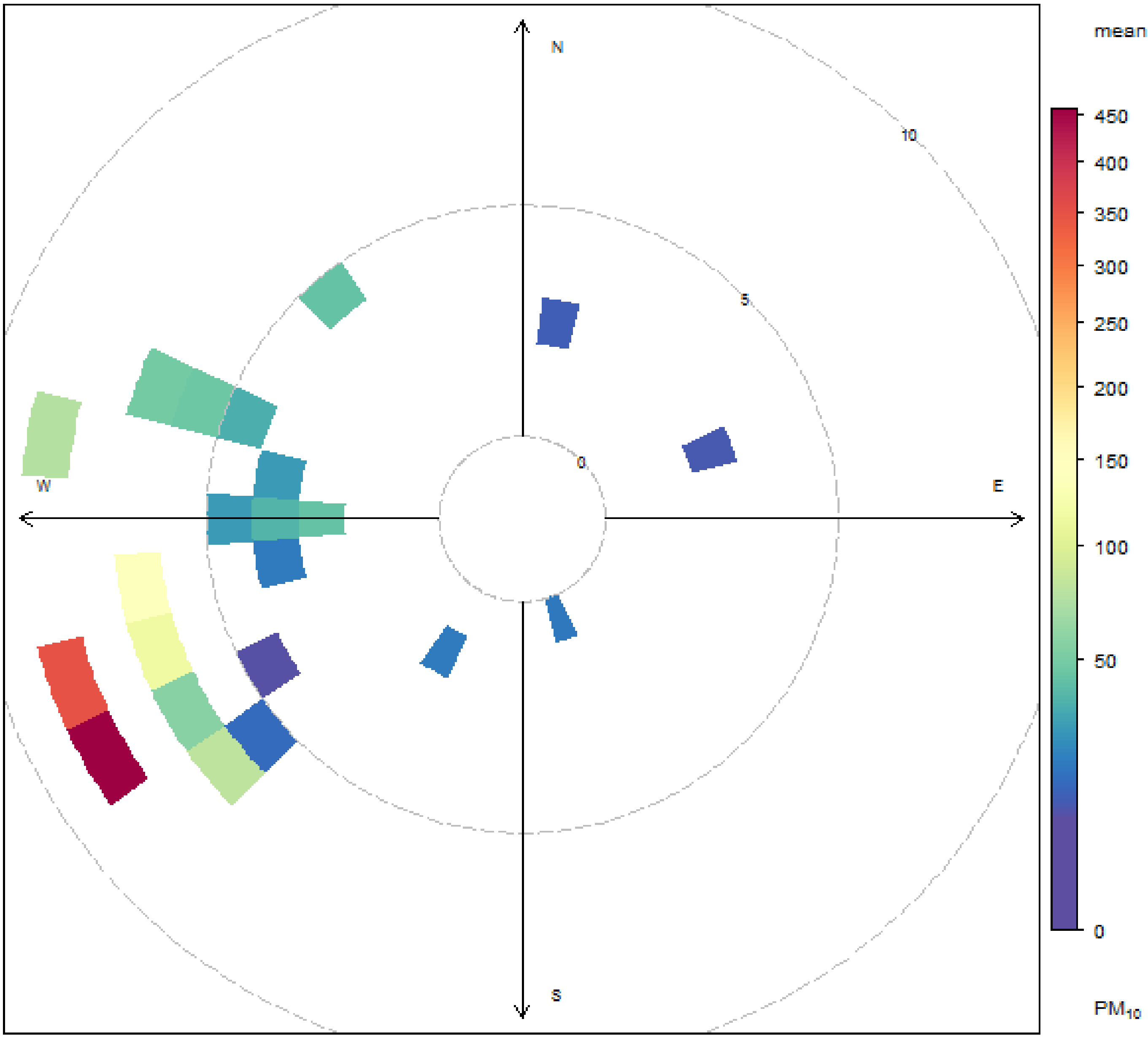


Figure E - 54: **Polar frequency plot for PM_{10} during the alert event period, June 20 to June 21, 2017.**

E-19. Station 7B PM_{10} event on 2017-06-25

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 19:00 on June 25, 2017, until 20:00 on June 27, 2017 (see time series, Figure E - 55). The figure shows that this event was characterized by an initial spike to greater than 200 µg/m^3 of PM_{10} followed by a period of lower concentrations, an extended period of elevated concentrations (> 200 µg/m^3), a sudden increase to 600 µg/m^3 and a rapid decline to baseline values.

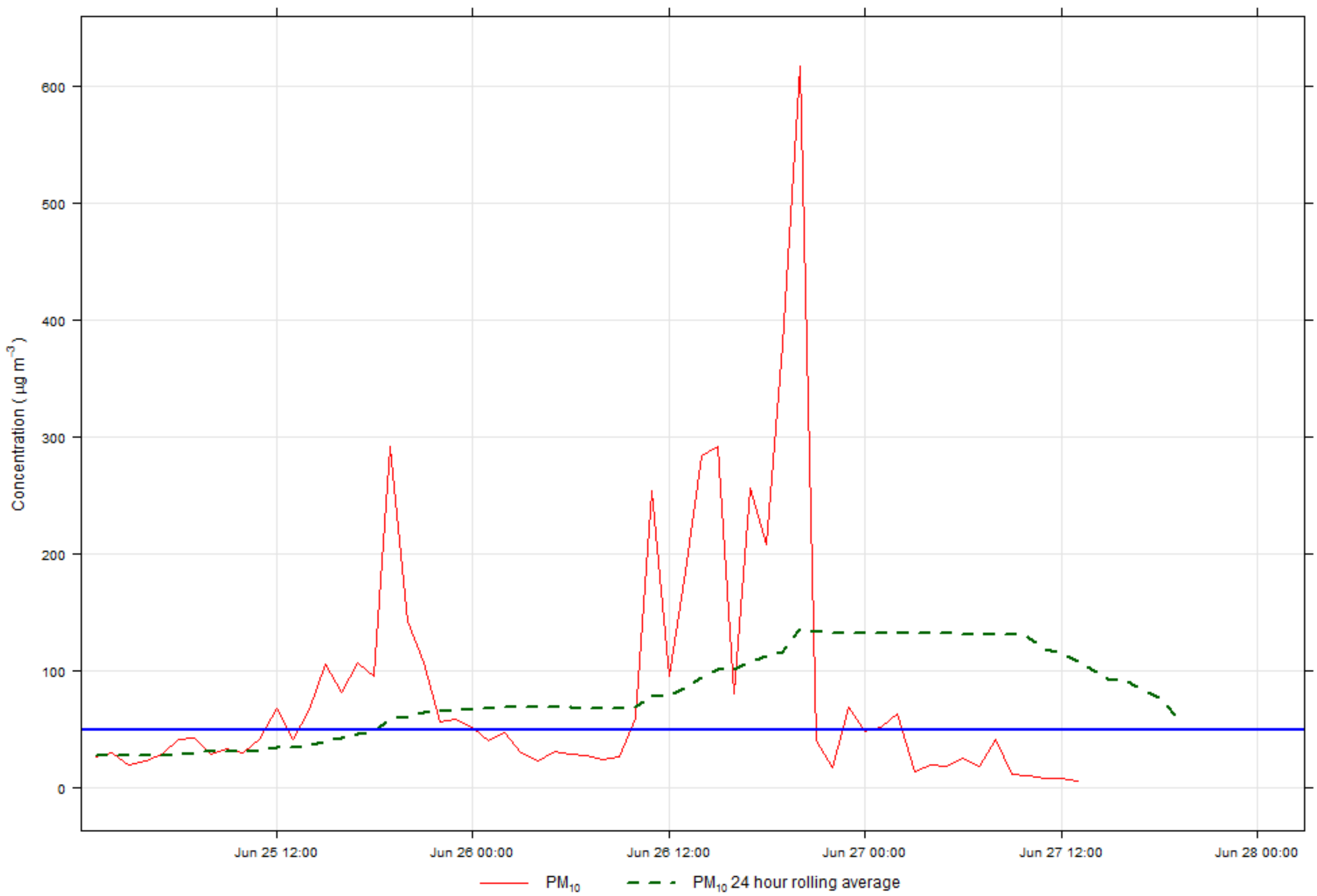


Figure E - 55: PM_{10} time series plot for the period, June 25 to June 27, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the west-southwest and northwest. Wind speeds were recorded ranging from 1 to 10 m/s (see wind rose, Figure E - 56). The greatest PM_{10} concentrations were observed at wind speeds from 8 to 9 m/s from the northwest (see polar frequency plot, Figure E - 57). A secondary maximum was observed at wind speeds from 6 to 8 m/s from the west-southwest.

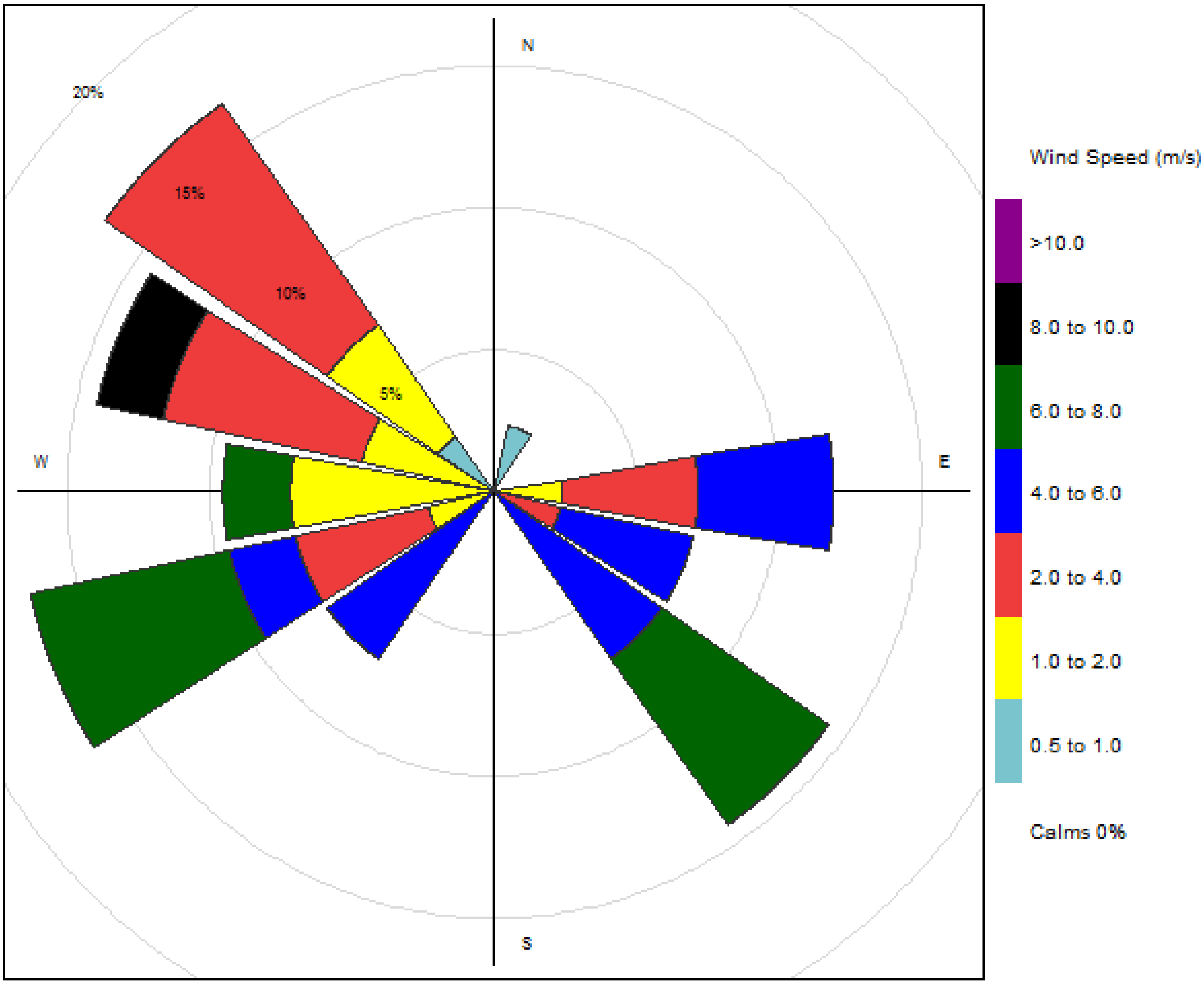


Figure E - 56: Wind rose during the alert event period, June 25 to June 27, 2017.

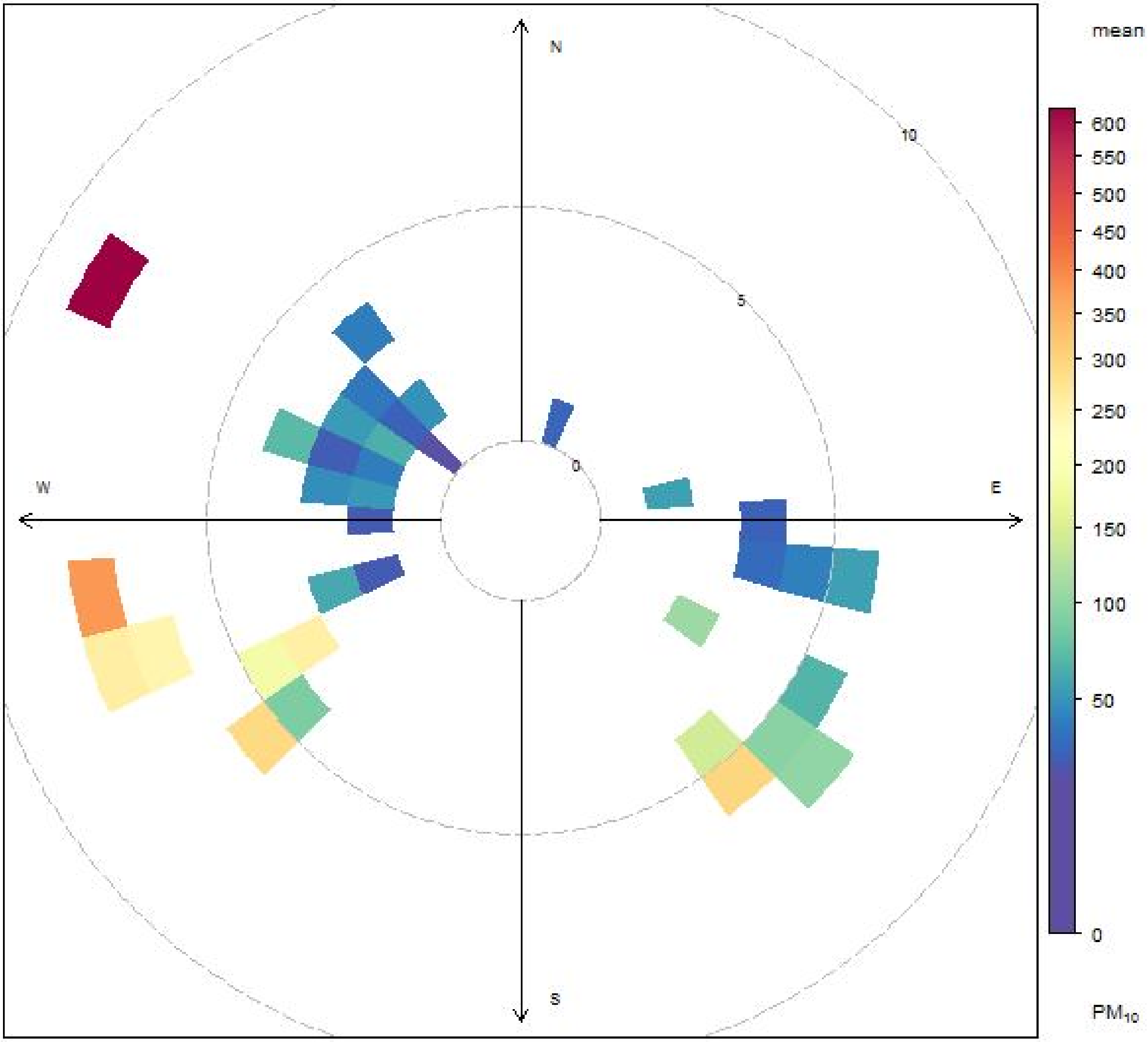


Figure E - 57: Polar frequency plot for PM_{10} during the alert event period, June 25 to June 27, 2017.

E-20. Station 7B PM_{10} event on 2017-07-01

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 12:00 on July 01, 2017 until 20:00 on July 6 and again from 17:00 on July 7 until 18:00 on July 08, 2017 (see time series, Figure E - 58). The figure shows that this event was characterized by several long duration spikes (> 18 hours) of very high hourly concentrations (up to 1500 µg/m^3) interspersed with periods of elevated PM_{10} concentrations (> 50 µg/m^3).

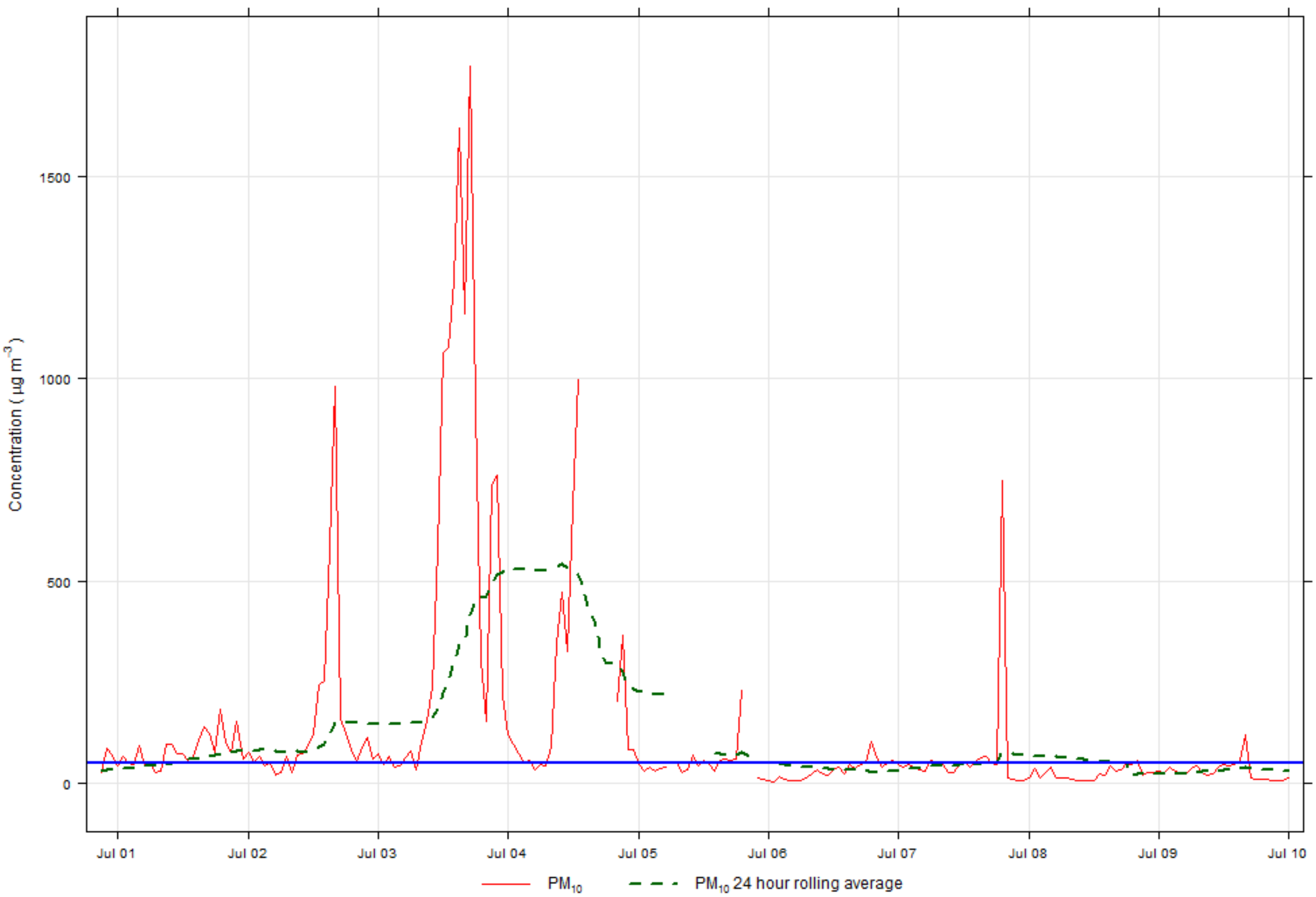


Figure E - 58: PM_{10} time series plot for the period, July 01 to June 08, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the west and west-southwest. Wind speeds were recorded from 1 to greater than 10 m/s (see wind rose, Figure E - 59). The greatest PM_{10} concentrations were observed at high wind speeds (10-11 m/s) from the west-southwest (see polar frequency plot, Figure E - 60).

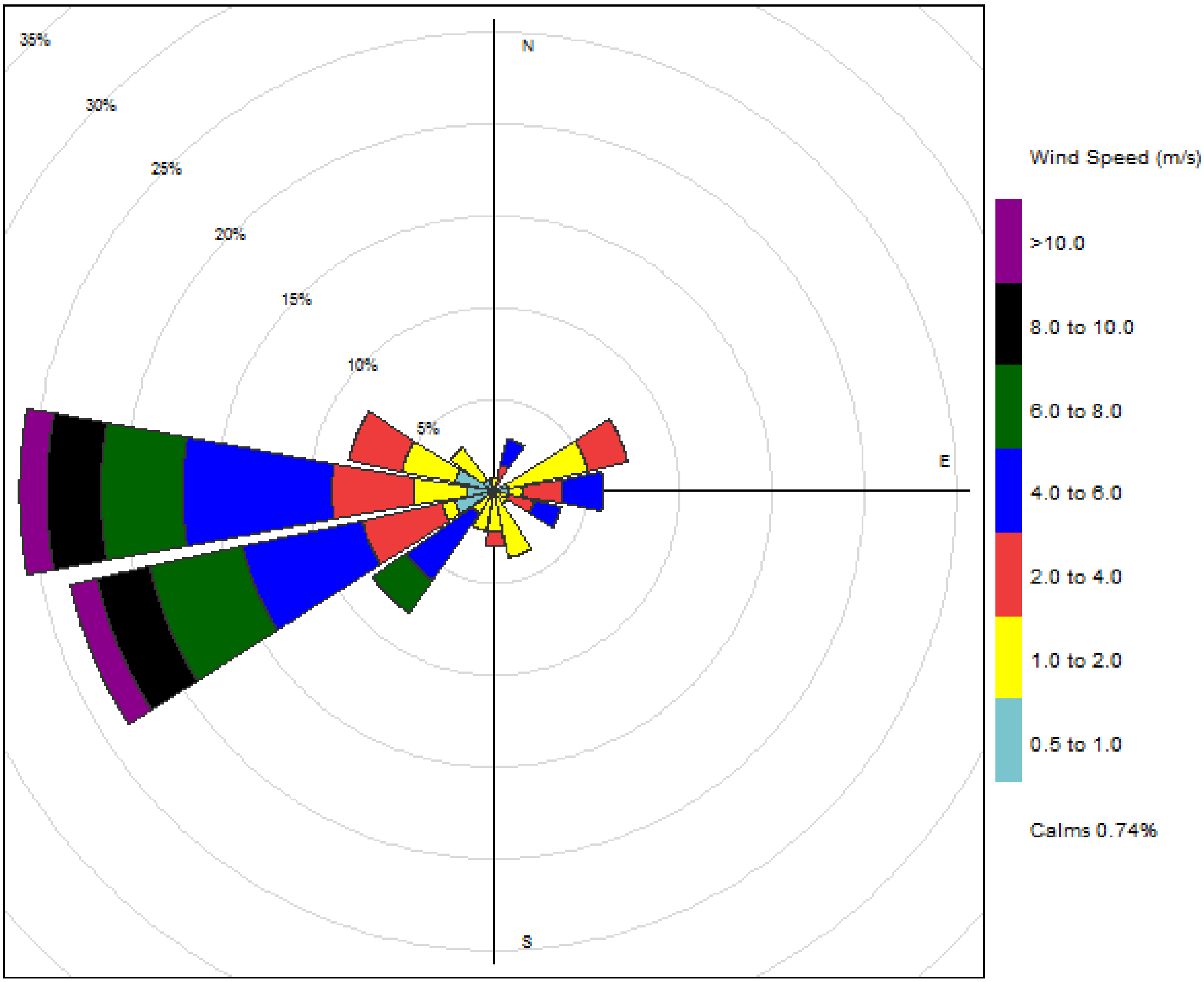


Figure E - 59: Wind rose during the alert event period, July 01 to July 08, 2017.

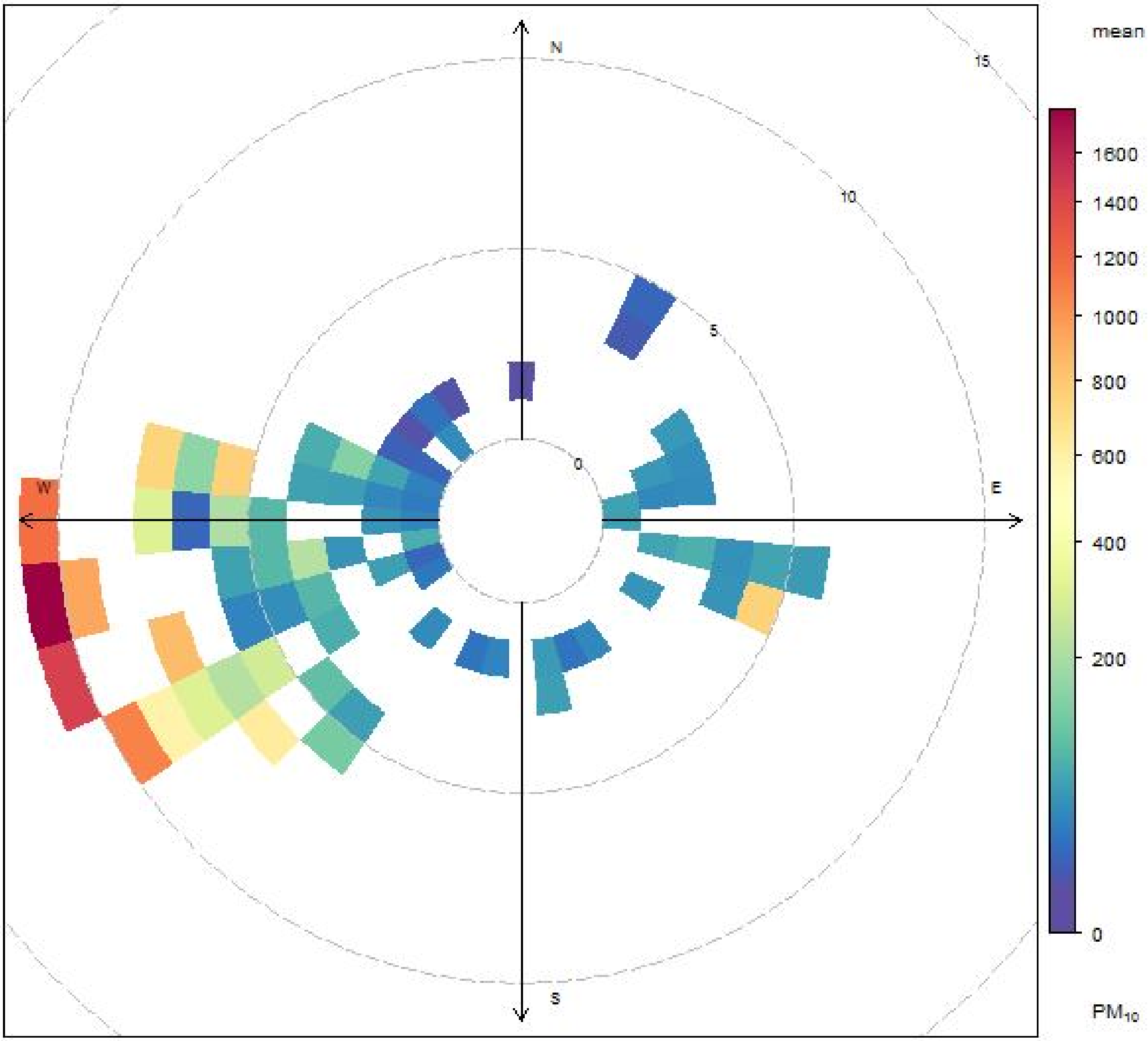


Figure E - 60: Polar frequency plot for PM_{10} during the alert event period, July 01 to July 08, 2017.

E-21. Station 7B PM_{10} event on 2017-07-10

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 17:00 on July 10, 2017, until 03:00 on July 13, 2017 (see time series, Figure E - 61). The figure shows that this event was characterized by two periods of approximately 12 hours during which hourly concentrations varied between 100 and 200 µg/m^3 followed by a gradual decline to background levels.

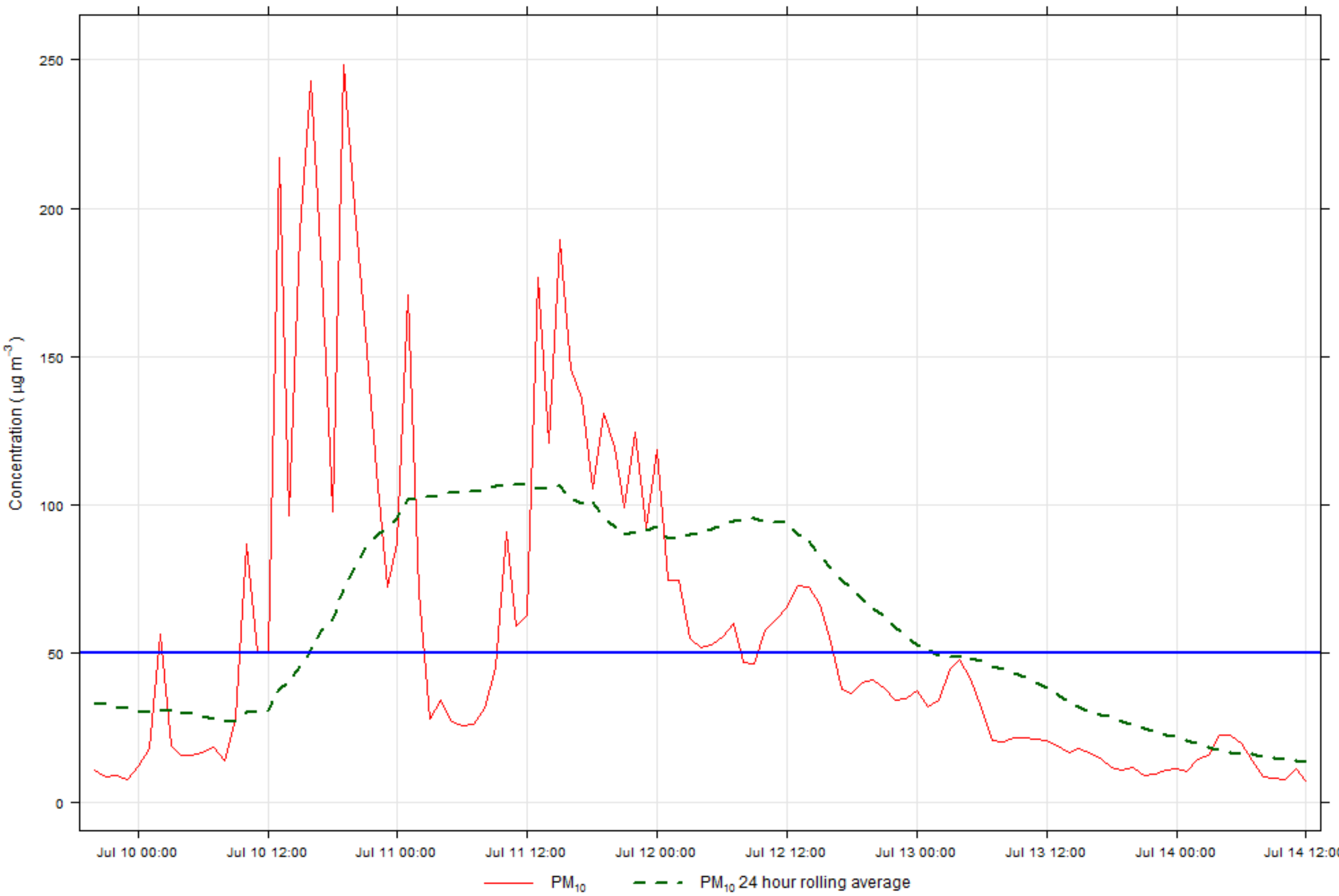


Figure E - 61: PM_{10} time series plot for the period, July 10 to June 13, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the northwest. Wind speeds were recorded ranging from 1 to 8 m/s (see wind rose, Figure E - 62). The greatest PM_{10} concentrations were observed at wind speeds of 3 to 4 m/s from the southwest (see polar frequency plot, Figure E - 63). A secondary maximum was recorded at wind speeds of 7 to 8 m/s from the east-southeast.

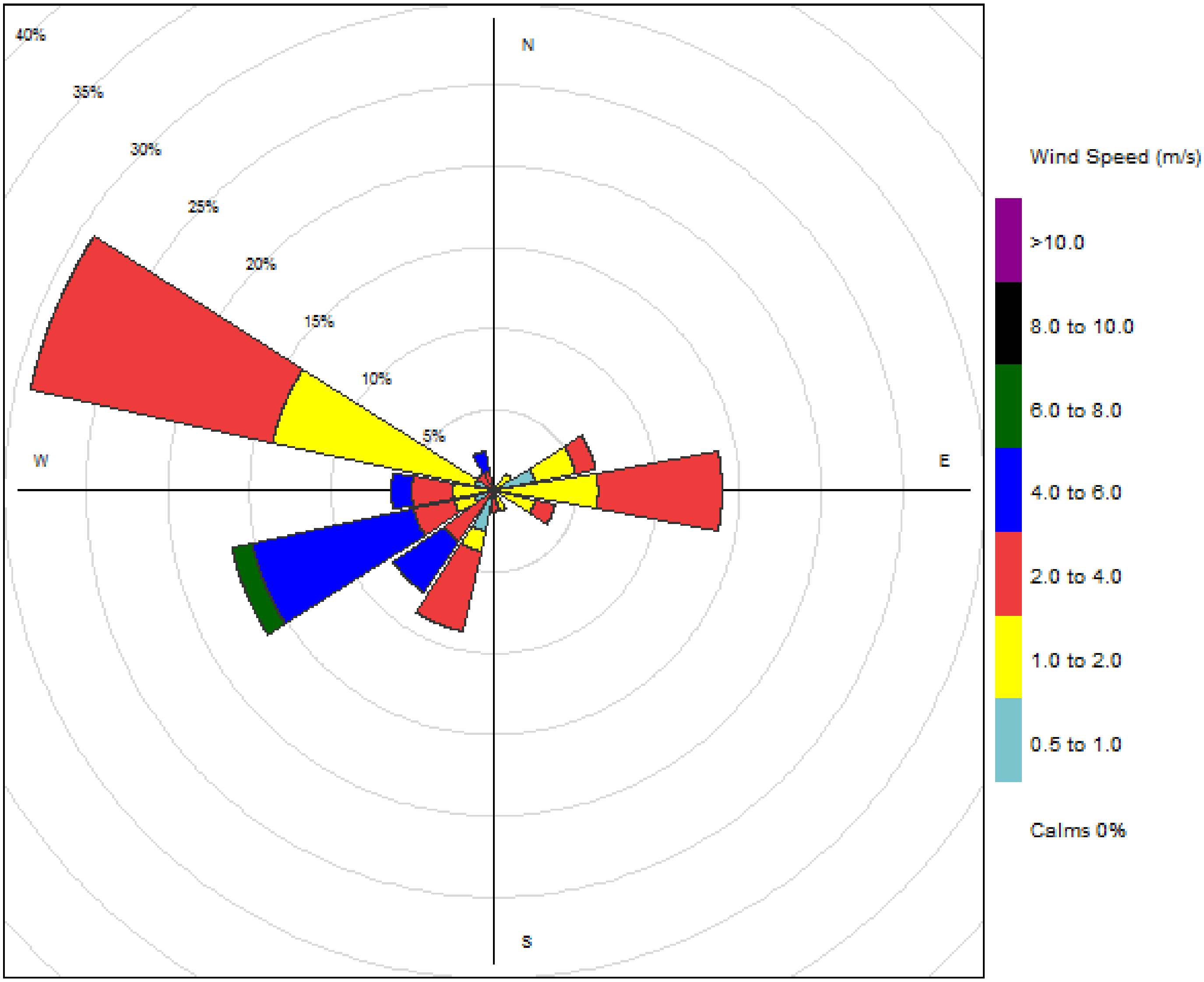


Figure E - 62: Wind rose during the alert event period, July 10 to July 13, 2017.

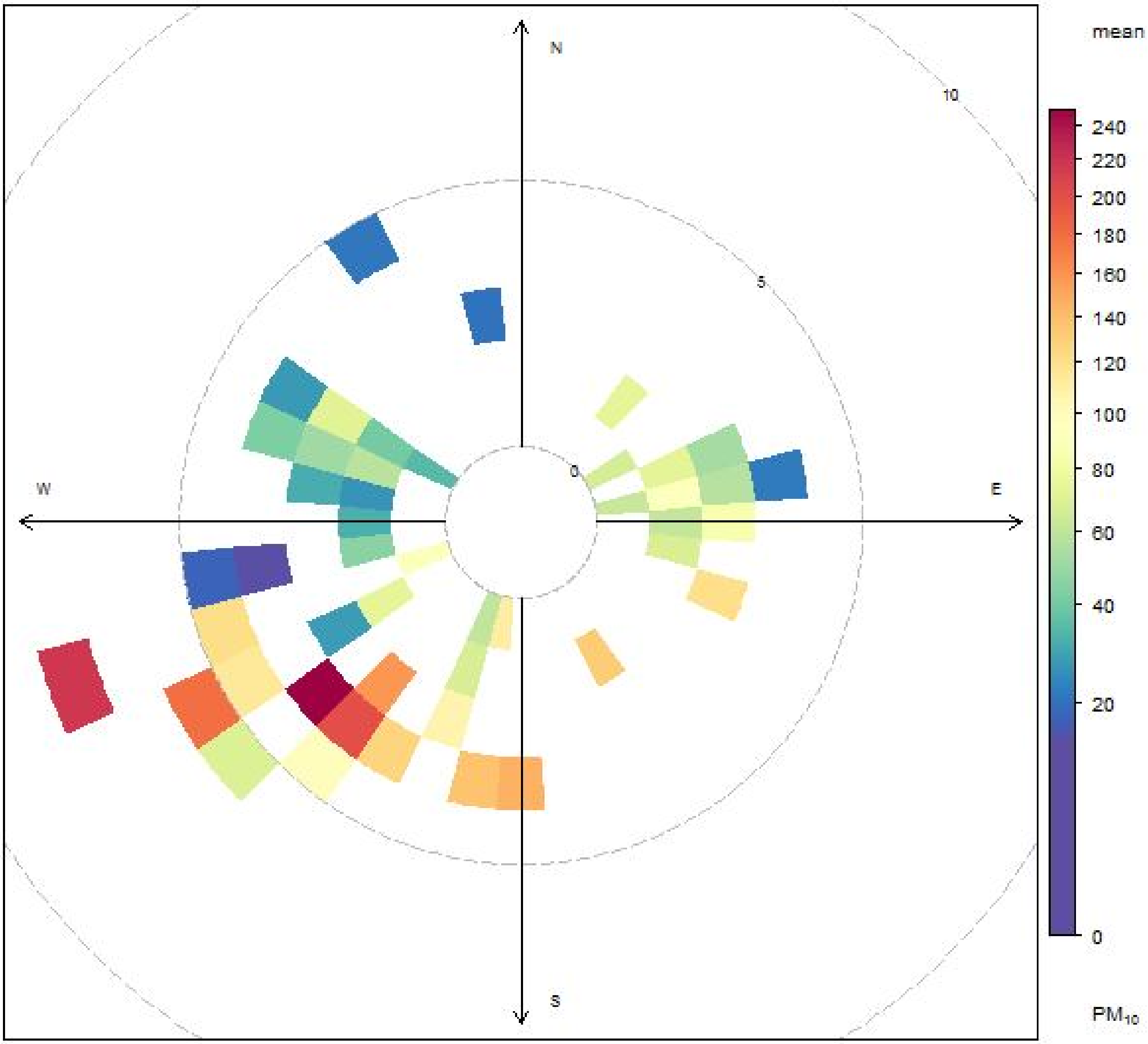


Figure E - 63: Polar frequency plot for PM_{10} during the alert event period, July 10 to July 13, 2017.

E-22. Station 9 $PM_{2.5}$ event on 2017-07-12

The 24 hour rolling average $PM_{2.5}$ concentrations at Station 9 were greater than the BC MOE 24-hour AAQO of 25 µg/m^3 from 08:00 on July 15, 2017, until 04:00 on July 16, 2017 (see time series, Figure E - 64). The figure shows that this event was characterized by an initial four day period of elevated $PM_{2.5}$ concentrations that remained below the AAQO followed by a 24-hour period of concentrations greater than the AAQO which is what caused the 24-hour rolling average to surpass the AAQO and a rapid decline to baseline values. A Smoky Skies bulletin issued by BC MOE was in effect at the time of this event.

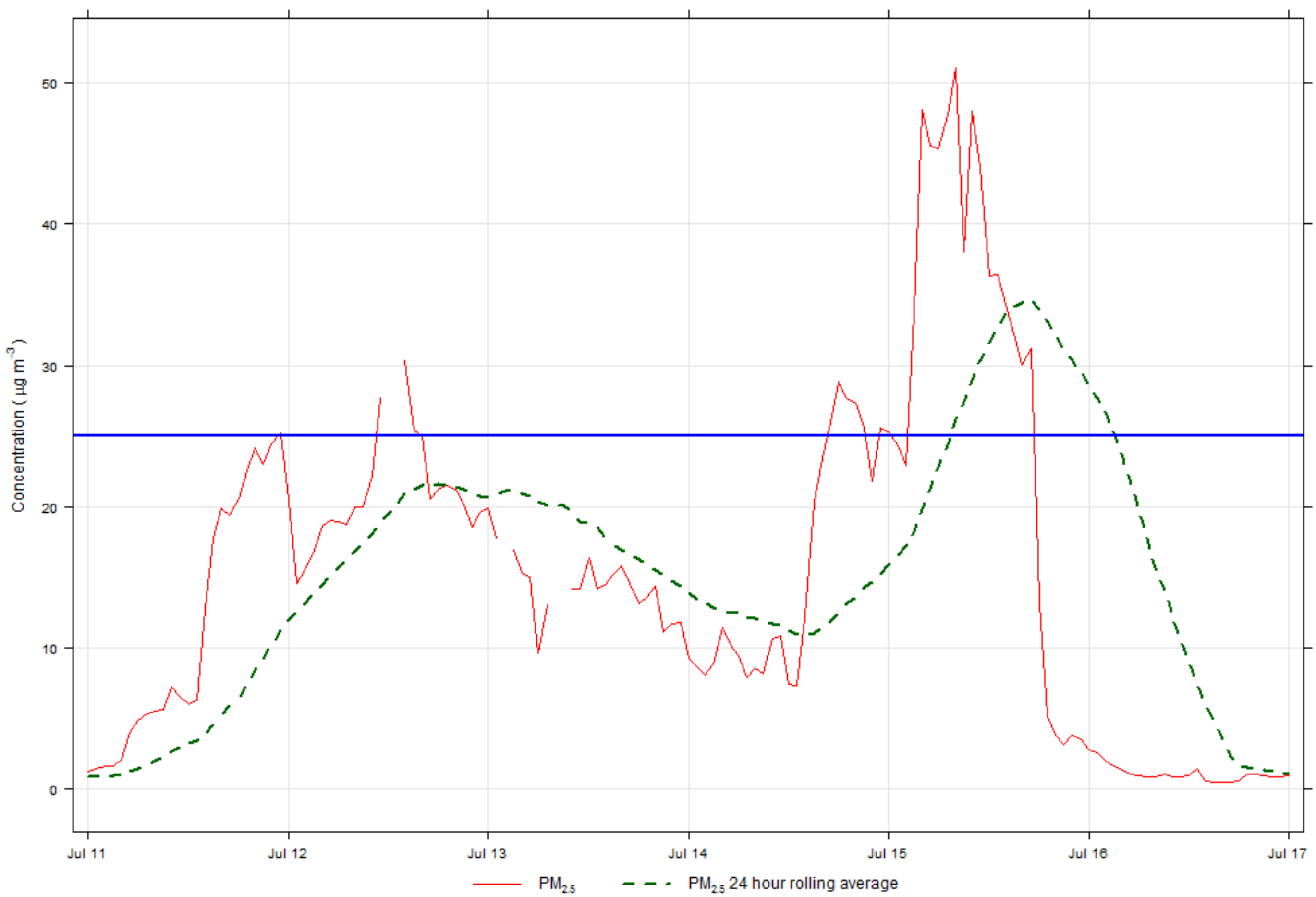


Figure E - 64: $PM_{2.5}$ time series plot for the period, July 12 to July 16, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m^3

Wind directions at the time of the event were predominantly from the west. Wind speeds were recorded from 1 to 10 m/s (see wind rose, Figure E - 65). The greatest PM_{10} concentrations were observed at wind speeds of 2 to 3 m/s from the northeast (see polar frequency plot, Figure E - 66). Secondary maxima occurred when winds were from the southwest, and the northwest.

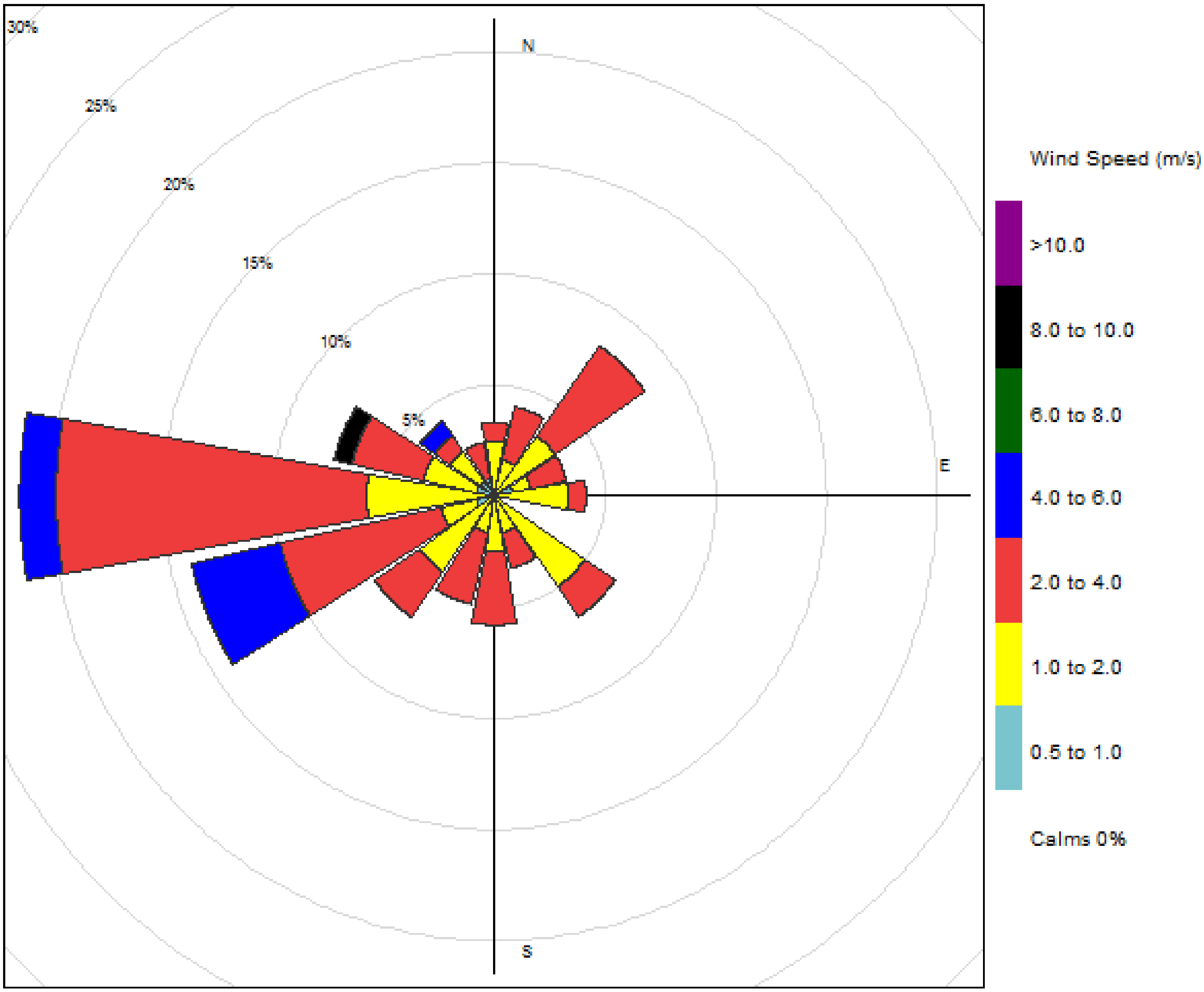


Figure E - 65: Wind rose during the alert event period, July 12 to July 16, 2017.

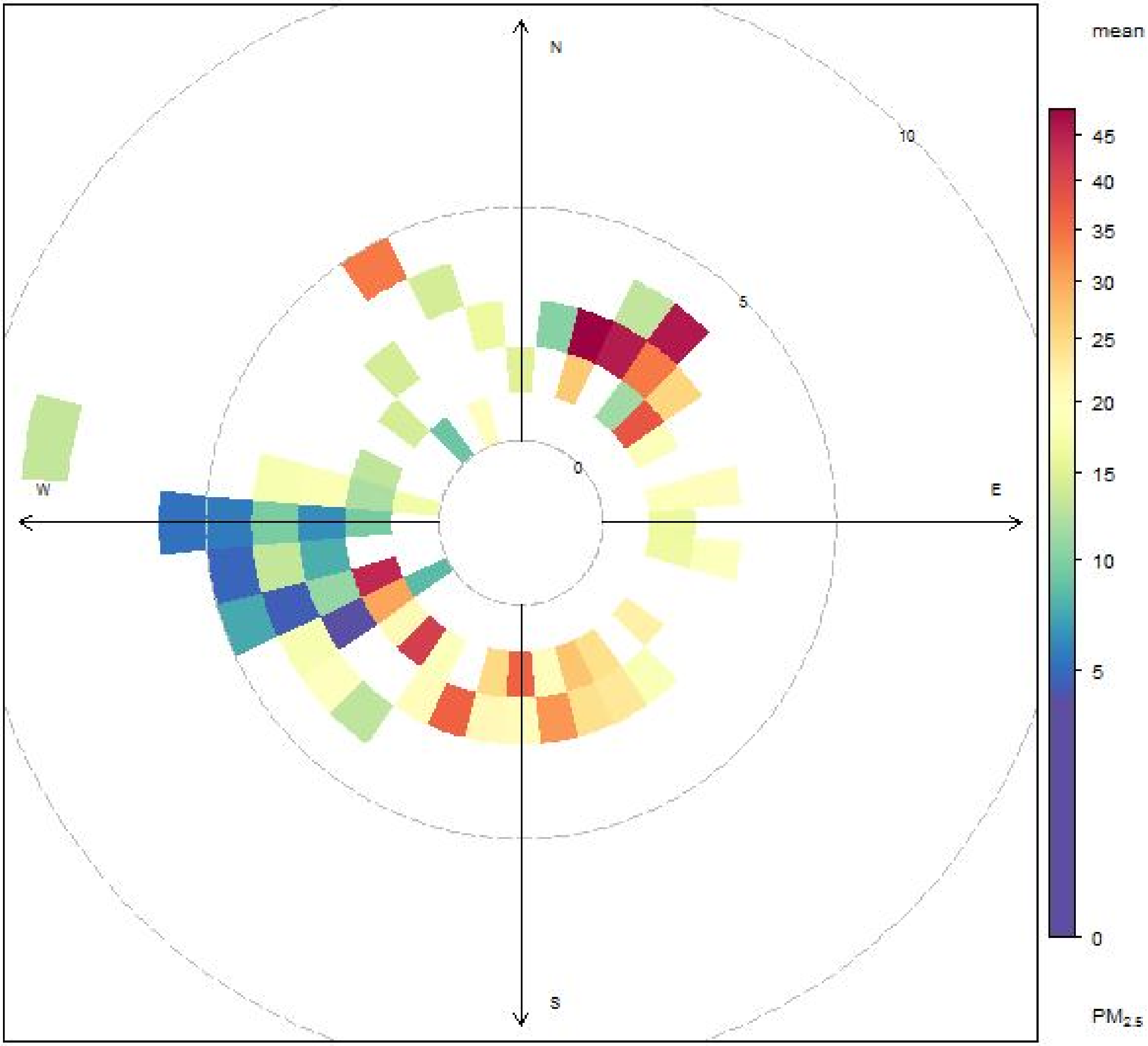


Figure E - 66: Polar Frequency plot during the alert event period, July 12 to July 16, 2017.

E-23. 23 Station 8 PM 2.5 event on 2017-07-15

The 24 hour rolling average $PM_{2.5}$ concentrations at Station 8 were greater than the BC MOE 24-hourAAQO of 25 µg/m^3 from 11:00 on July 15, 2017, until 03:00 on July 16, 2017 (see time series, Figure E - 67). The figure shows that this event was characterized by an initial 12-hour period of generally elevated $PM_{2.5}$ concentrations that remained just under the AAQO followed by an increase to concentrations greater than 60 µg/m^3 and then a rapid decline to baseline concentrations. A Smoky Skies bulletin issued by BC MOE was in effect at the time of this event.

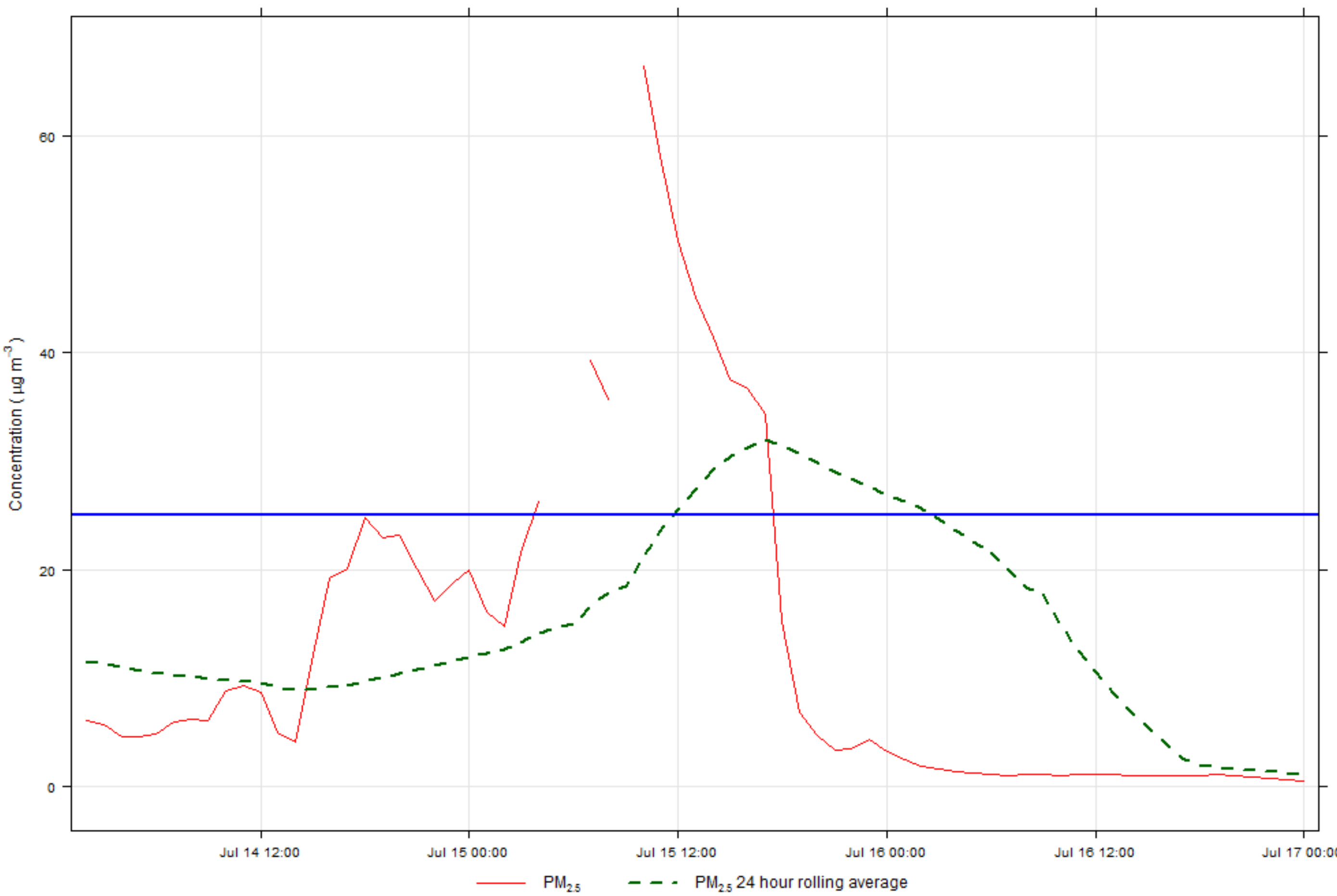


Figure E - 67: $PM_{2.5}$ time series plot for the period, July 15 to July 16, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m^3

Wind directions at the time of the event were predominantly from the south-southwest, northeast, and the southeast. Wind speeds were recorded from 1 to 10 m/s (see wind rose, Figure E - 68). The greatest $PM_{2.5}$ concentrations were observed at wind speeds of 1 to 2 m/s from the southwest (see polar frequency plot, Figure E - 69).

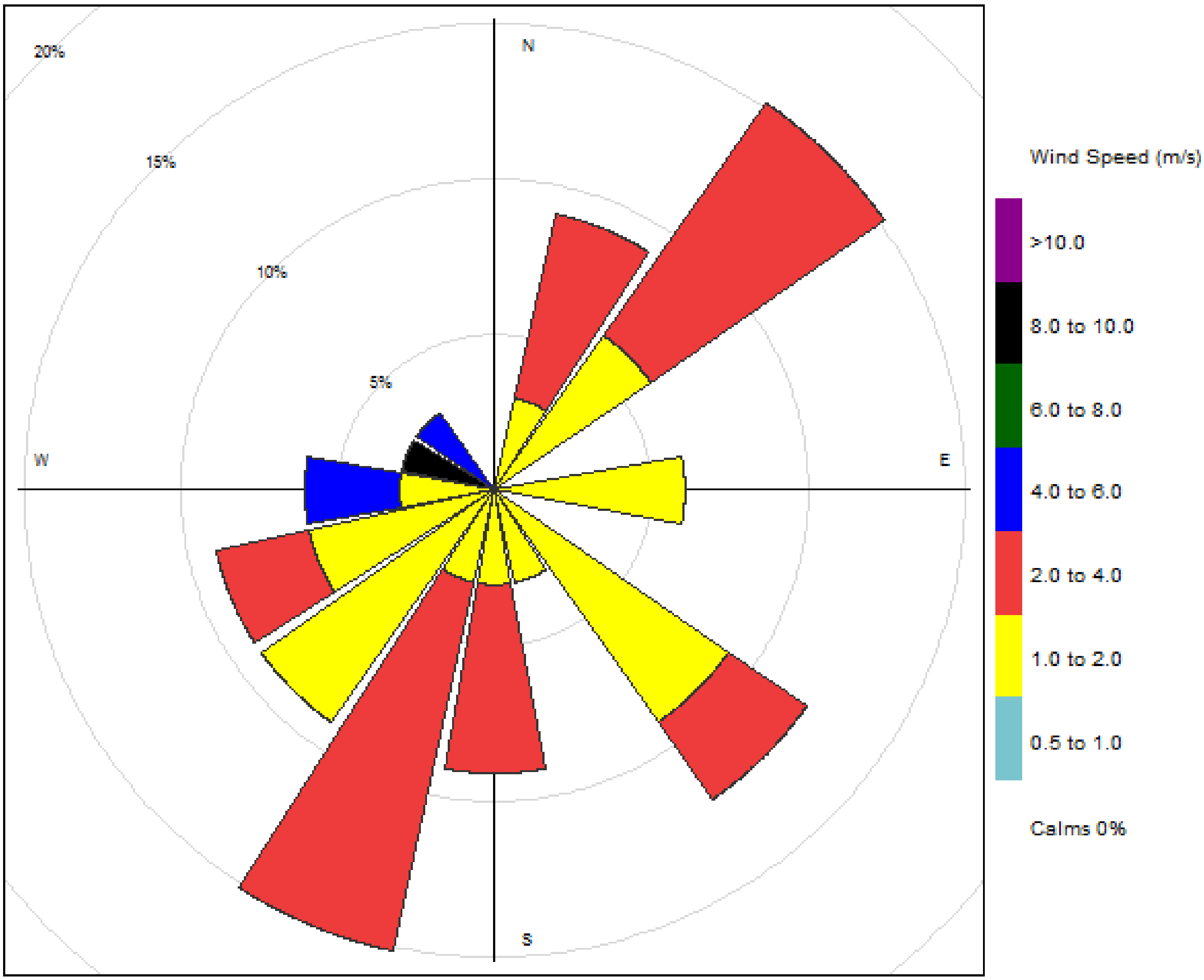


Figure E - 68: Wind rose during the alert event period, July 15 to July 16, 2017.

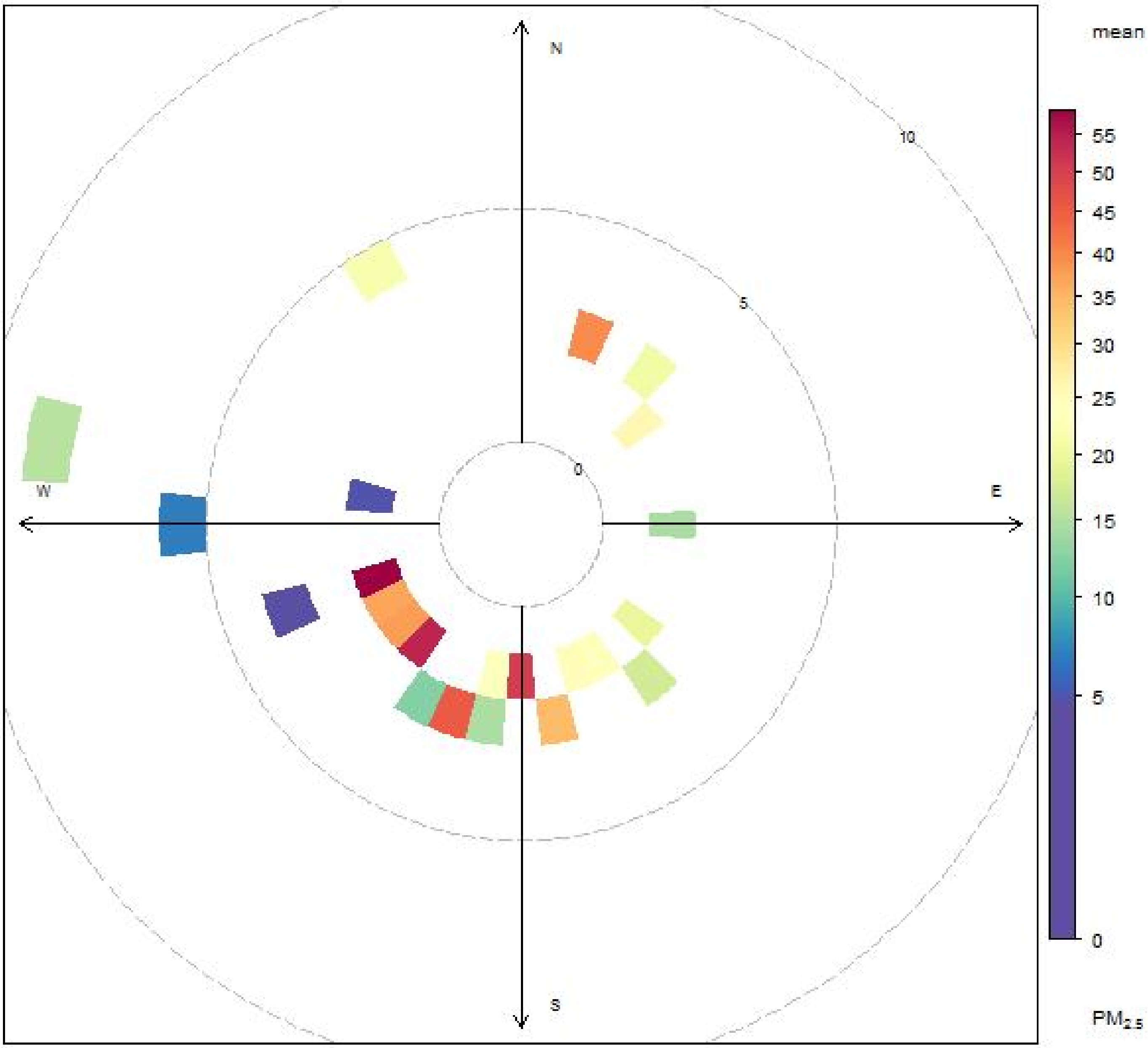


Figure E - 69: Polar frequency plot during the alert event period, July 15 to July 16, 2017.

E-24. Station 7B PM_{10} event on 2017-08-01

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 03:00 on August 01, 2017, until 02:00 on August 02, 2017 (see time series, Figure E - 70). The figure shows that this event was characterized by a single 6-hour spike of very high hourly concentrations (greater than 400 µg/m^3) followed by a rapid decline to baseline levels.

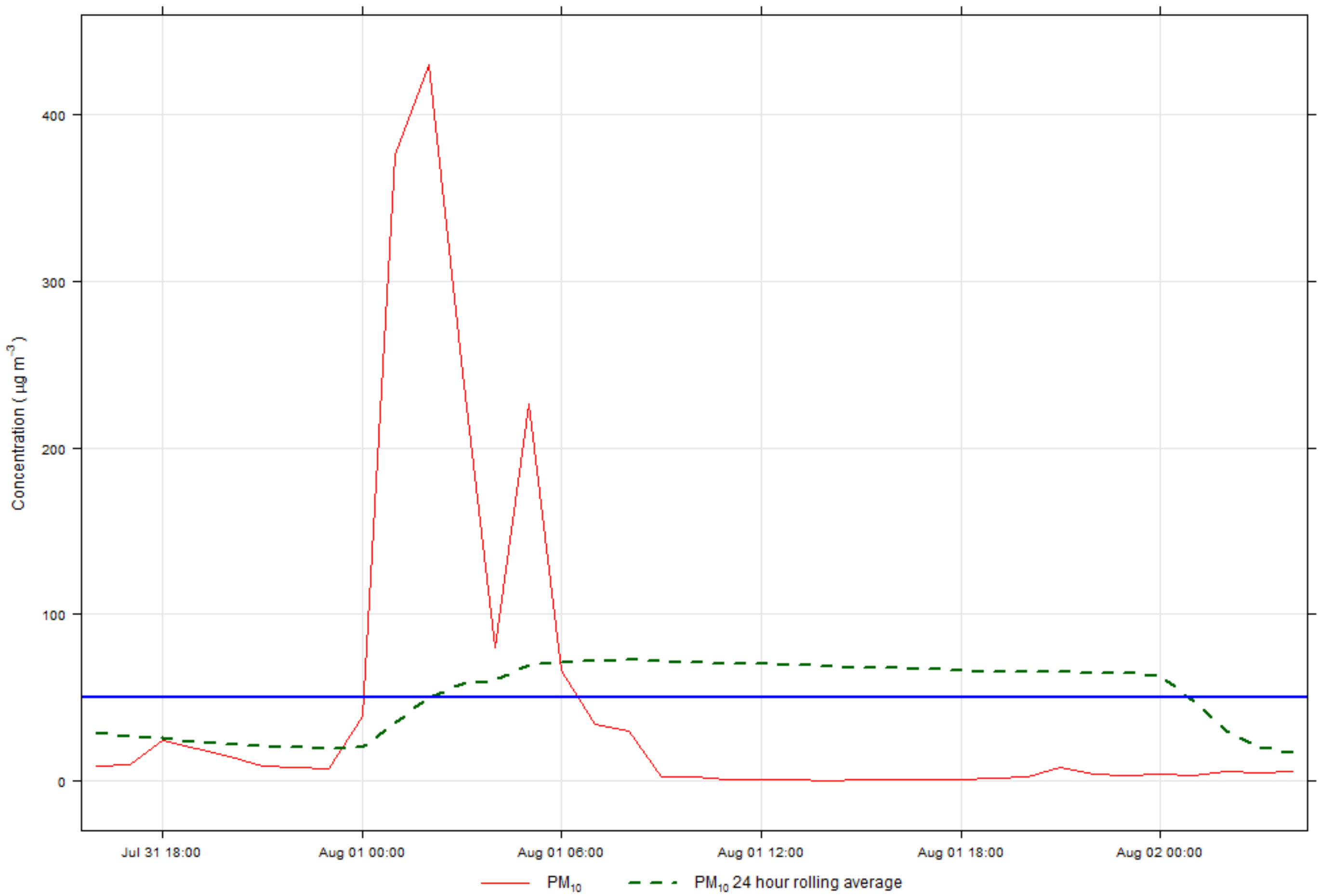


Figure E - 70: PM_{10} time series plot for the period, August 01 to August 02, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the west. Wind speeds were recorded from 2 to 4 m/s (see wind rose, Figure E - 71). The greatest PM_{10} concentrations were observed at wind speeds of 2 to 3 m/s from the west (see polar frequency plot, Figure E - 72).

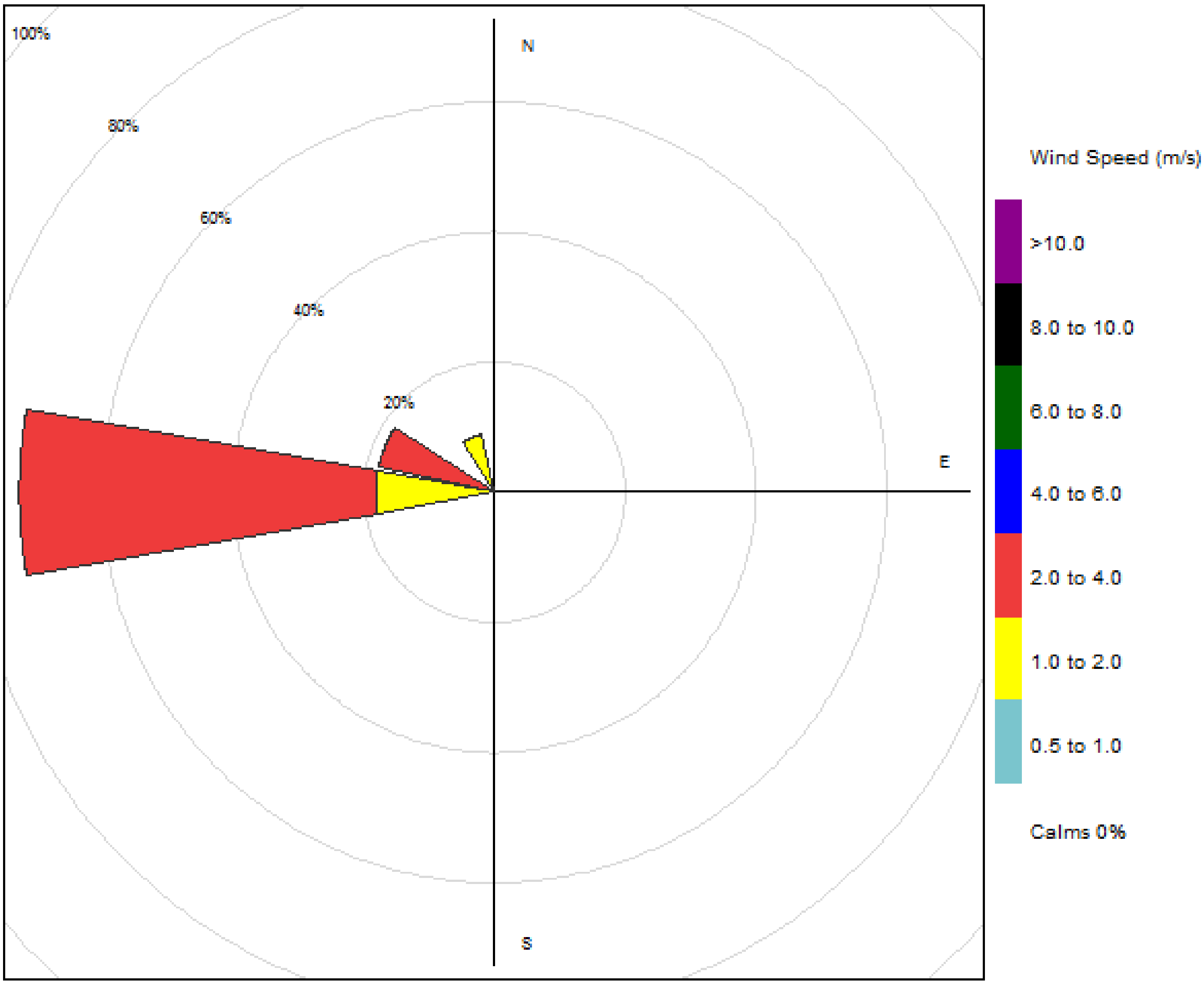


Figure E - 71: Wind rose during the alert event period, August 01 to August 02, 2017.

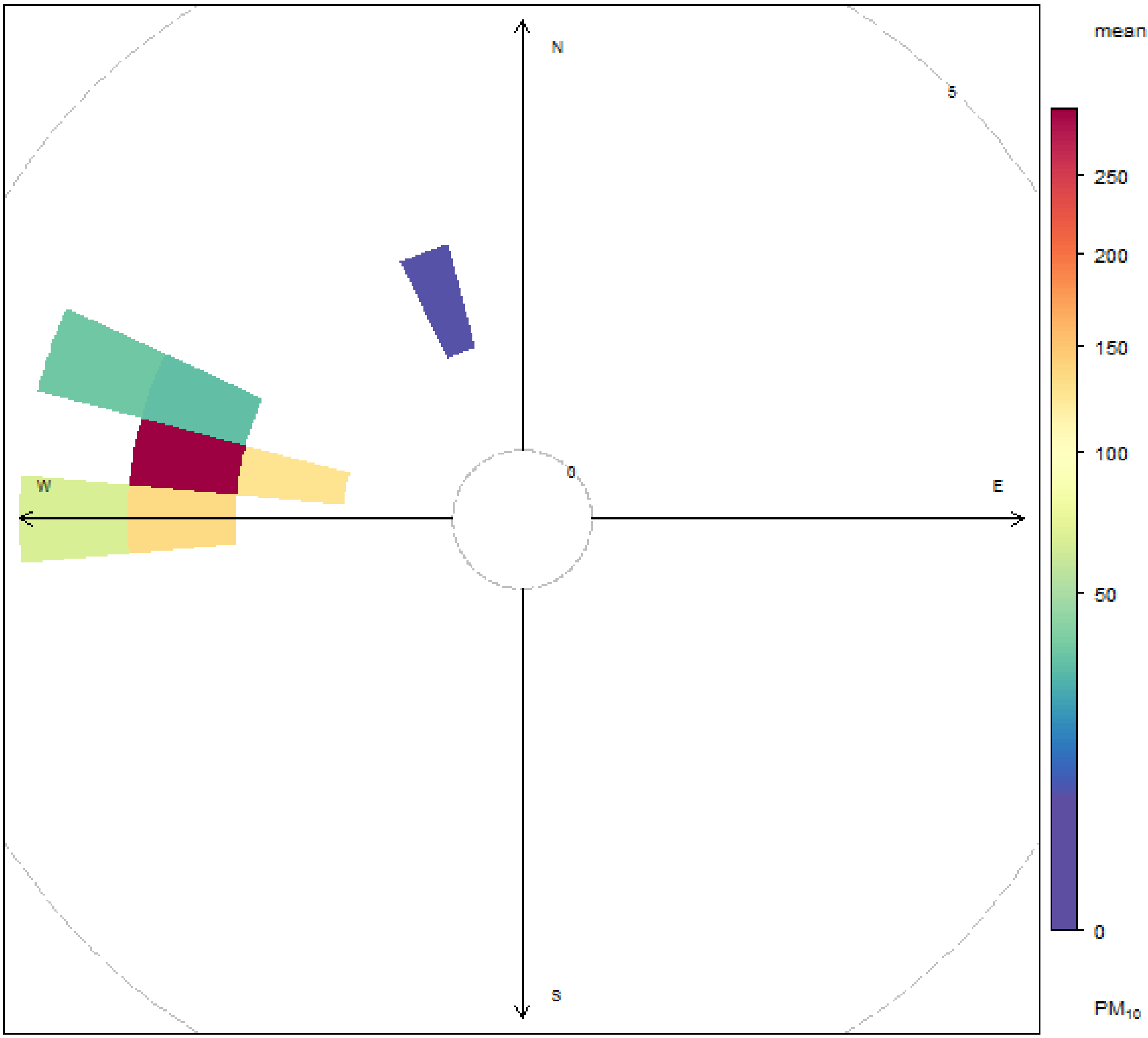


Figure E - 72: Polar frequency plot for PM_{10} during the alert event period, August 01 to August 02, 2017.

E-25. Station 7B PM_{10} event on 2017-08-11

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 μg/m^3 from 12:00 on August 11, 2017, until 05:00 on August 14, 2017 (see time series, Figure E - 73). The figure shows that this event was characterized by a long period of generally elevated PM_{10} concentrations (> 50 μg/m^3) followed by a single hour of very high hourly concentrations (greater than 400 μg/m^3) and a rapid decline to baseline levels. A Smoky Skies bulletin issued by BC MOE was in effect at the time of this event.

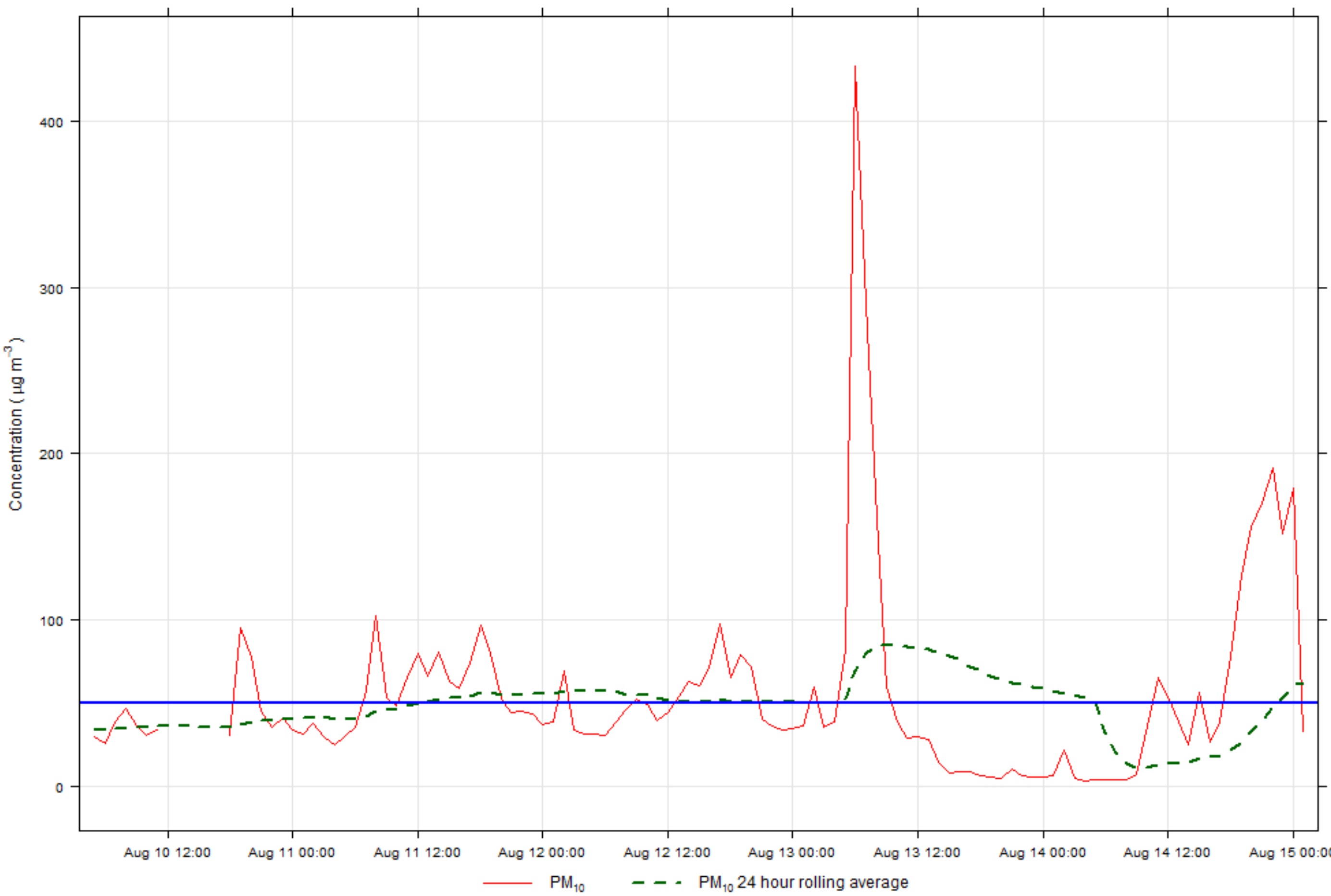


Figure E - 73: PM_{10} time series plot for the period, August 11 to August 14, 2017. Blue line indicates the 24-hour BC AAQO of 50 μg/m^3

Wind directions at the time of the event were predominantly from the east. Wind speeds were recorded from 2 to 6 m/s (see wind rose, Figure E - 74). The greatest PM_{10} concentrations were observed at wind speeds of 2 to 3 m/s from the south-southwest (see polar frequency plot, Figure E - 75).

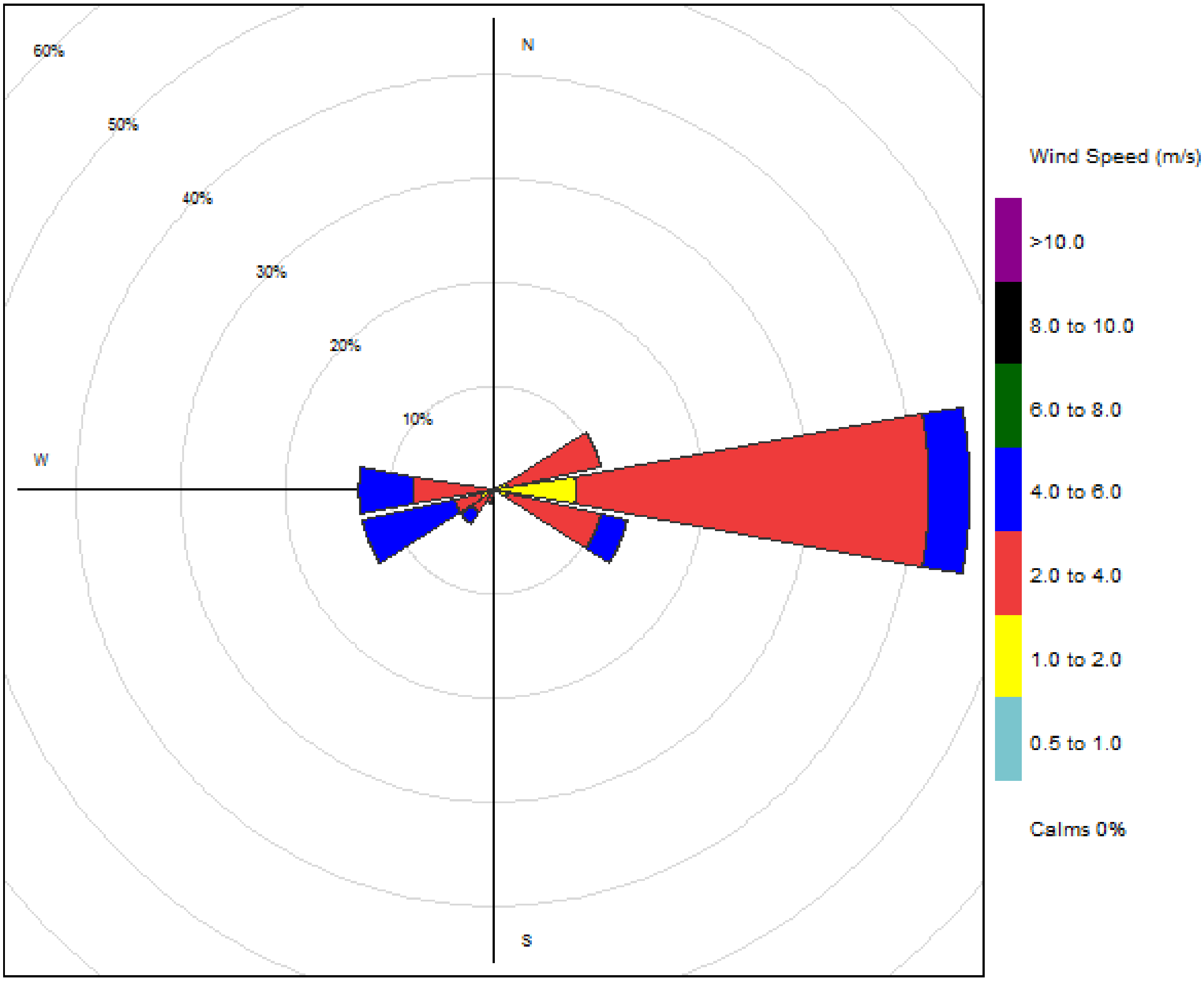


Figure E - 74: Wind rose during the alert event period, August 11 to August 14, 2017.

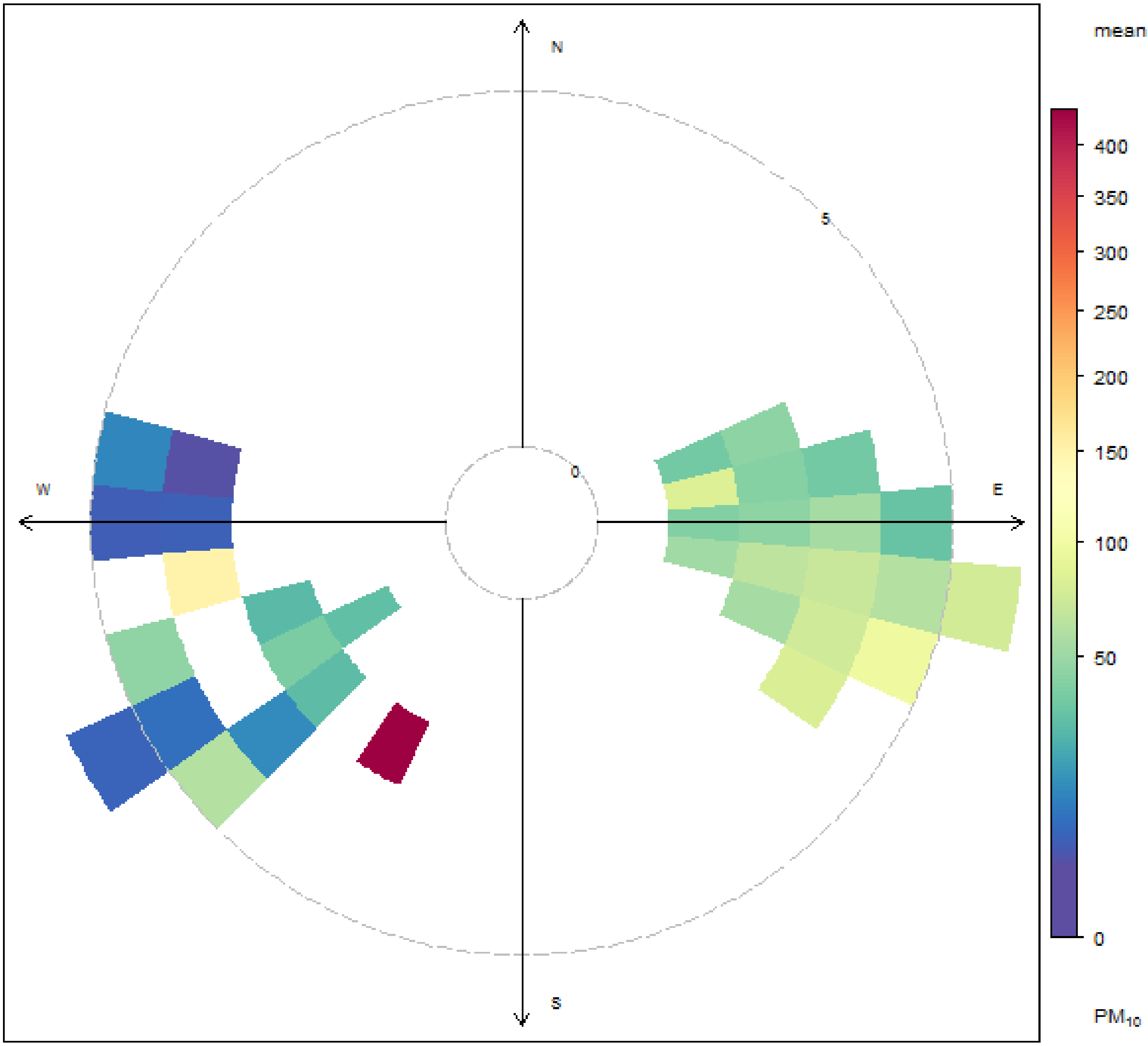


Figure E - 75: Polar frequency plot during the alert event period, August 11 to August 14, 2017.

E-26. Station 9 $PM_{2.5}$ event on 2017-08-13

The 24 hour rolling average $PM_{2.5}$ concentrations at Station 9 were greater than the BC MOE 24-hour AAQO of 25 µg/m^3 from 08:00 on August 13, 2017, until 06:00 on August 14, 2017 (see time series, Figure E - 76). The figure shows that this event was characterized by a prolonged spike of very high hourly concentrations (greater than 150 µg/m^3). A Smoky Skies bulletin issued by BC MOE was in effect at the time of this event.

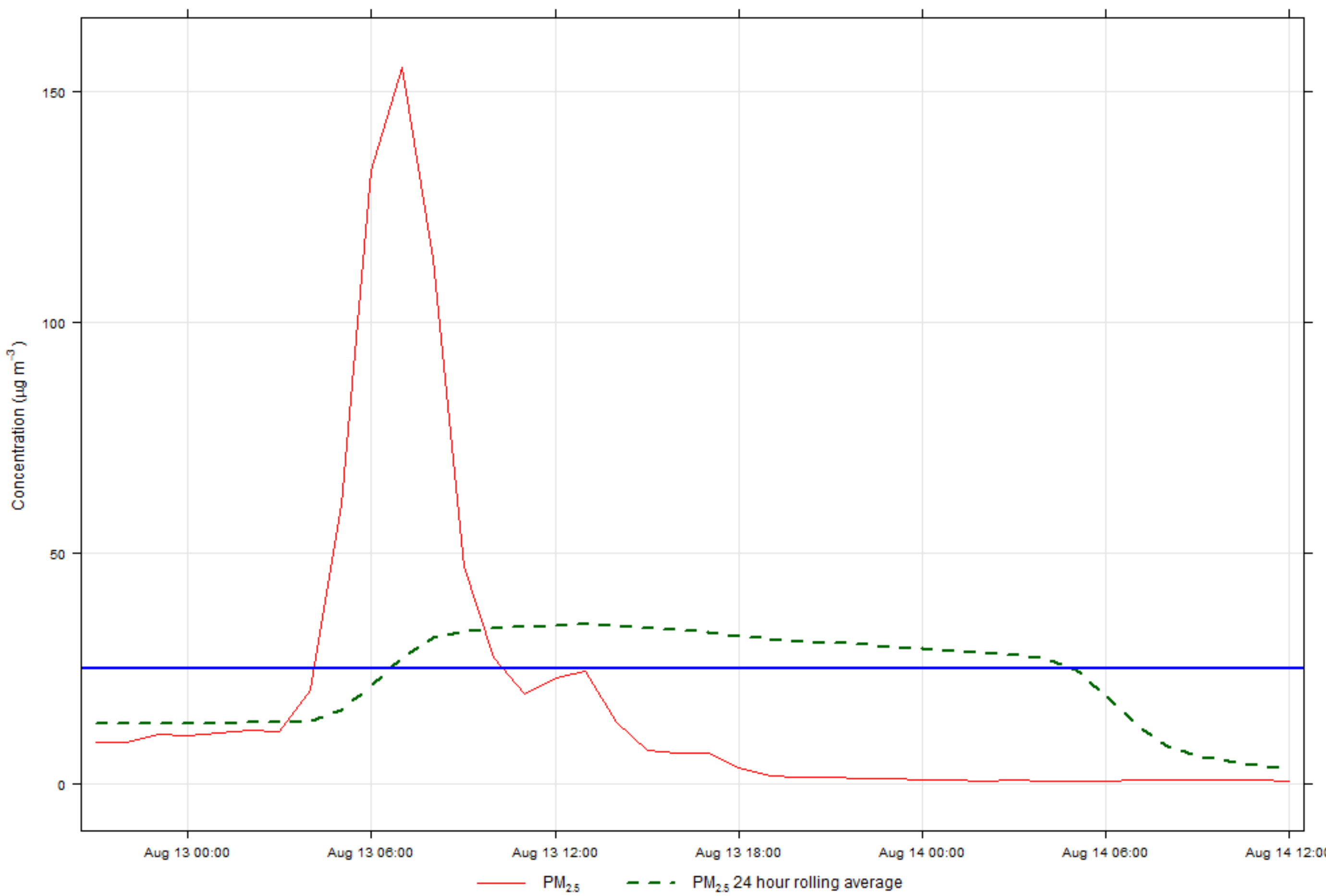


Figure E - 76: $PM_{2.5}$ time series plot for the period, August 13 to August 14, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m^3

Wind directions at the time of the event were predominantly from the southwest. Wind speeds were recorded from 2 to 6 m/s (see wind rose, Figure E - 77). The greatest $PM_{2.5}$ concentrations were observed at moderate wind speeds from the southwest (see polar frequency plot, Figure E - 78).

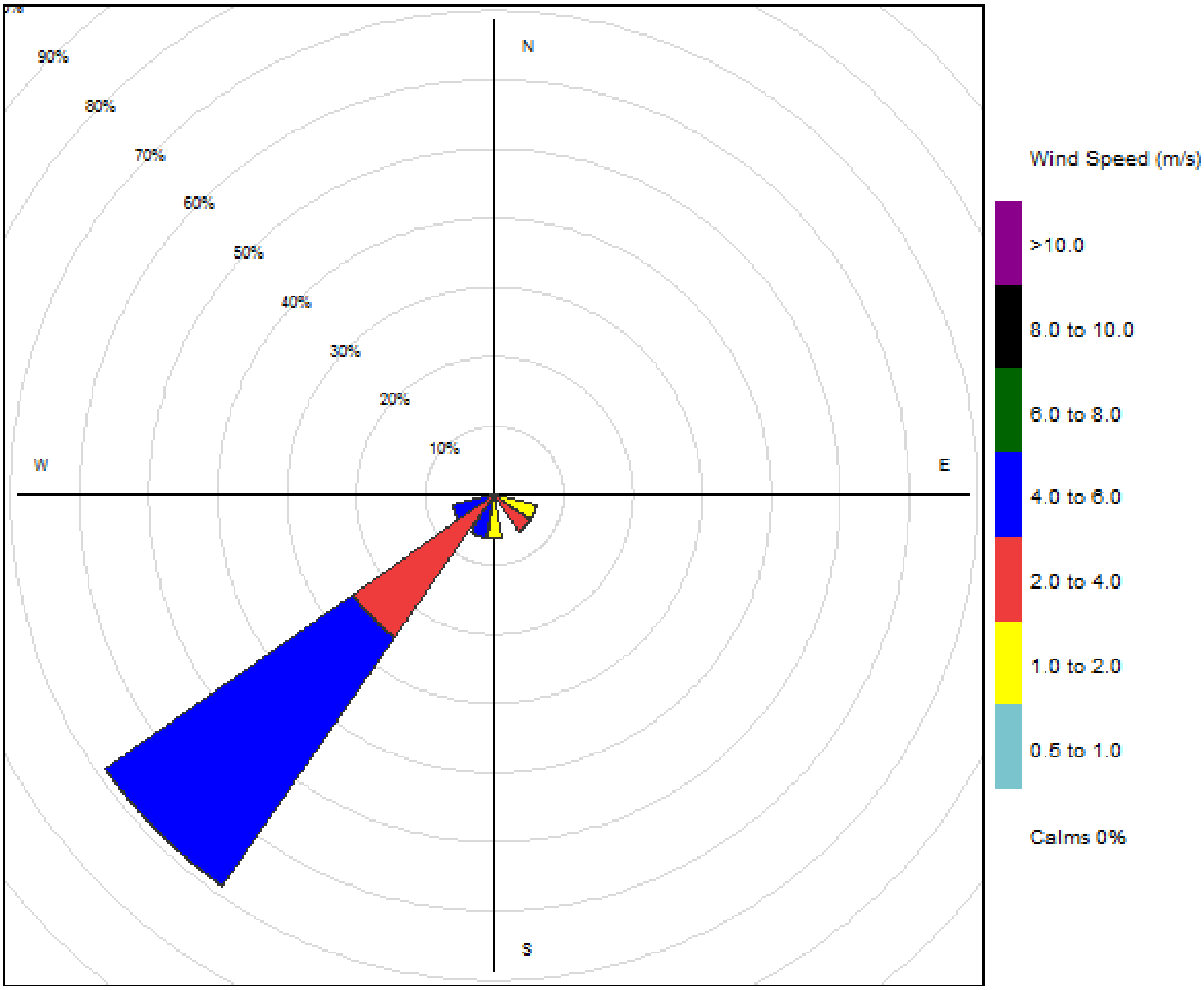


Figure E - 77: Wind rose during the alert event period, August 13 to August 14, 2017.

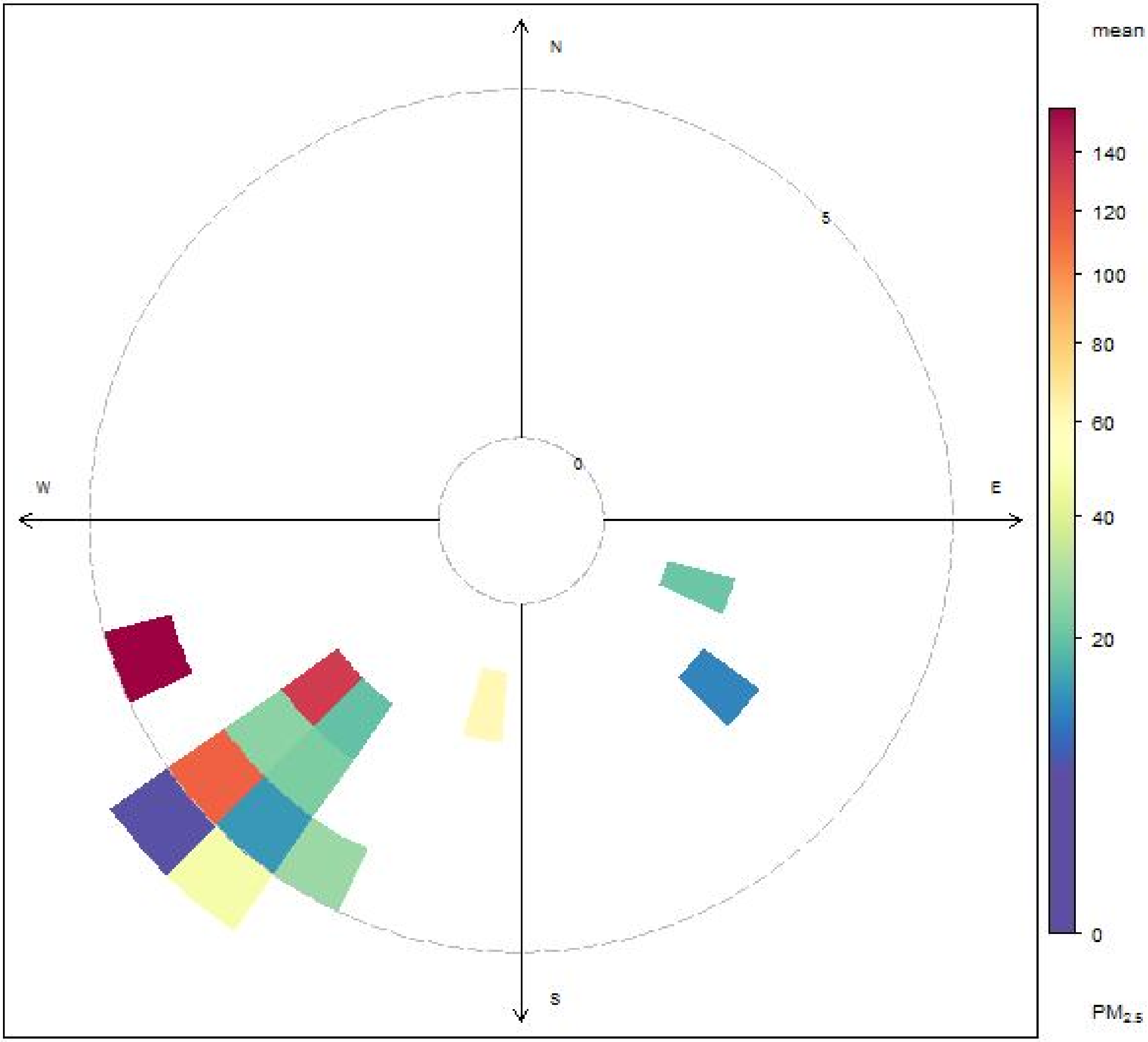


Figure E - 78: Polar frequency plot for $PM_{2.5}$ during the alert event period, August 13 to August 14, 2017.

E-27. Station 7B $PM_{2.5}$ event on 2017-08-13

The 24 hour rolling average $PM_{2.5}$ concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 25 µg/m^3 from 07:00 on August 13, 2017, until 07:00 on August 14, 2017 (see time series, Figure E - 79). The figure shows that this event was characterized by a prolonged spike of hourly concentrations (greater than 200 µg/m^3). A Smoky Skies bulletin issued by BC MOE was in effect at the time of this event.

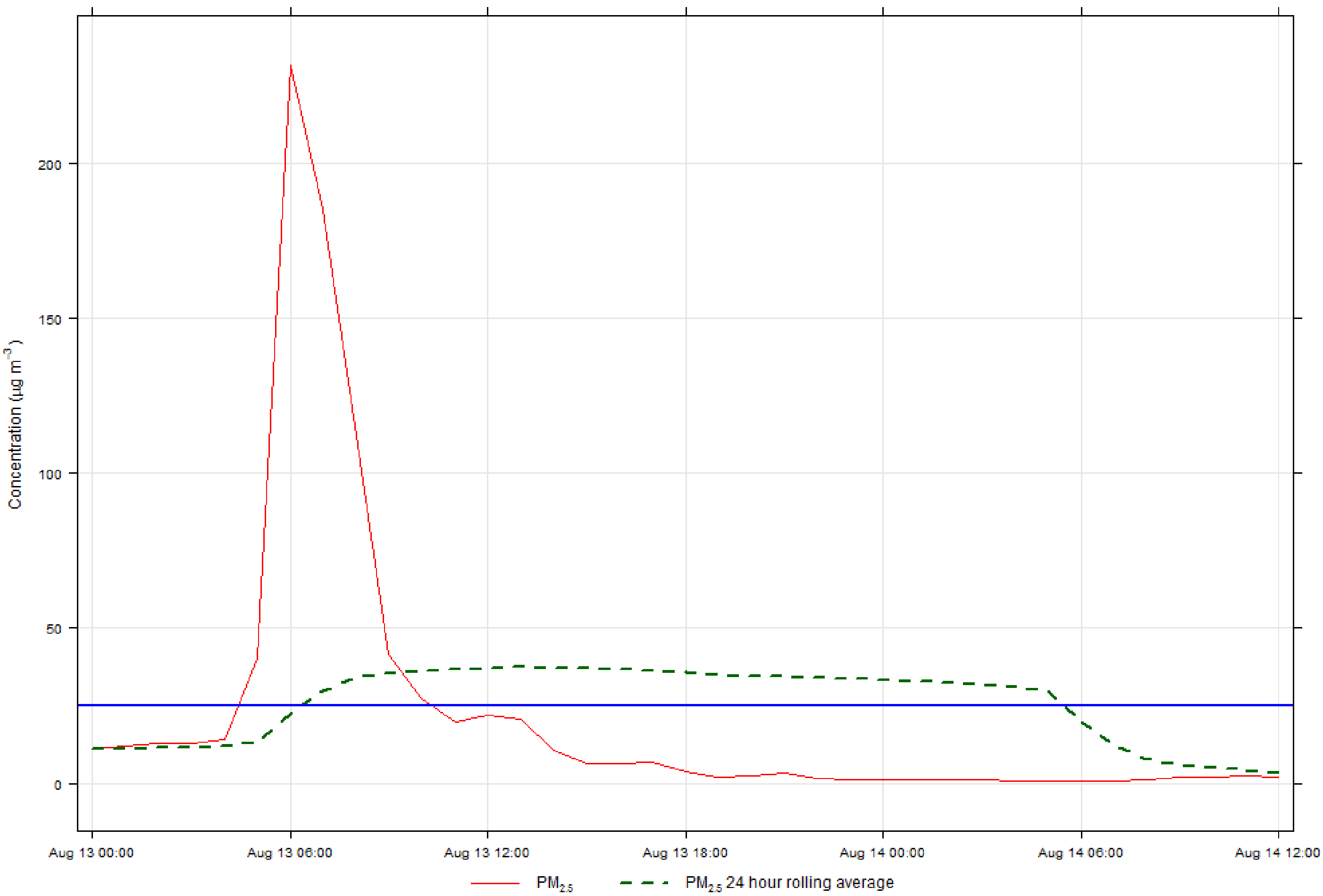


Figure E - 79: $PM_{2.5}$ time series plot for the period, August 13 to August 14, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m^3

Wind directions at the time of the event were predominantly from the west-southwest. Wind speeds were recorded from 2 to 6 m/s (see wind rose, Figure E - 80). The greatest $PM_{2.5}$ concentrations were observed at wind speeds of 2 to 3 m/s from the southwest (see polar frequency plot, Figure E - 81).

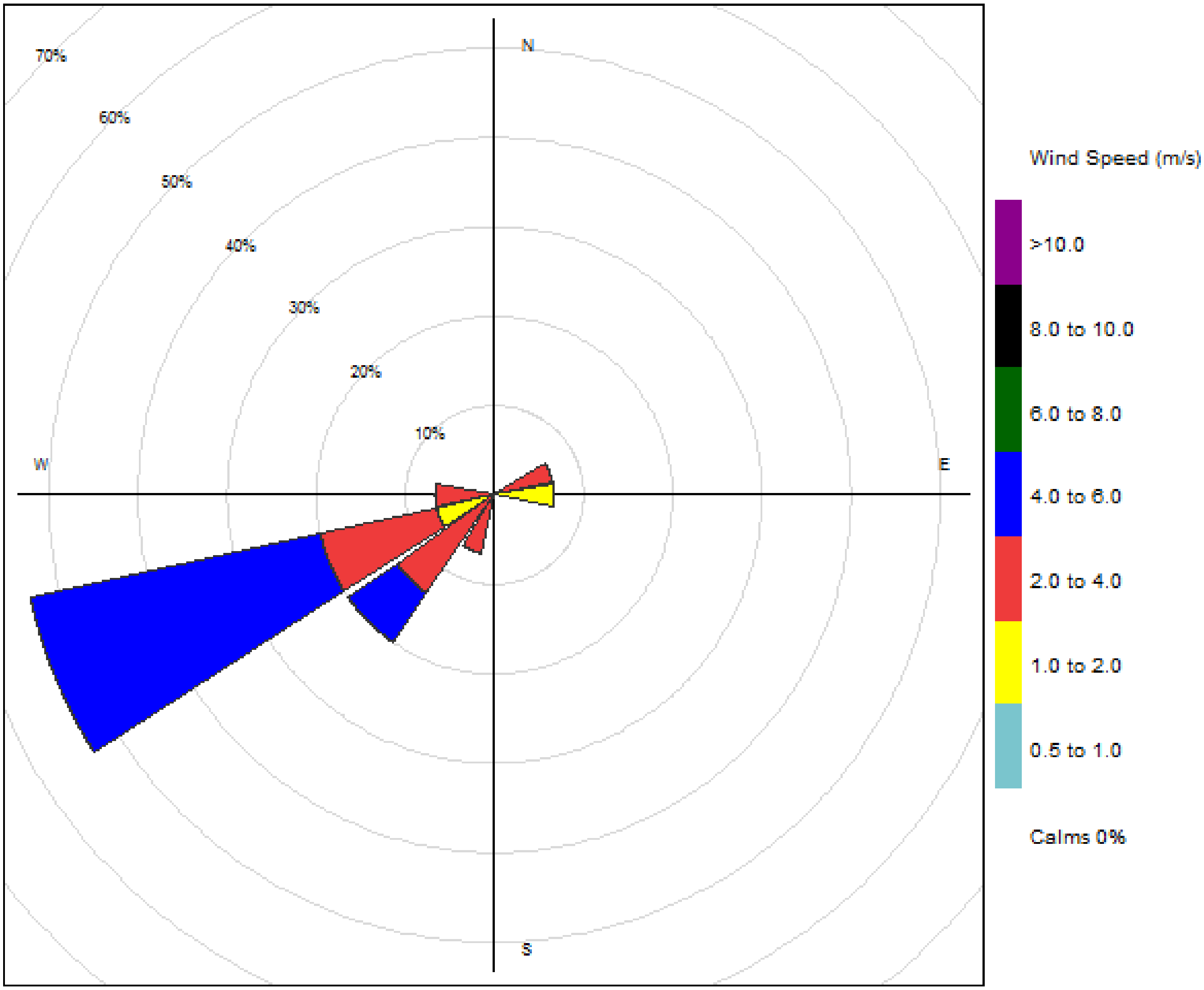


Figure E - 80: Wind rose during the alert event period, August 13 to August 14, 2017.

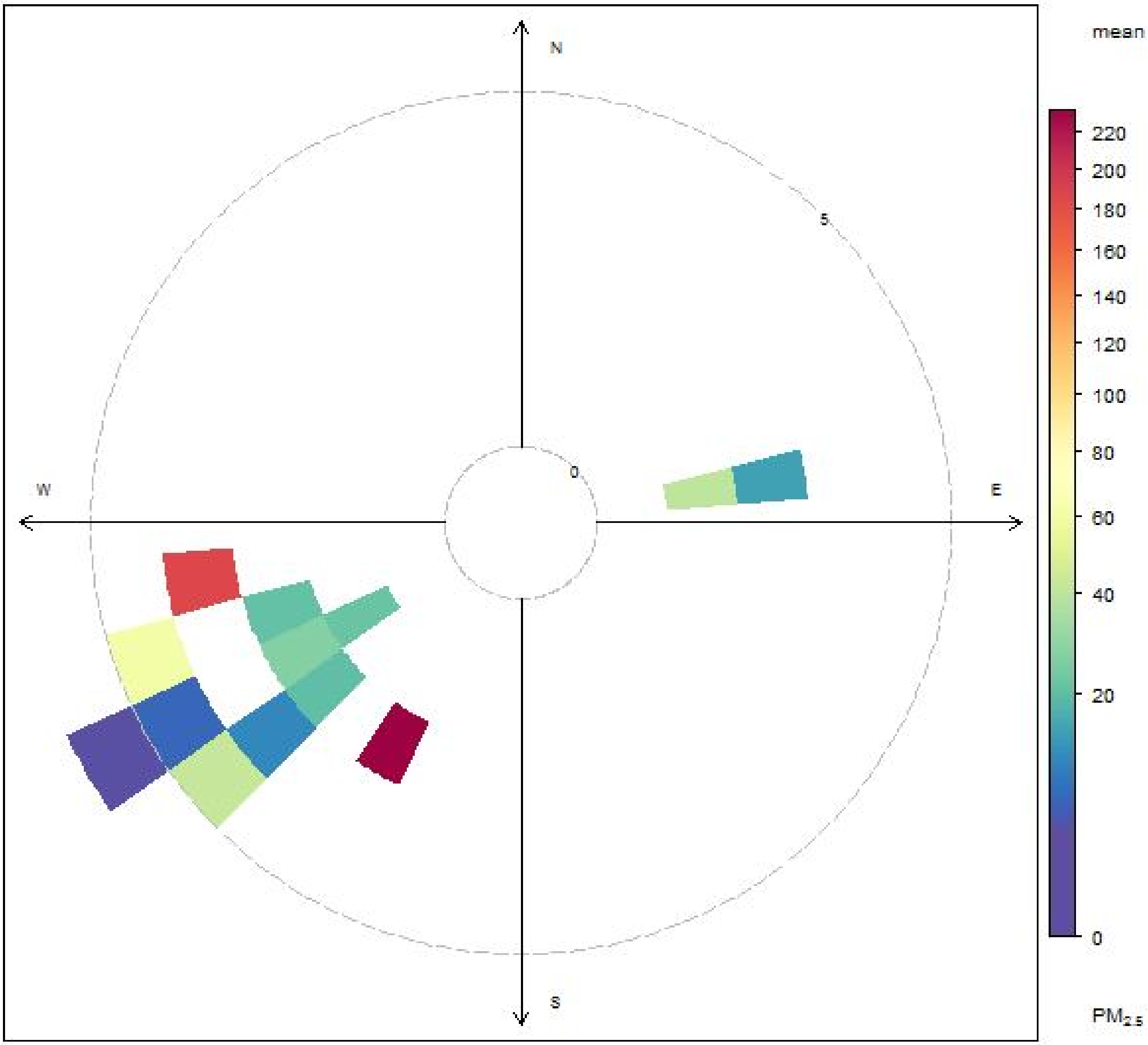


Figure E - 81: Polar frequency plot for $PM_{2.5}$ during the alert event period, August 13 to August 14, 2017.

E-28. Station 7B PM_{10} event on 2017-08-14

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 23:00 on August 14, 2017 until 23:00 on August 15, 2017 and then from 12:00 August 16, 2017, until 12:00 on August 20, 2017 (see time series, Figure E - 82). The figure shows that this event was characterized by several peaks of elevated PM_{10} concentrations (> 100 µg/m^3) interspersed with periods of low PM_{10}. A Smoky Skies bulletin had been issued by BC MOE and was in effect August 11, 2018 to August 14, 2018, shortly before the time of this event.

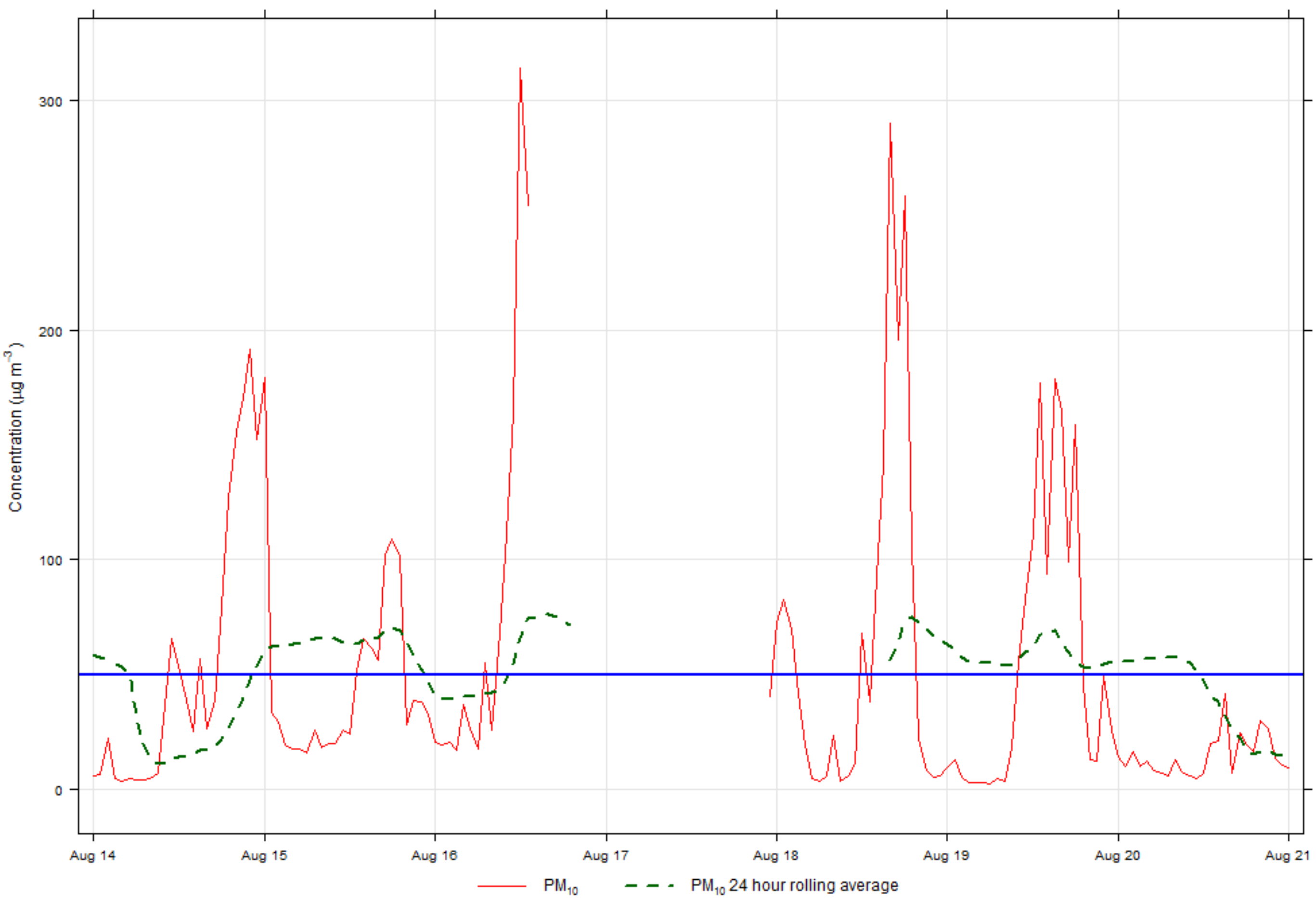


Figure E - 82: PM_{10} time series plot for the period, August 14 to 20, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the west and the southwest. Wind speeds were recorded from 2 to greater than 10 m/s (see wind rose, Figure E - 83). The greatest PM_{10} concentrations were observed at high wind speeds (10-11 m/s) from the west (see polar frequency plot, Figure E - 84).

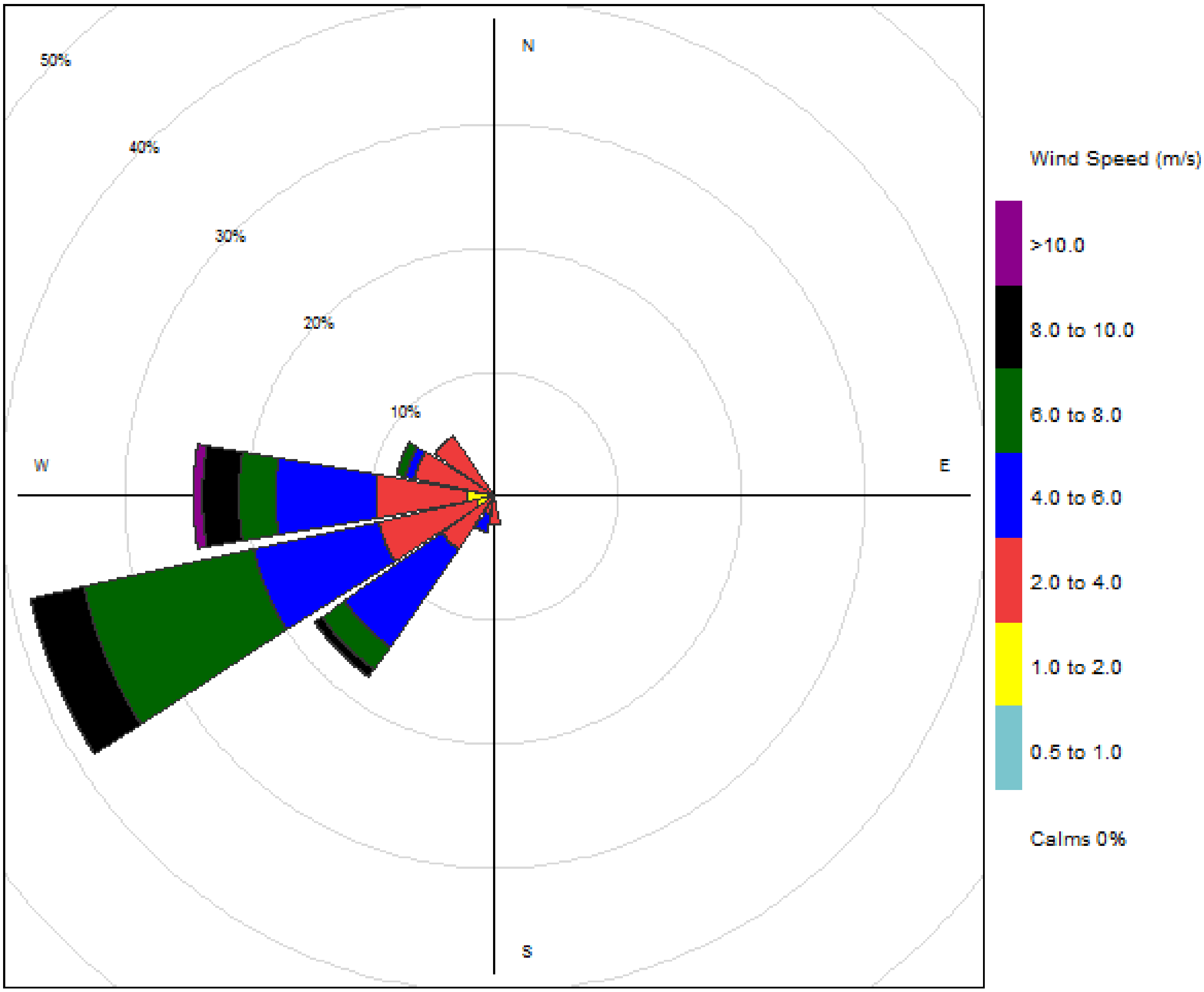


Figure E - 83: Wind rose during the alert event period, August 14 to August 20, 2017.

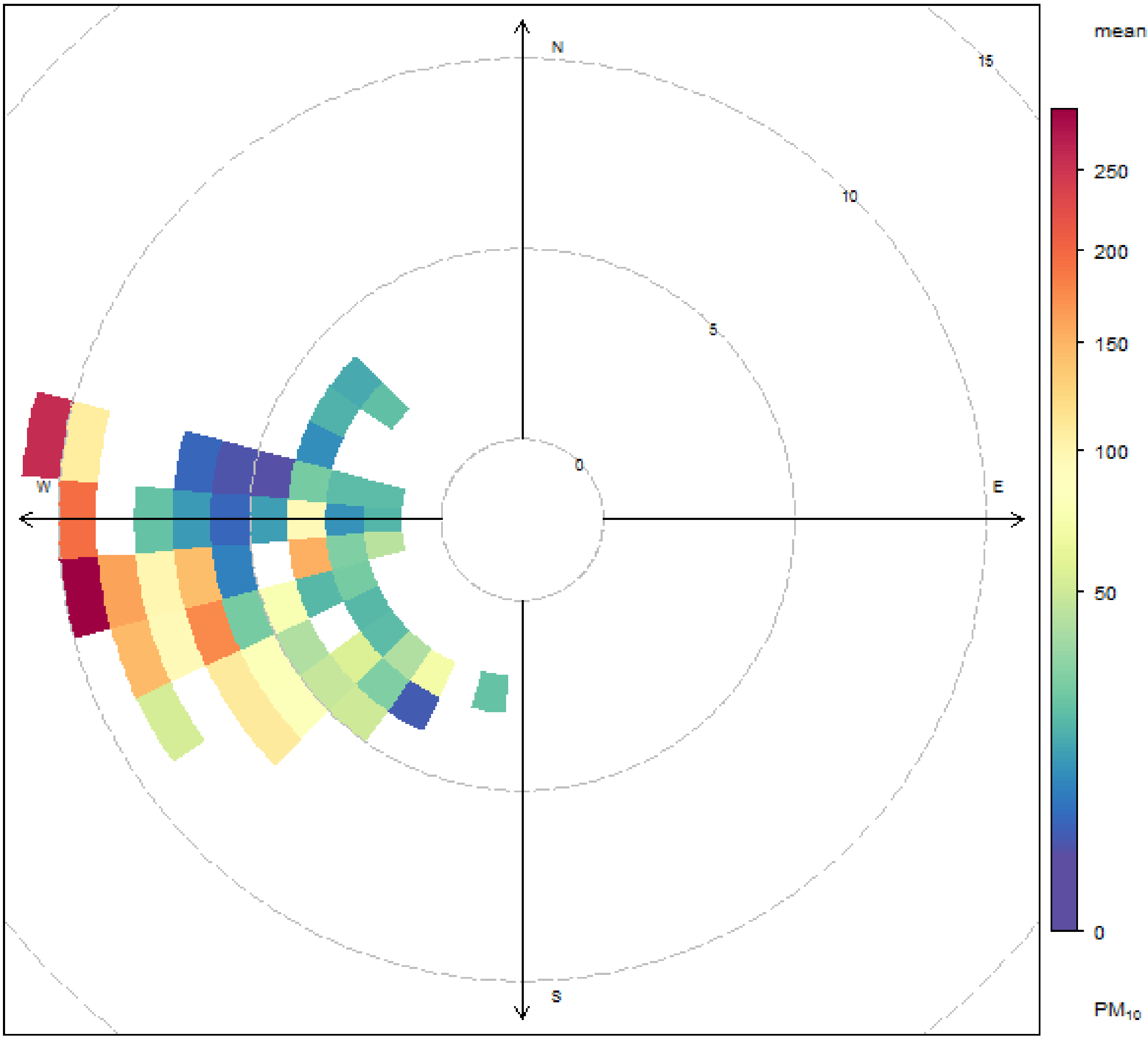


Figure E - 84: Polar frequency plot for $PM_{2.5}$ during the alert event period, August 14 to August 20, 2017.

E-29. Station 7B PM_{10} event on 2017-08-23

Due to a loss of data from this instrument near the beginning of the event, 24 hour rolling average PM_{10} concentrations could not be calculated until after the event was underway. Hourly concentrations indicate that PM_{10} increased rapidly between 09:00 and 12:00 on August 23, 2017 and then rapidly declined to baseline levels. (see time series, Figure E - 85)

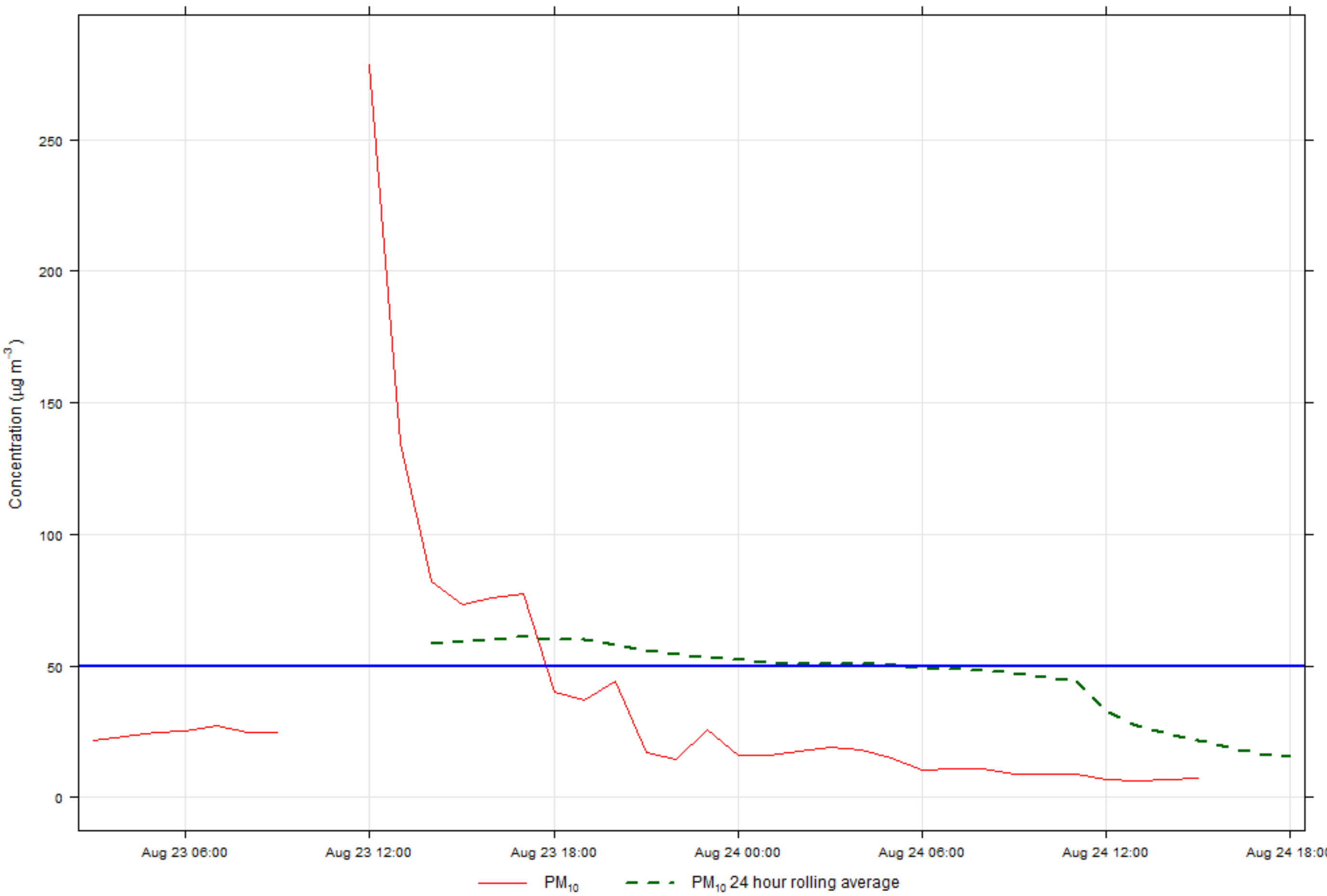


Figure E - 85: PM_{10} time series plot for the period, August 23 to 24, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the southwest. Wind speeds were recorded from 2 to 10 m/s (see wind rose, Figure E - 86). The greatest PM_{10} concentrations were observed at high wind speeds (8-9 m/s) from the west-southwest (see polar frequency plot, Figure E - 87).

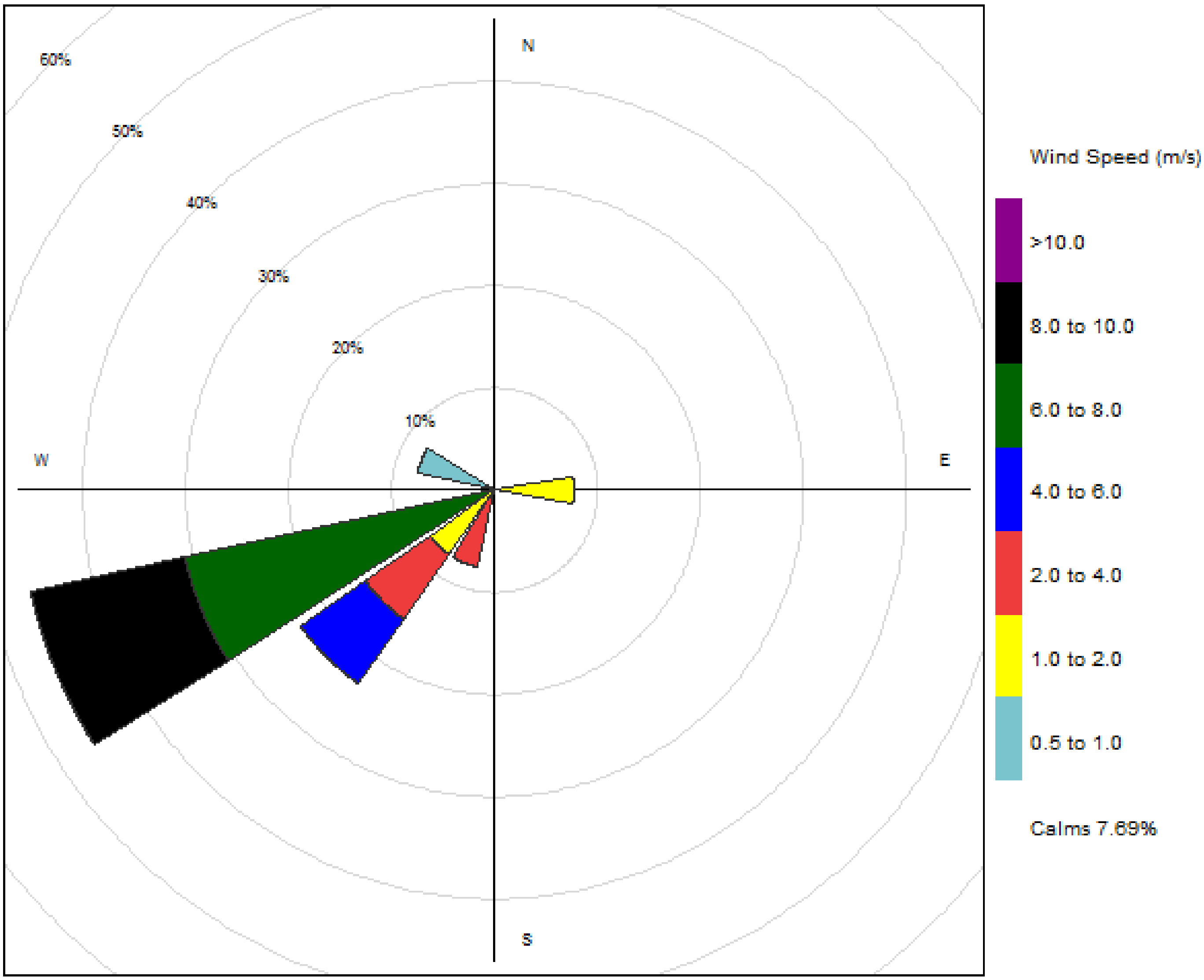


Figure E - 86: Wind rose during the alert event period, August 23 to August 24, 2017.

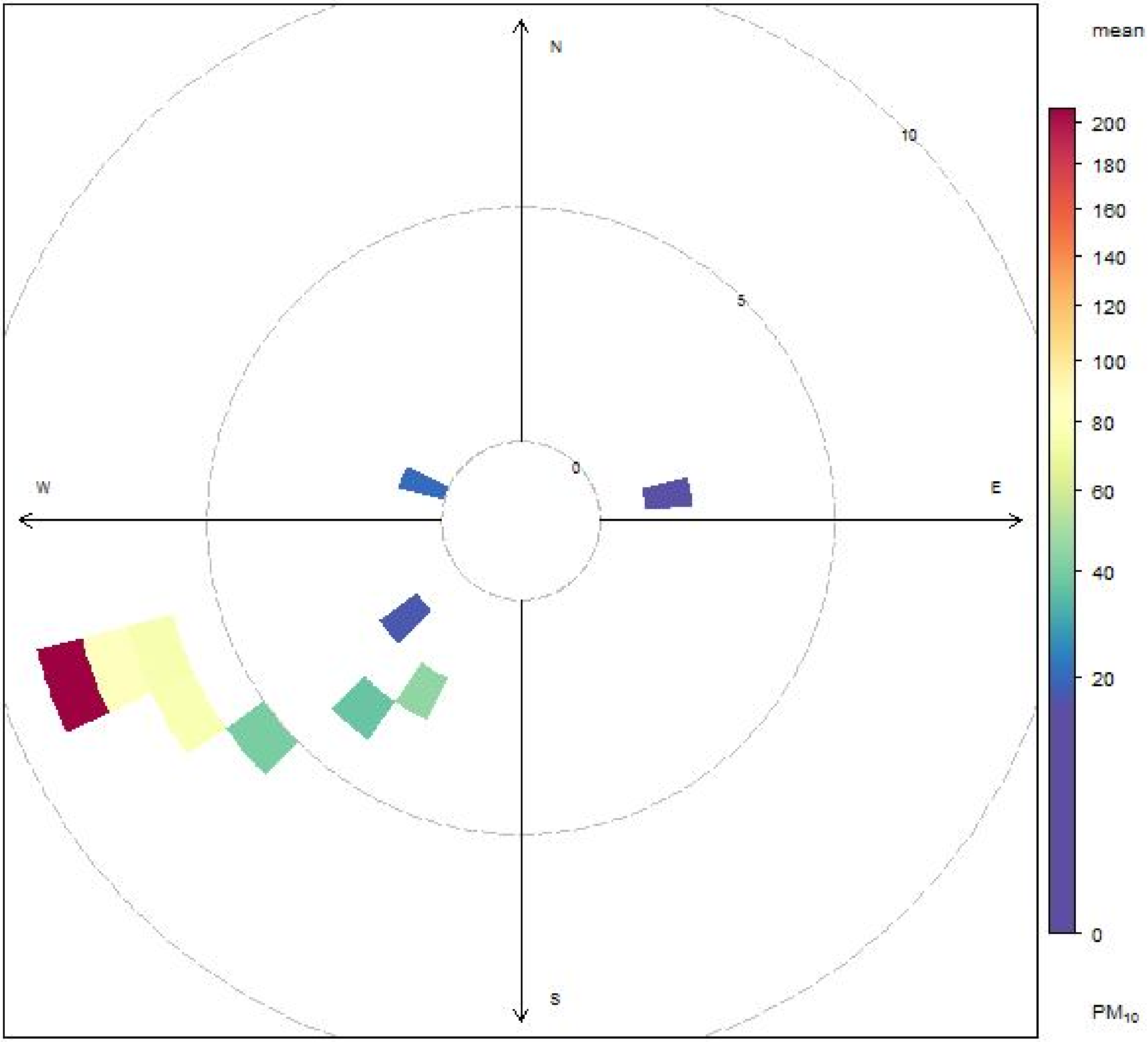


Figure E - 87: Polar frequency plot for PM_{10} during the alert event period, August 23 to August 24, 2017.

E-30. Station 9 $PM_{2.5}$ event on 2017-09-07

The 24 hour rolling average $PM_{2.5}$ concentrations at Station 9 were greater than the BC MOE 24-hour AAQO of 25 µg/m^3 from 15:00 on September 07, 2017, until 17:00 on September 08, 2017 (see time series, Figure E - 88). The figure shows that this event was characterized by an initial gradual increase in $PM_{2.5}$, 8 hours of elevated concentrations (35-60 µg/m^3) and finally, a gradual decline to baseline levels. A Smoky Skies bulletin issued by BC MOE was in effect at the time of this event, local RWDI staff in Fort St, John confirmed haze and the smell of smoke.

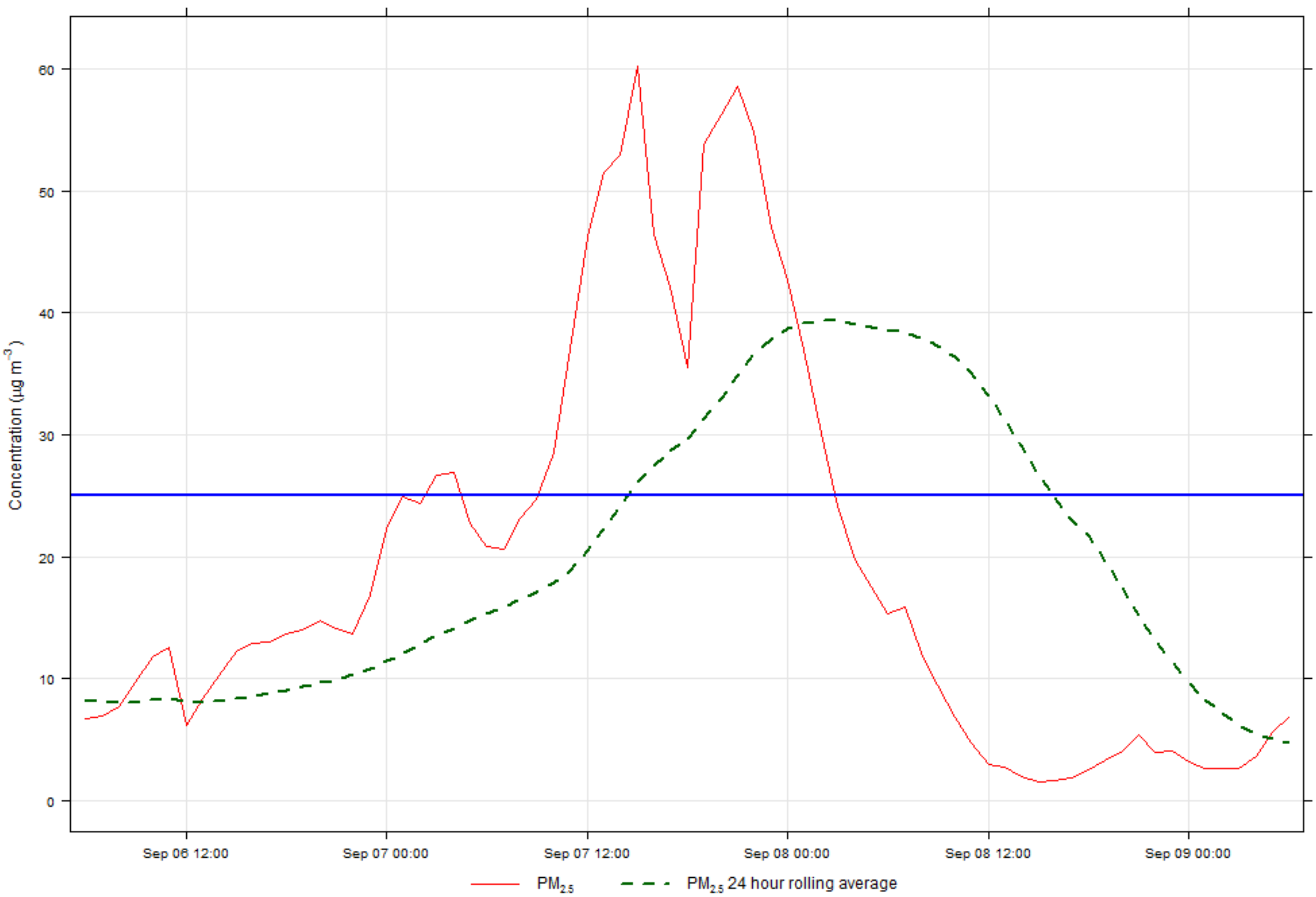


Figure E - 88: $PM_{2.5}$ time series plot for the period, September 07 to September 08, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m^3

Wind directions at the time of the event were predominantly from the southwest. Wind speeds were recorded from 1 to 8 m/s (see wind rose, Figure E - 89). The greatest $PM_{2.5}$ concentrations were observed at wind speeds of 3 to 7 m/s from the southwest (see polar frequency plot, Figure E - 90).

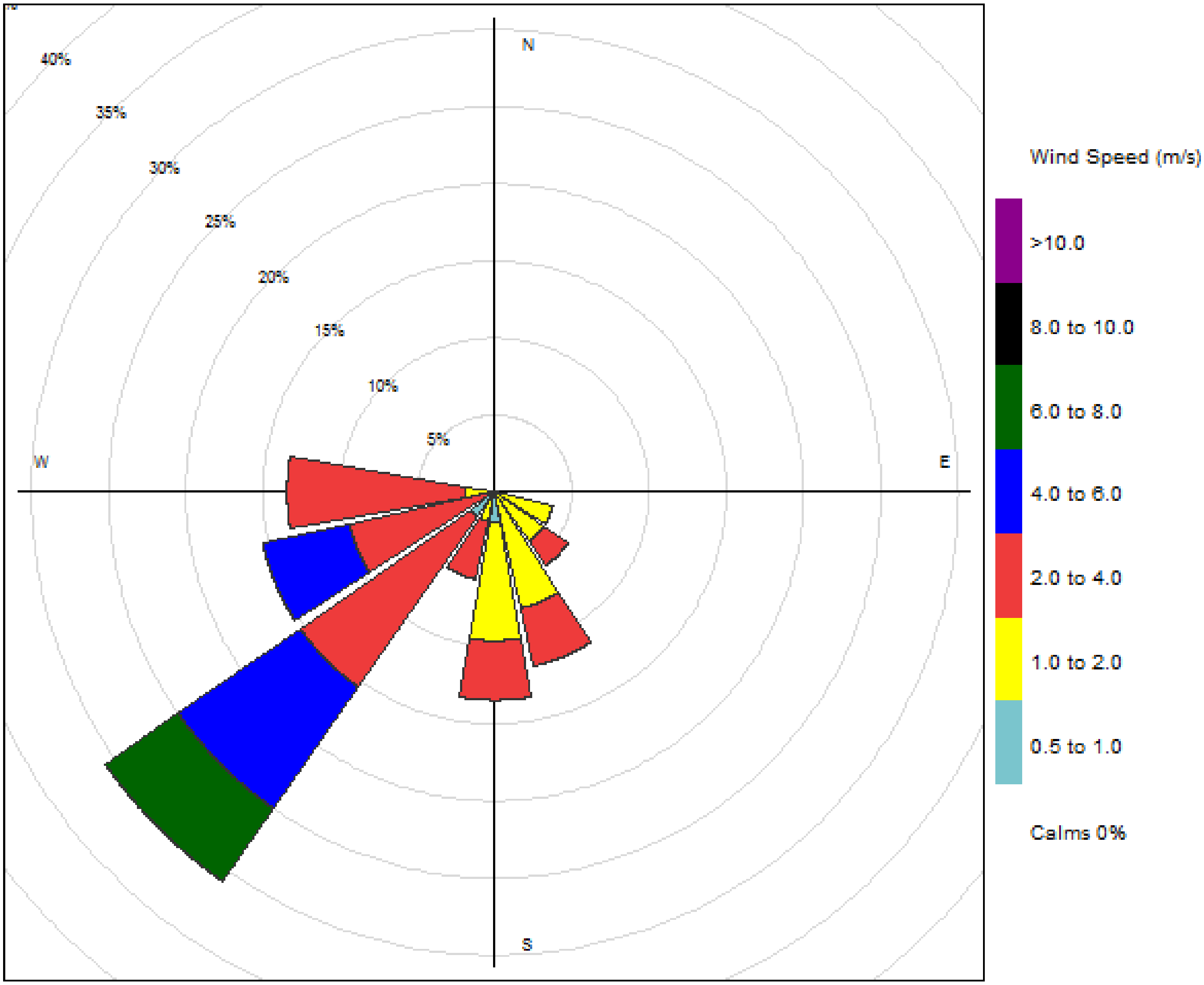


Figure E - 89: Wind rose during the alert event period, September 07 to September 08, 2017.

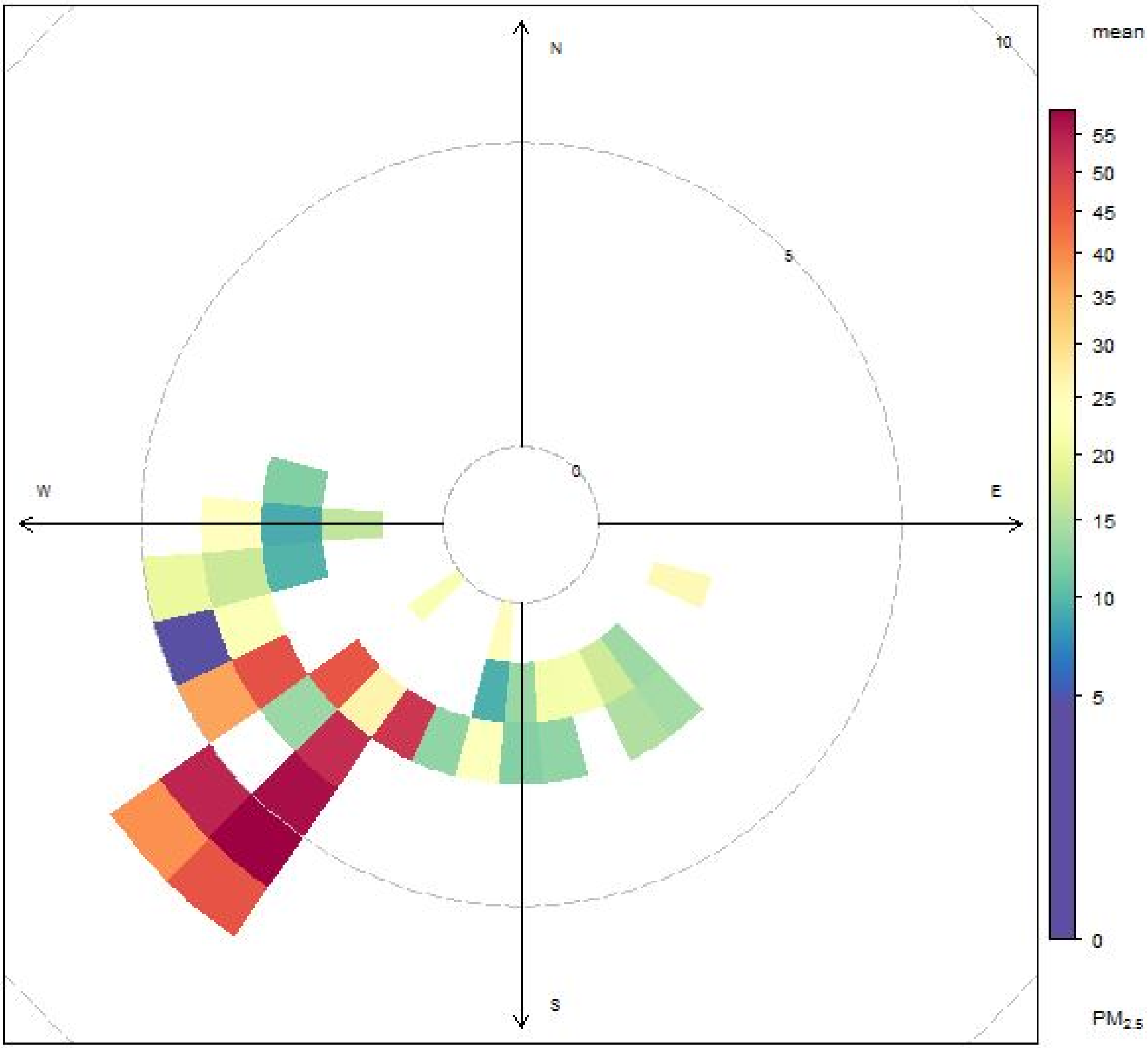


Figure E - 90: Polar frequency plot for $PM_{2.5}$ during the alert event period, September 07 to September 08, 2017.

E-31. Station 8 $PM_{2.5}$ event on 2017-09-07

The 24 hour rolling average $PM_{2.5}$ concentrations at Station 8 were greater than the BC MOE 24-hour AAQO of 25 µg/m^3 from 18:00 on September 07, 2017, until 17:00 on September 08, 2017 (see time series, Figure E - 91). The figure shows that this event was characterized by an initial gradual increase in $PM_{2.5}$, 8 hours of elevated concentrations (55-65 µg/m^3) and finally a gradual decline to baseline levels. A Smoky Skies bulletin issued by BC MOE was in effect at the time of this event, local RWDI staff in Fort St, John confirmed haze and the smell of smoke.

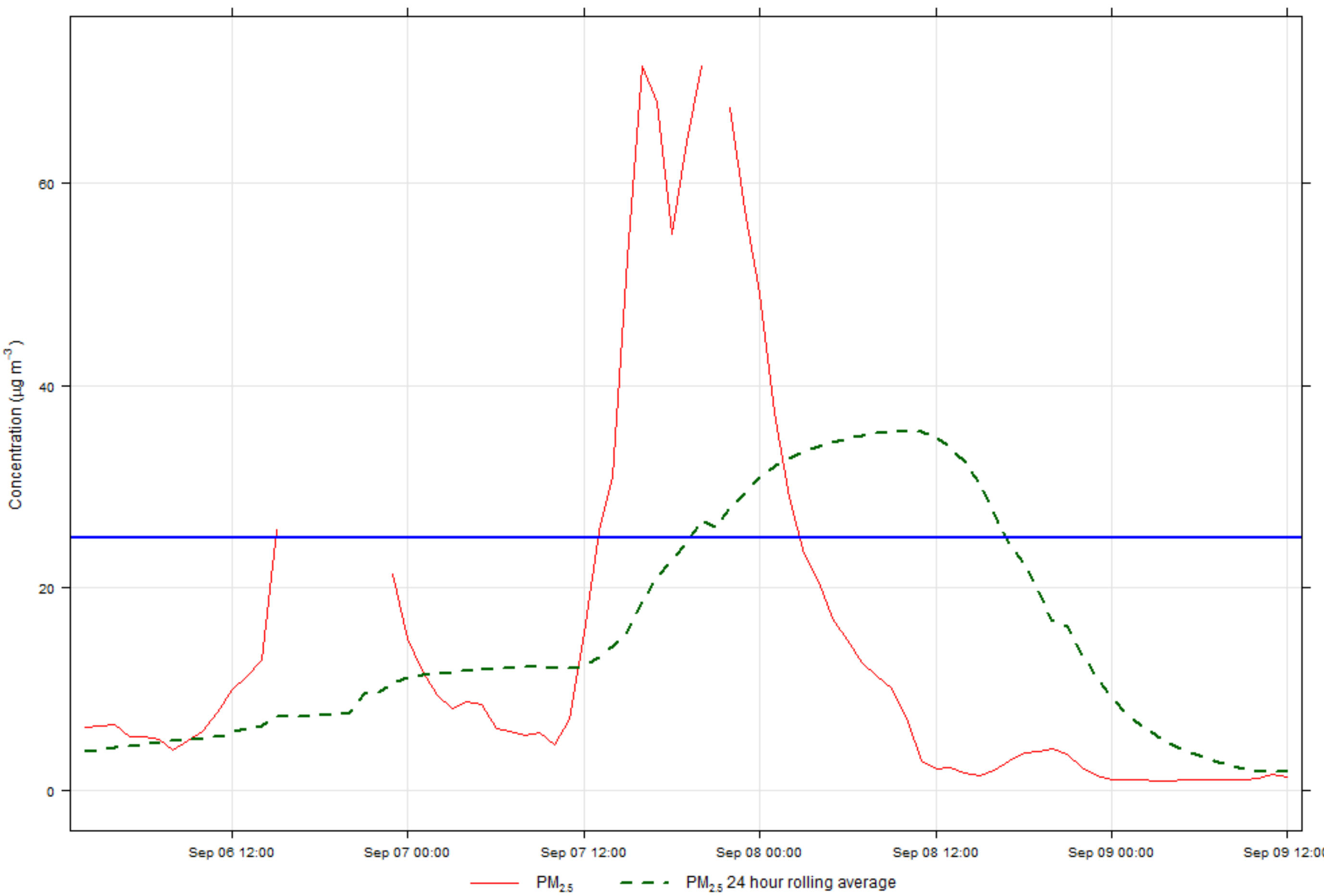


Figure E - 91: $PM_{2.5}$ time series plot for the period, September 07 to September 08, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m^3

Wind directions at the time of the event were predominantly from the southwest. Wind speeds were recorded from 1 to 8 m/s (see wind rose, Figure E - 92). The greatest $PM_{2.5}$ concentrations were observed at wind speeds of 4 to 7 m/s from the southwest (see polar frequency plot, Figure E - 93).

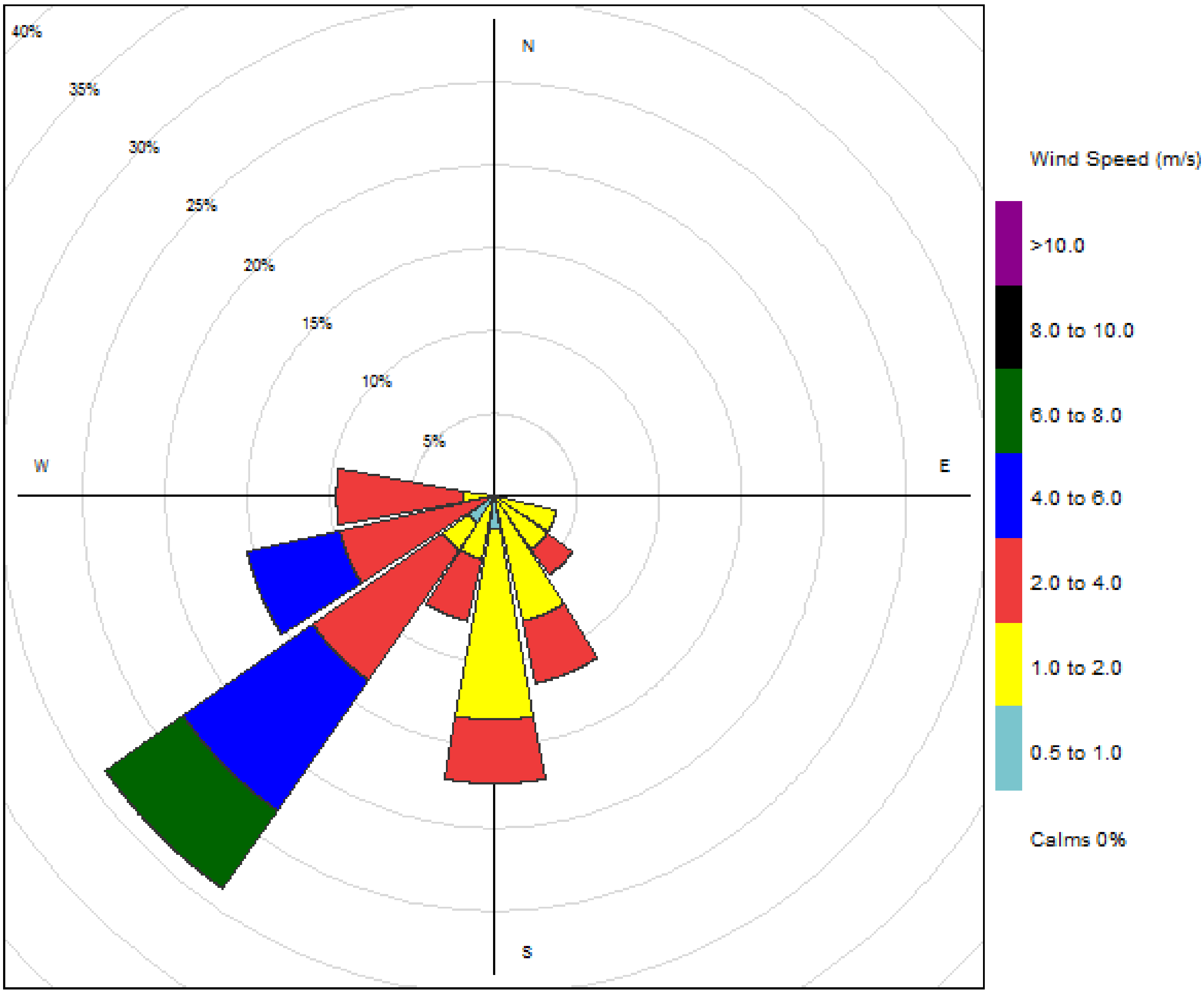


Figure E - 92: Wind rose during the alert event period, September 07 to September 08, 2017.

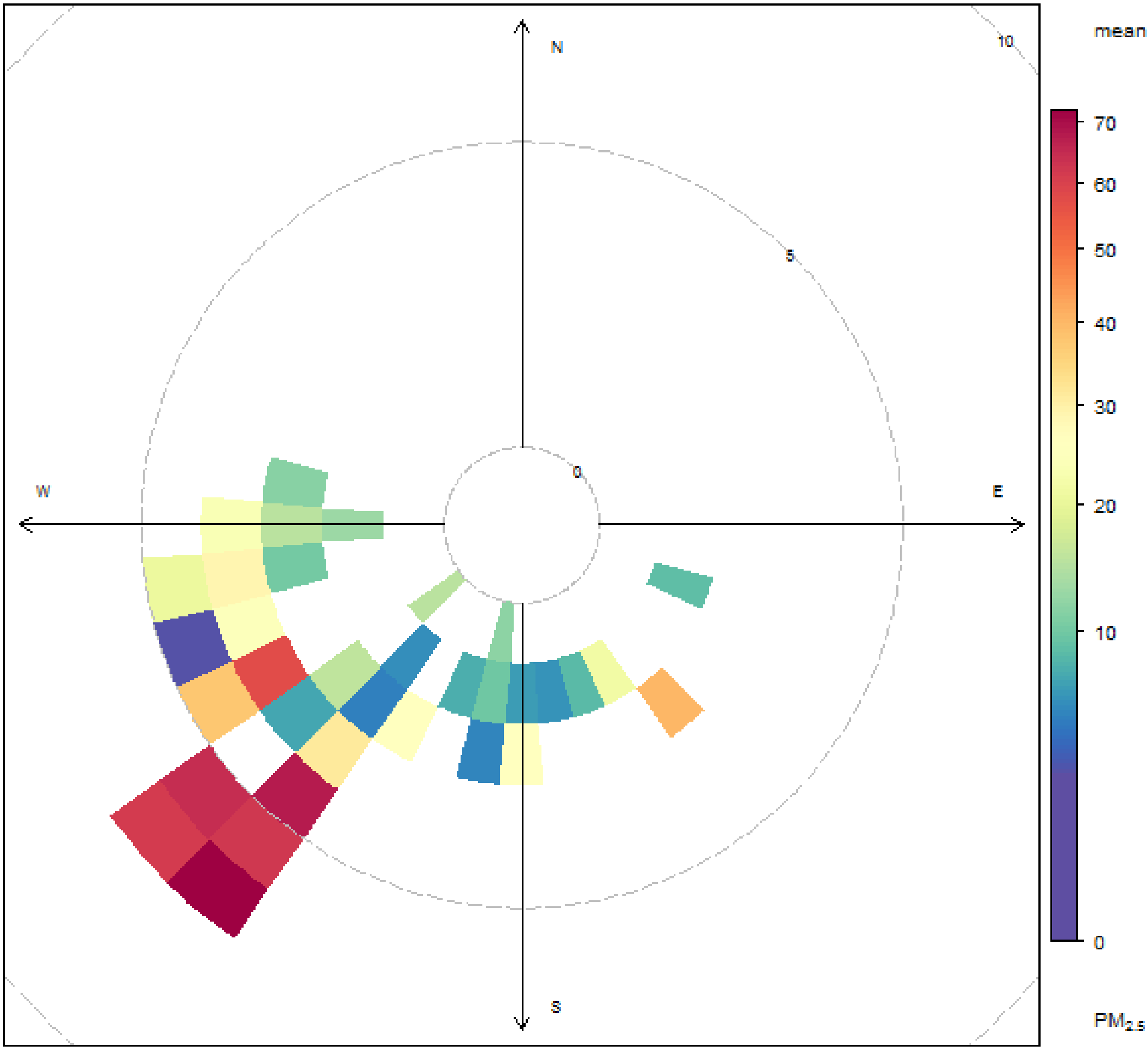


Figure E - 93: Polar frequency plot for $PM_{2.5}$ during the alert event period, September 07 to September 08, 2017.

E-32. Station 7B PM_{10} event on 2017-09-07

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 16:00 on September 07, 2017, until 14:00 on September 08, 2017 (see time series, Figure E - 94). The figure shows that this event was characterized by a gradually increasing baseline (from less 20 to 40 µg/m^3 over 4 days) overlain with sudden short-lived increases in PM_{10} late in the day. A Smoky Skies bulletin issued by BC MOE was in effect at the time of this event, local RWDI staff in Fort St, John confirmed haze and the smell of smoke.

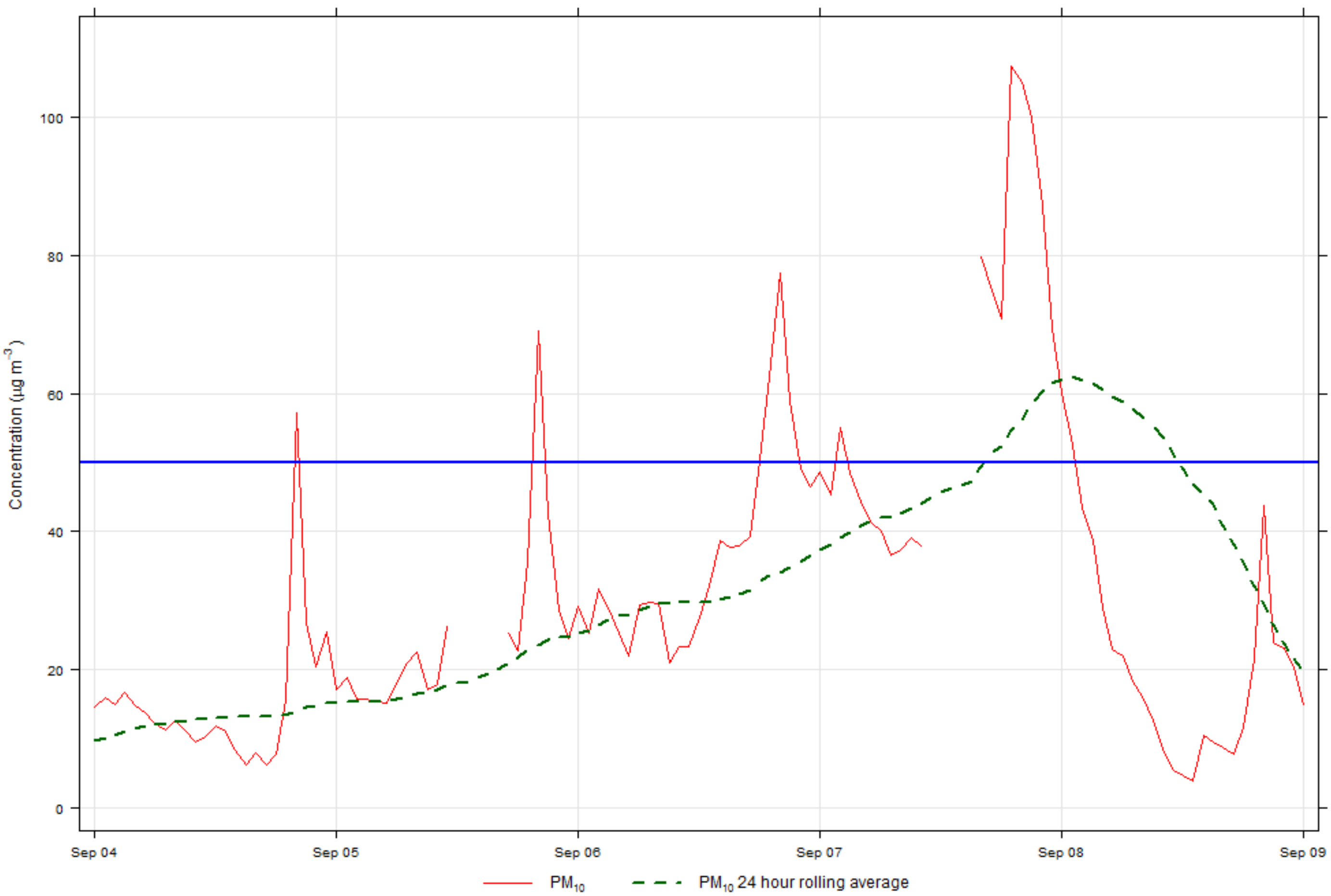


Figure E - 94: PM_{10} time series plot for the period, September 07 to September 08, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the east. Wind speeds were recorded from 0.5 to 6 m/s (see wind rose, Figure E - 95). The greatest PM_{10} concentrations were observed at wind speeds of 4 to 6 m/s from the southwest (see polar frequency plot, Figure E - 96). A secondary maximum was recorded at wind speeds of 1 to 3 m/s from the east.

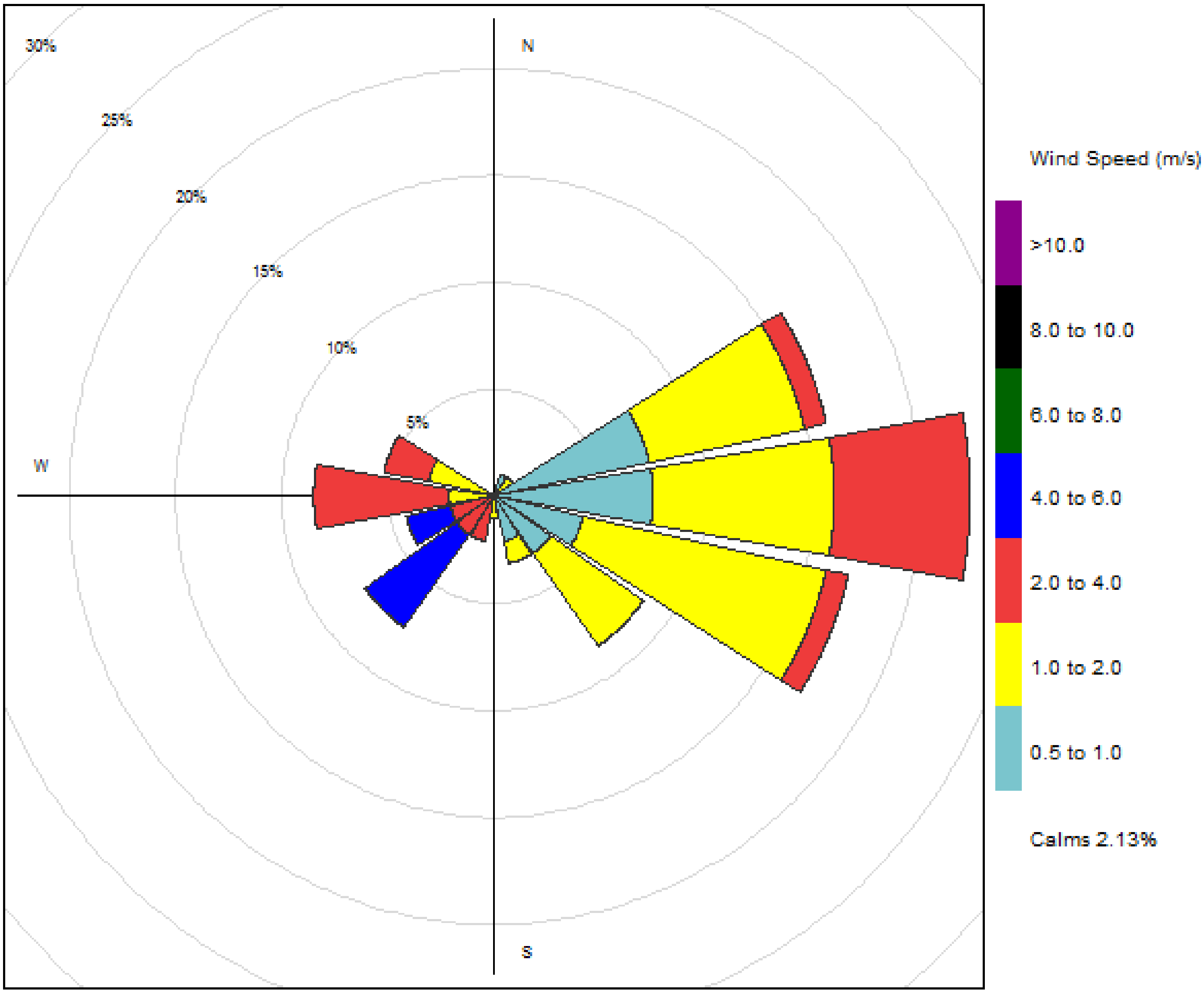


Figure E - 95: Wind rose during the alert event period, September 07 to September 08, 2017.

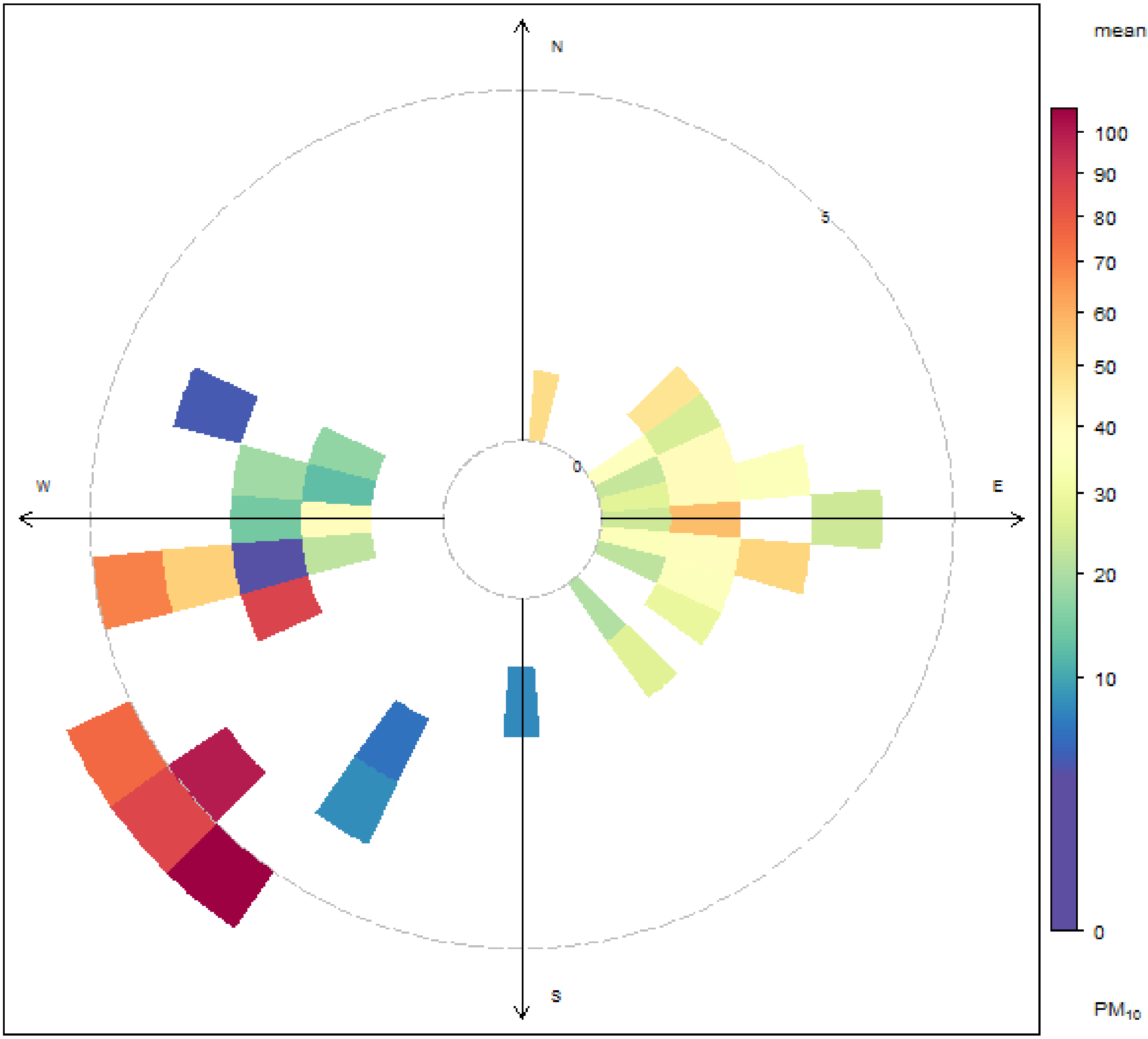


Figure E - 96: Polar frequency plot for PM_{10} during the alert event period, September 07 to September 08, 2017.

E-33. Station 7B $PM_{2.5}$ event on 2017-09-07

The 24 hour rolling average $PM_{2.5}$ concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 25 µg/m^3 from 20:00 on September 07, 2017, until 16:00 on September 08, 2017 (see time series, Figure E - 97). The figure shows that this event was characterized by a gradual increase to a maximum concentration of greater than 50 µg/m^3 followed by a comparatively rapid decline to baseline values. A Smoky Skies bulletin issued by BC MOE was in effect at the time of this event, local RWDI staff in Fort St, John confirmed haze and the smell of smoke.

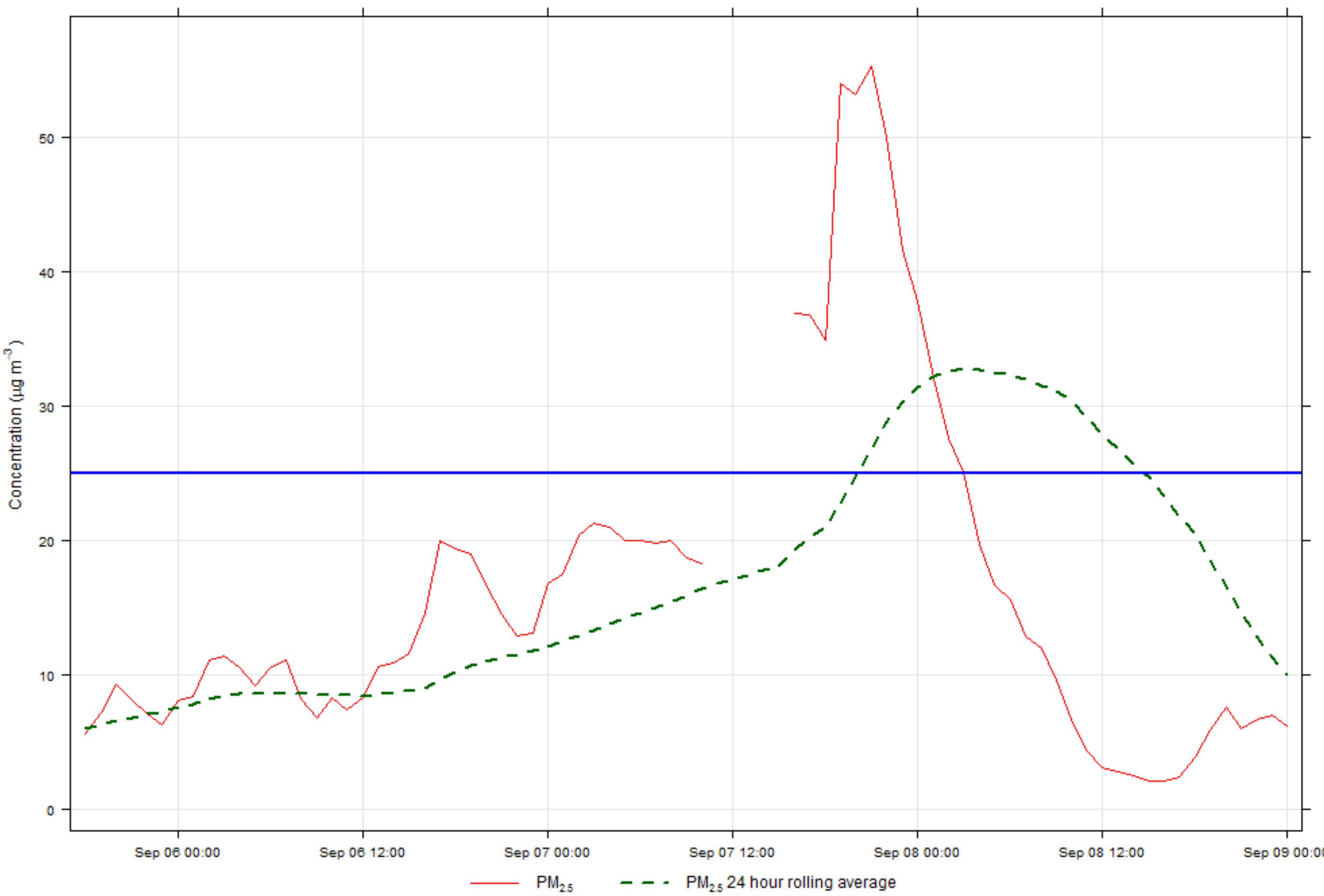


Figure E - 97: $PM_{2.5}$ time series plot for the period, September 07 to September 08, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m^3

Wind directions at the time of the event were predominantly from the southeast. Wind speeds were recorded from 0.5 to 6 m/s (see wind rose, Figure E - 98). The greatest $PM_{2.5}$ concentrations were observed at wind speeds of 4 to 6 m/s from the southwest (see polar frequency plot, Figure E - 99). A secondary maximum was recorded during winds of 2 to 5 m/s from the west.

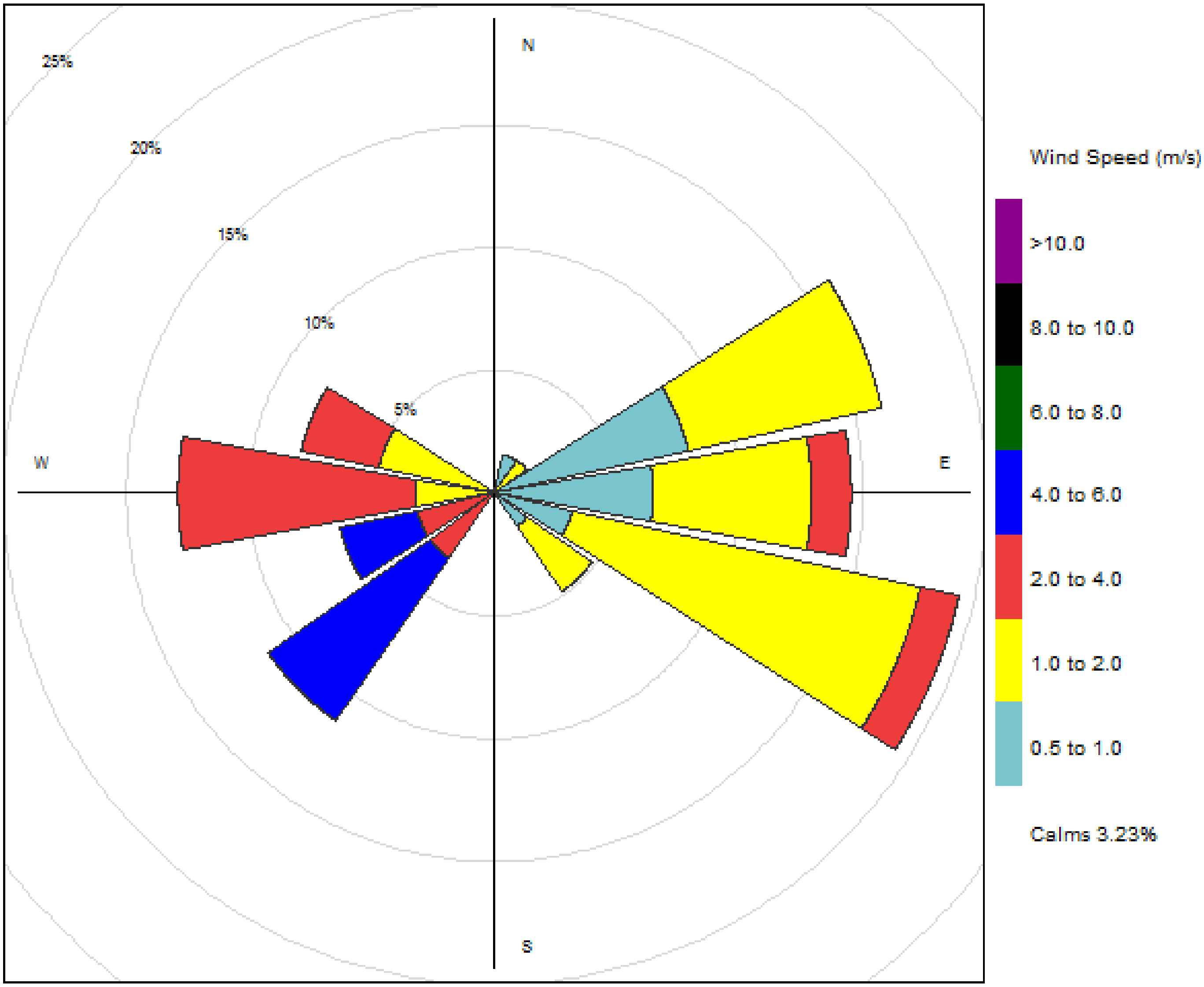


Figure E - 98: Wind rose during the alert event period, September 07 to September 08, 2017.

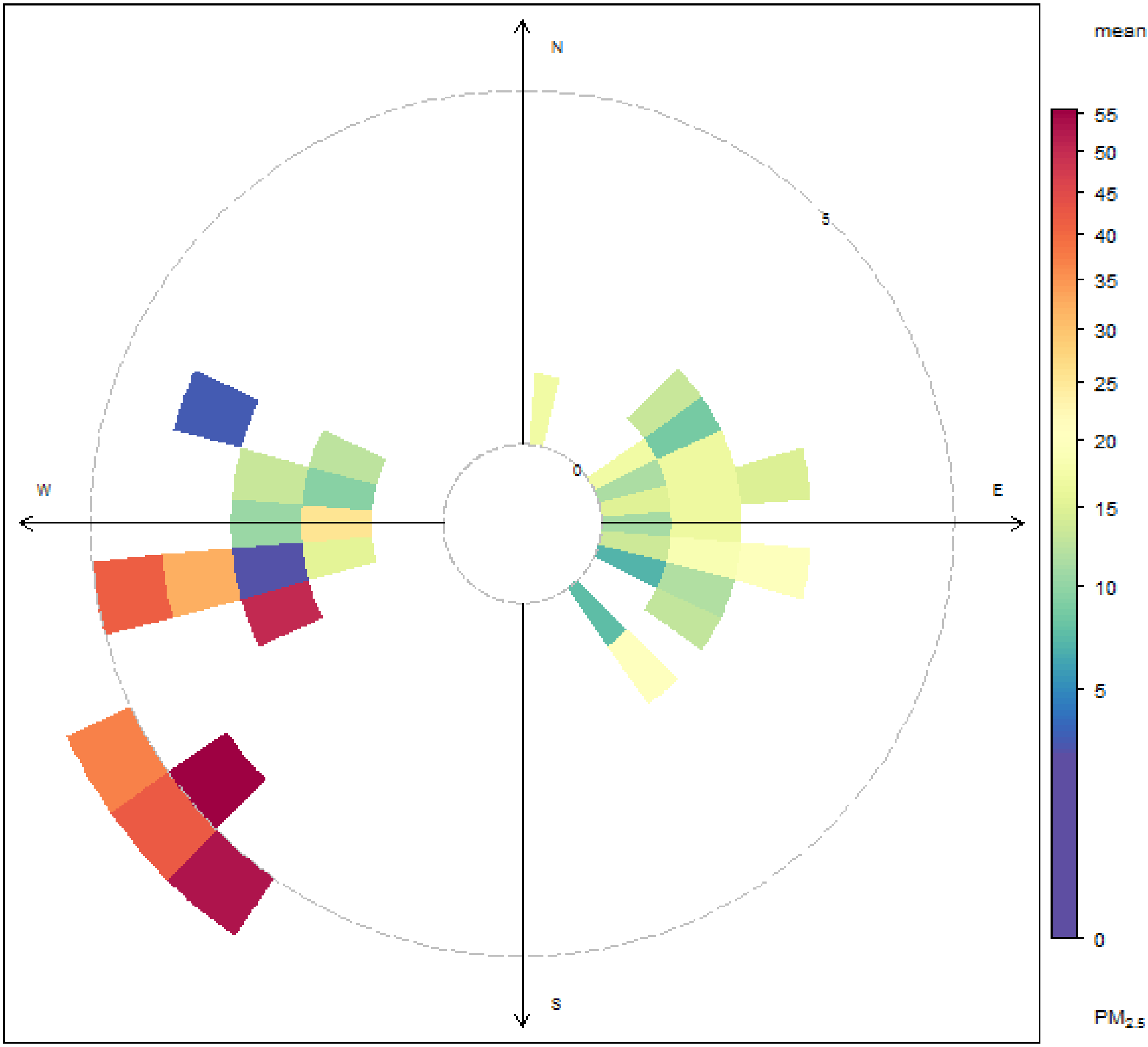


Figure E - 99: Polar frequency plot for $PM_{2.5}$ during the alert event period, September 07 to September 08, 2017.

E-34. Station 1 $PM_{2.5}$ event on 2017-09-07

The 24 hour rolling average $PM_{2.5}$ concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 25 µg/m^3 from 19:00 on September 07, 2017, until 15:00 on September 08, 2017 (see time series, Figure E - 100). The figure shows that this event was characterized by an initial low broad peak just above the AAQO followed by lower overnight concentrations, another 12-hour peak of high hourly concentrations (greater than 60 µg/m^3) and finally a gradual decline to baseline conditions. A Smoky Skies bulletin issued by BC MOE was in effect at the time of this event, local RWDI staff in Fort St, John confirmed haze and the smell of smoke.

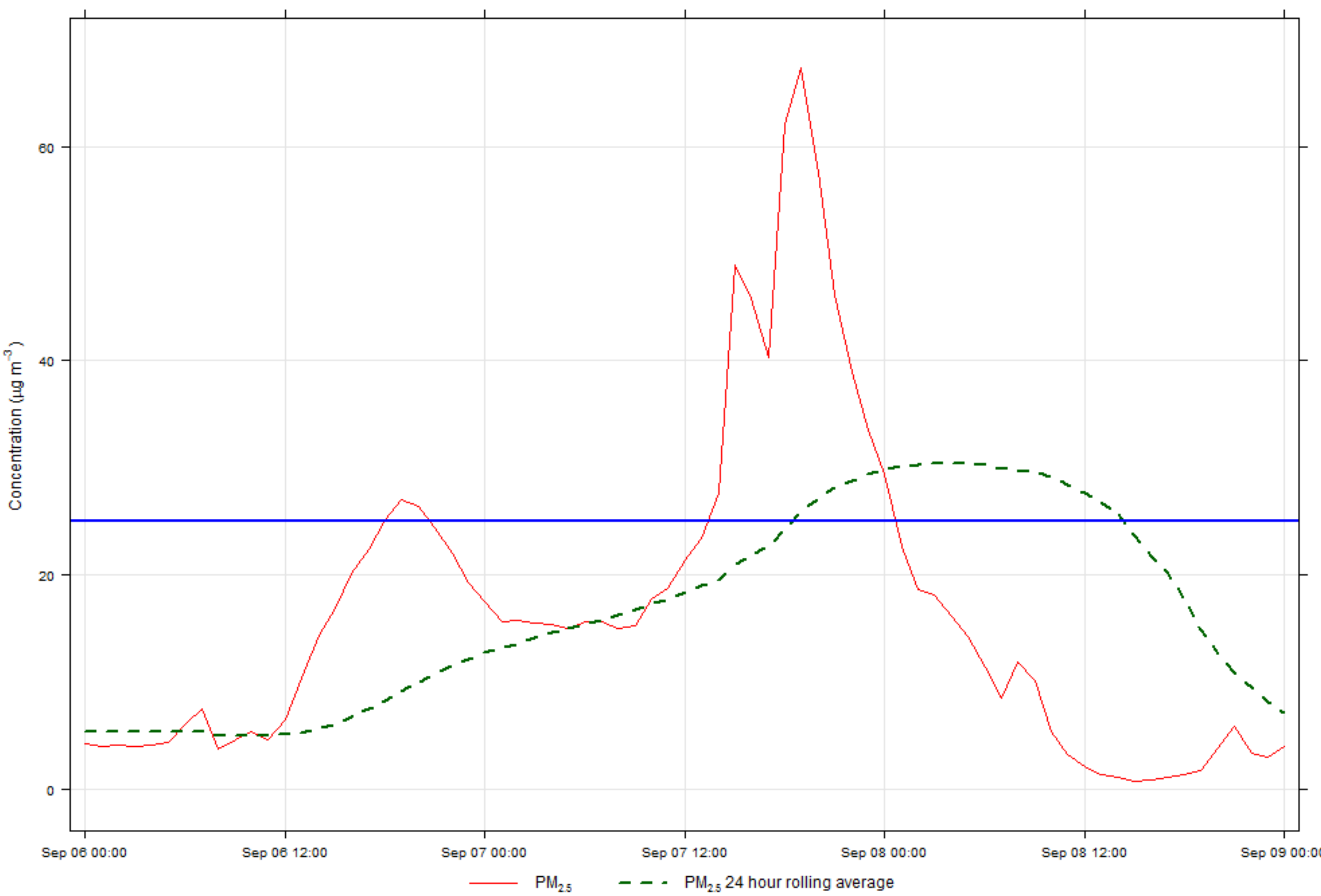


Figure E - 100: $PM_{2.5}$ time series plot for the period, September 07 to September 08, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m^3

Wind directions at the time of the event were predominantly from the east-northeast and the southwest. Wind speeds were recorded from 0.5 to 6 m/s (see wind rose, Figure E - 101). The greatest $PM_{2.5}$ concentrations were observed at wind speeds of 3 to 5 m/s from the southwest (see polar frequency plot, Figure E - 102).

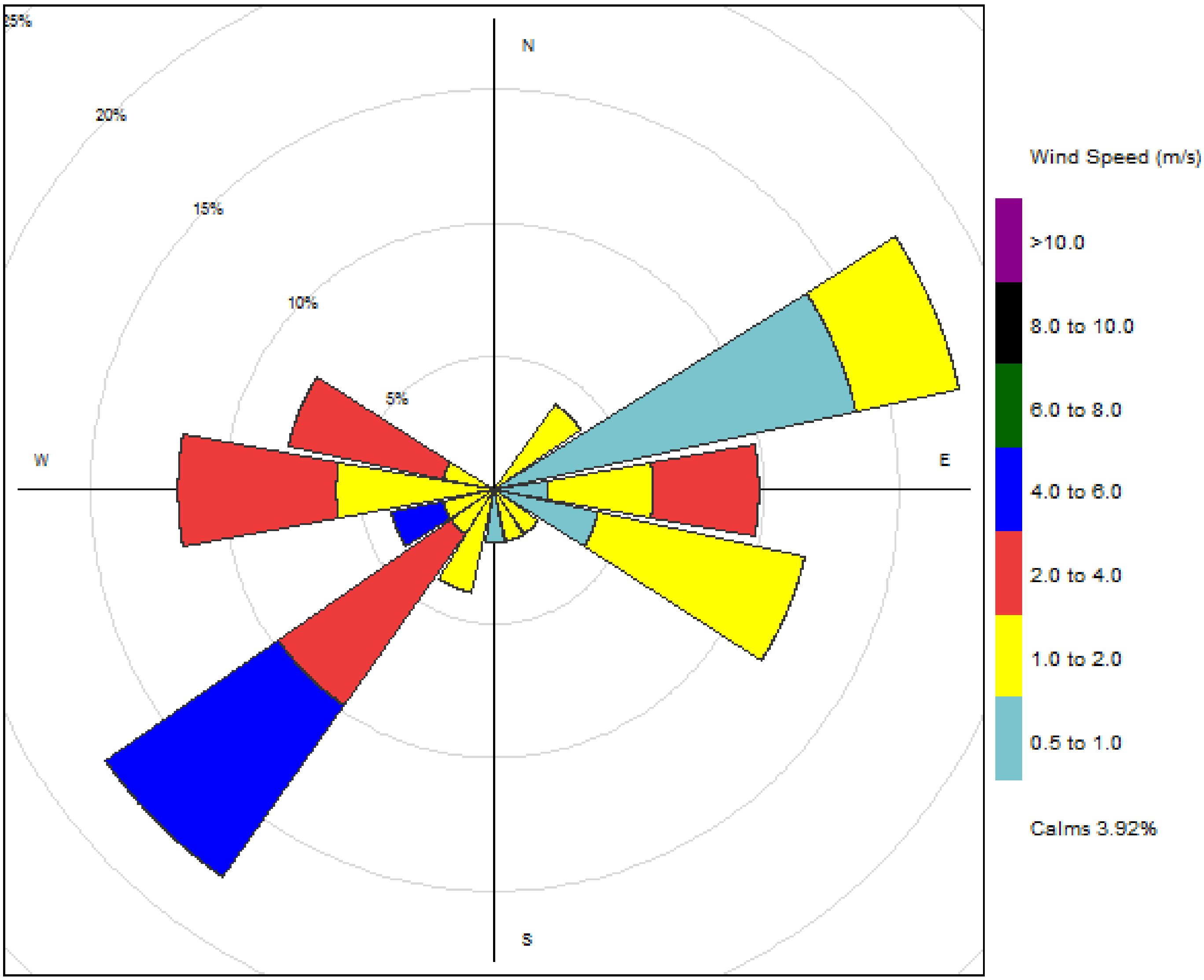


Figure E - 101: Wind rose during the alert event period, September 07 to September 08, 2017.

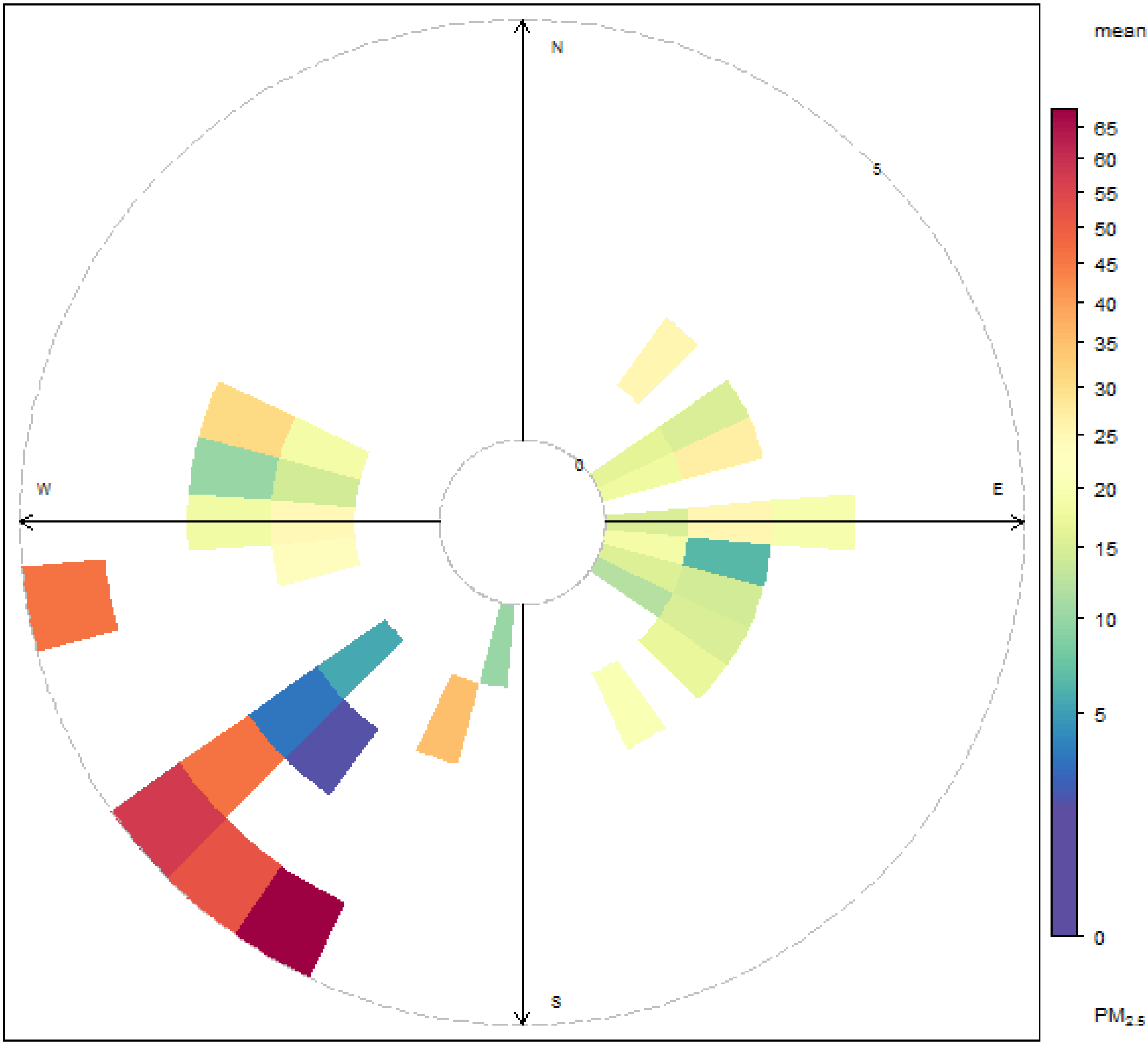


Figure E - 102: Polar frequency plot for $PM_{2.5}$ during the alert event period, September 07 to September 08, 2017.

E-35. Station 7B PM_{10} event on 2017-09-10

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 14:00 on September 10, 2017, until 13:00 on September 11, 2017 (see time series, Figure E - 103). The figure shows that this event was characterized by a single 8---hour peak spikes of high hourly concentrations (greater than 300 µg/m^3) followed by a rapid decline to baseline values.

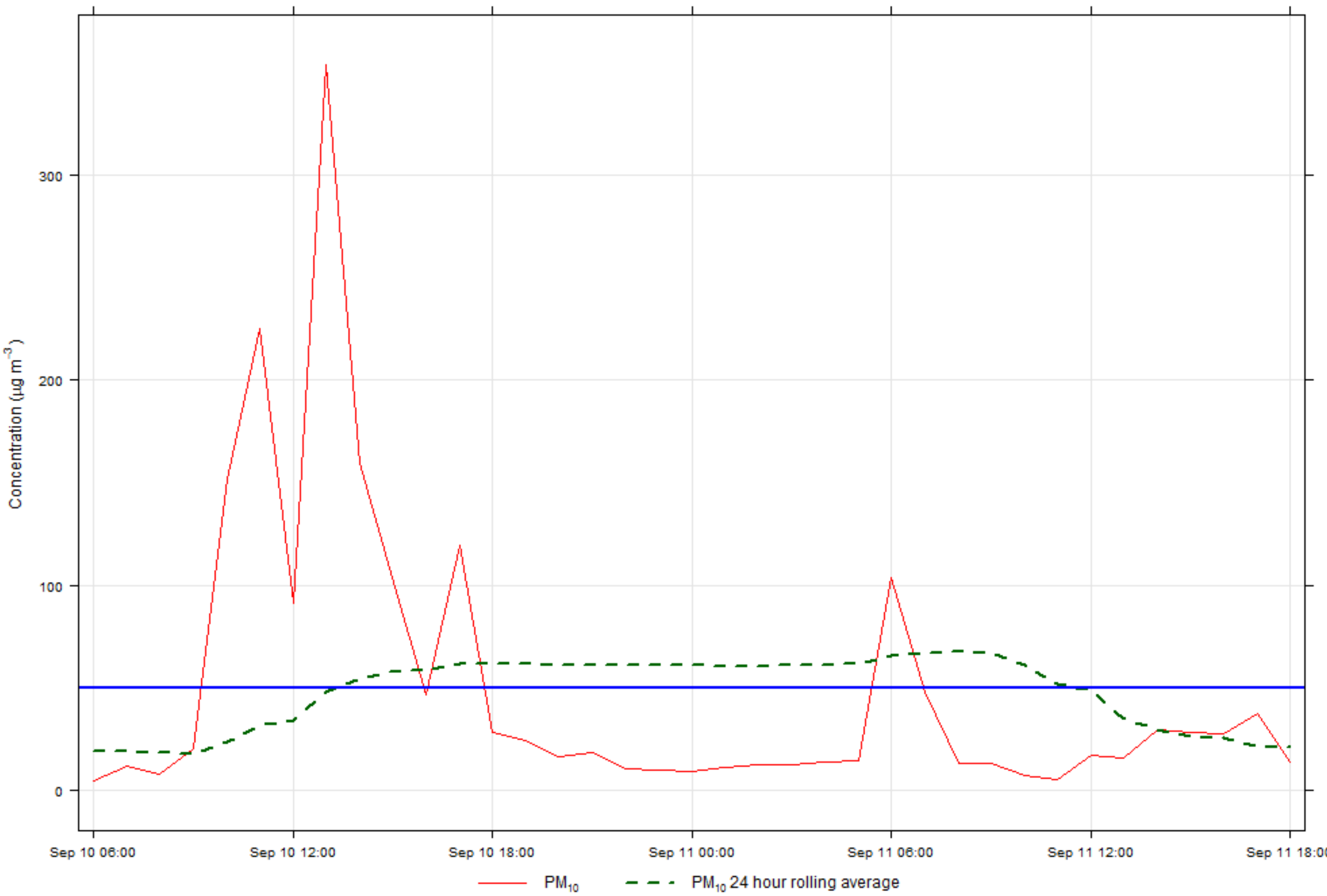


Figure E - 103: PM_{10} time series plot for the period, September 10 to September 11, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the west- southwest. Wind speeds were recorded from 6 to greater than 10 m/s (see wind rose, Figure E - 104). The greatest PM_{10} concentrations were observed at high wind speeds (10-11 m/s) from the southwest (see polar frequency plot, Figure E - 105).

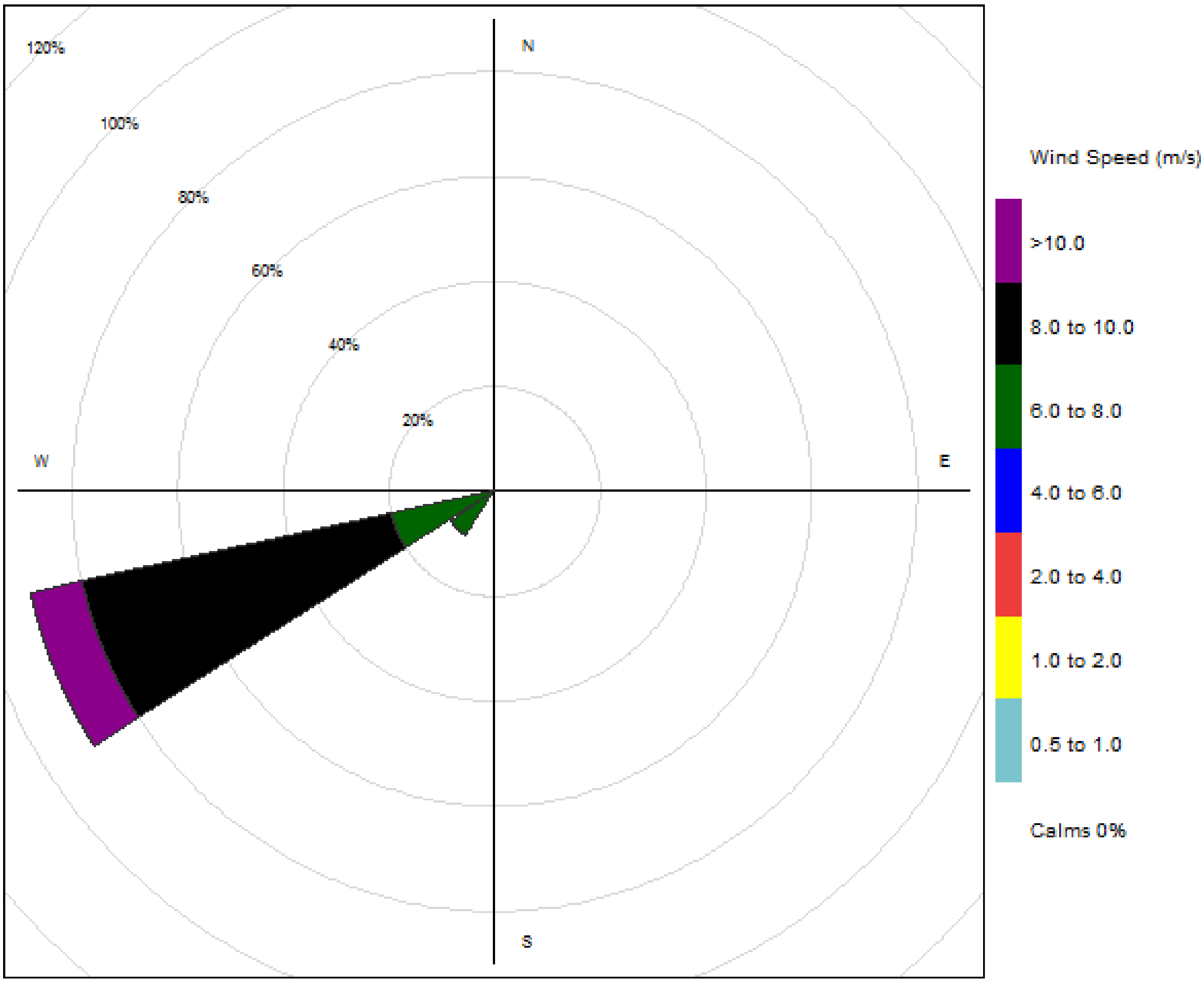


Figure E - 104: Wind rose during the alert event period, September 10 to September 11, 2017.

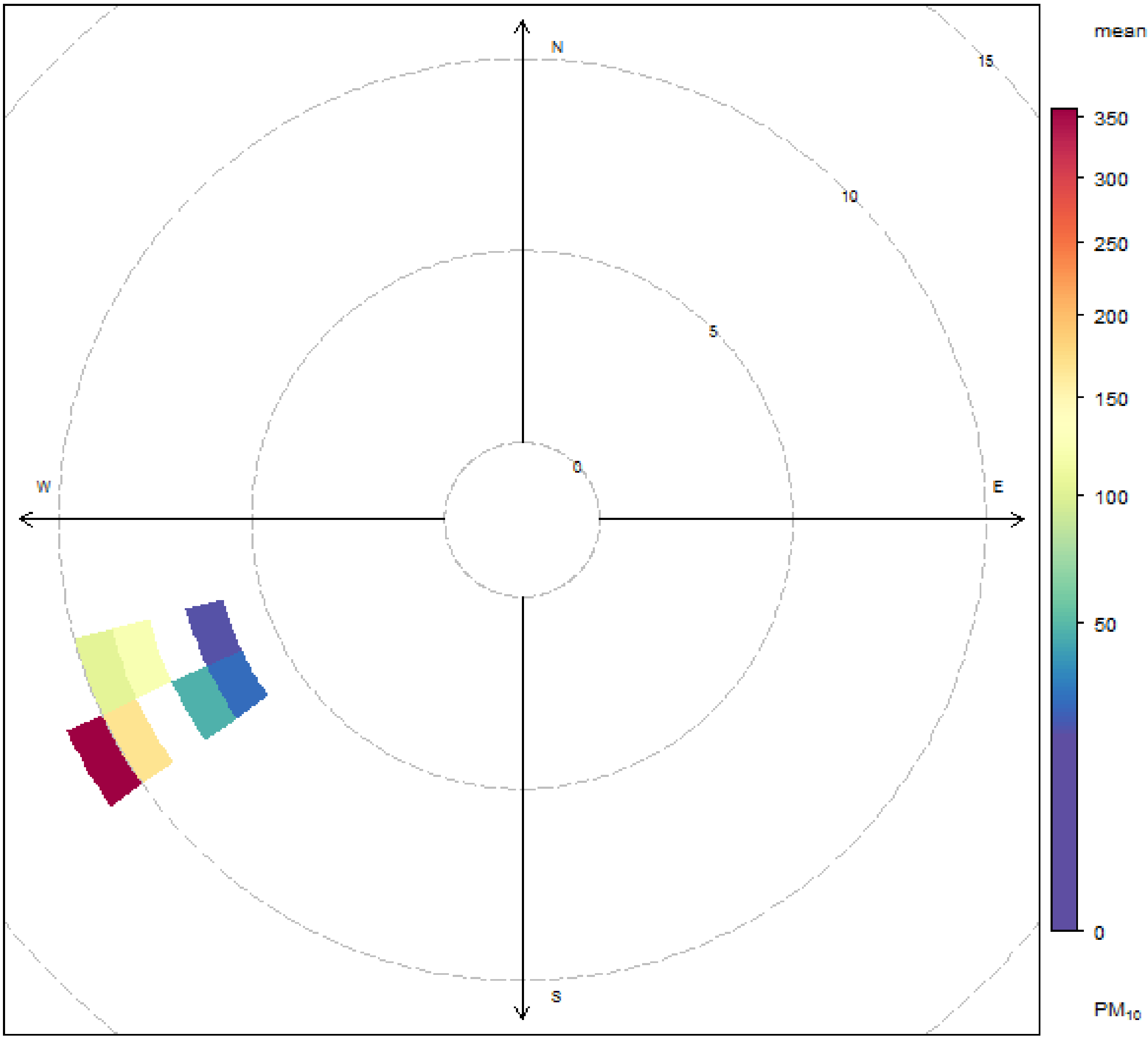


Figure E - 105: Polar frequency plot for PM_{10} during the alert event period, September 10 to September 11, 2017.

E-36. Station 7B PM_{10} event on 2017-10-15

The 24 hour rolling average PM_{10} concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 50 µg/m^3 from 14:00 on October 15, 2017, until 13:00 on October 16, 2017 (see time series, Figure E - 106). The figure shows that this event was characterized by a single peak of high hourly concentrations (greater than 300 µg/m^3) that lasted several hours followed by a return to baseline conditions.

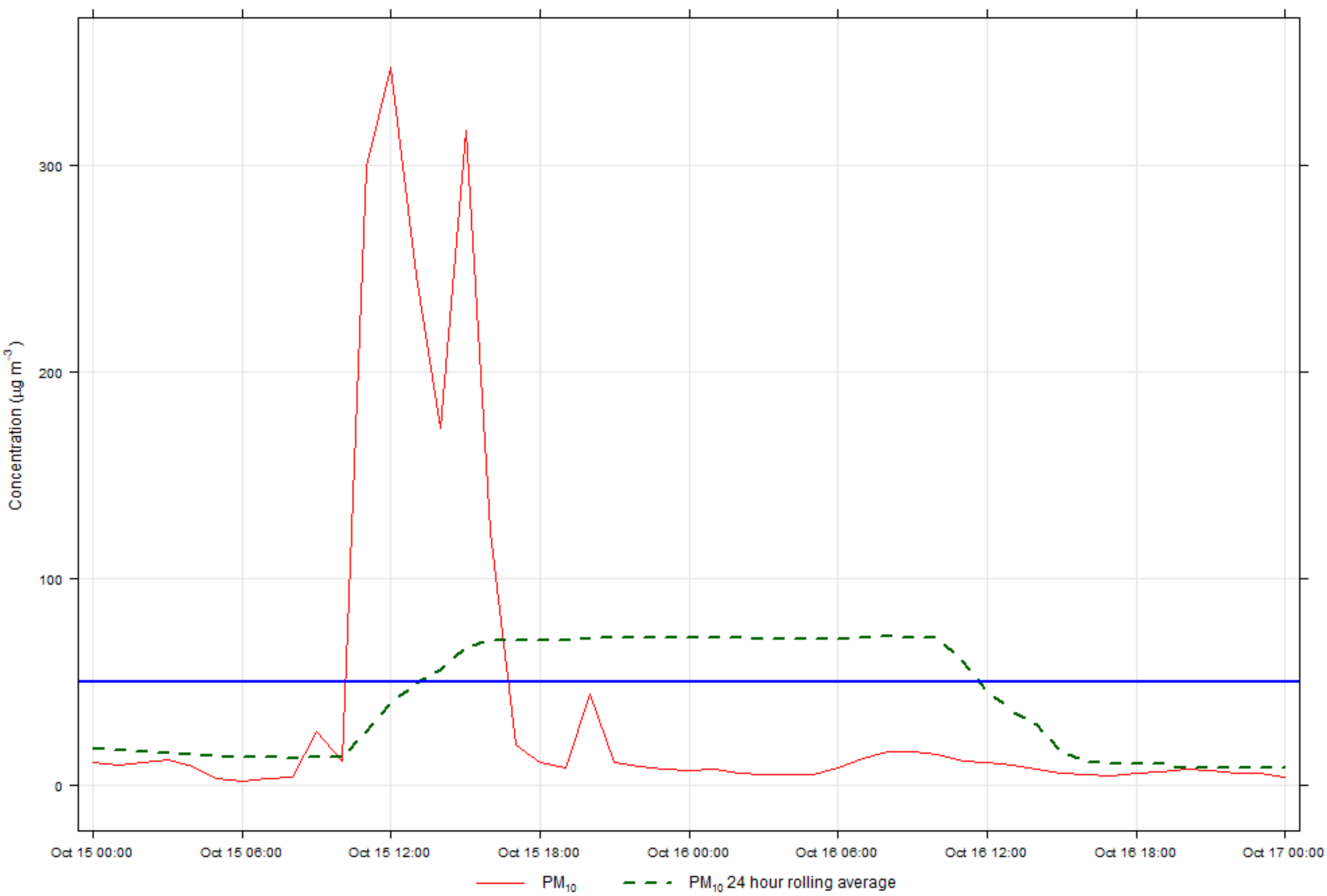


Figure E - 106: PM_{10} time series plot for the period, October 15, 2017. Blue line indicates the 24-hour BC AAQO of 50 µg/m^3

Wind directions at the time of the event were predominantly from the west southwest. Wind speeds were recorded from 6 to greater than 10 m/s (see wind rose, Figure E - 107). The greatest PM_{10} concentrations were observed at high wind speeds (9-13 m/s) from the west-southwest (see polar frequency plot, Figure E - 108).

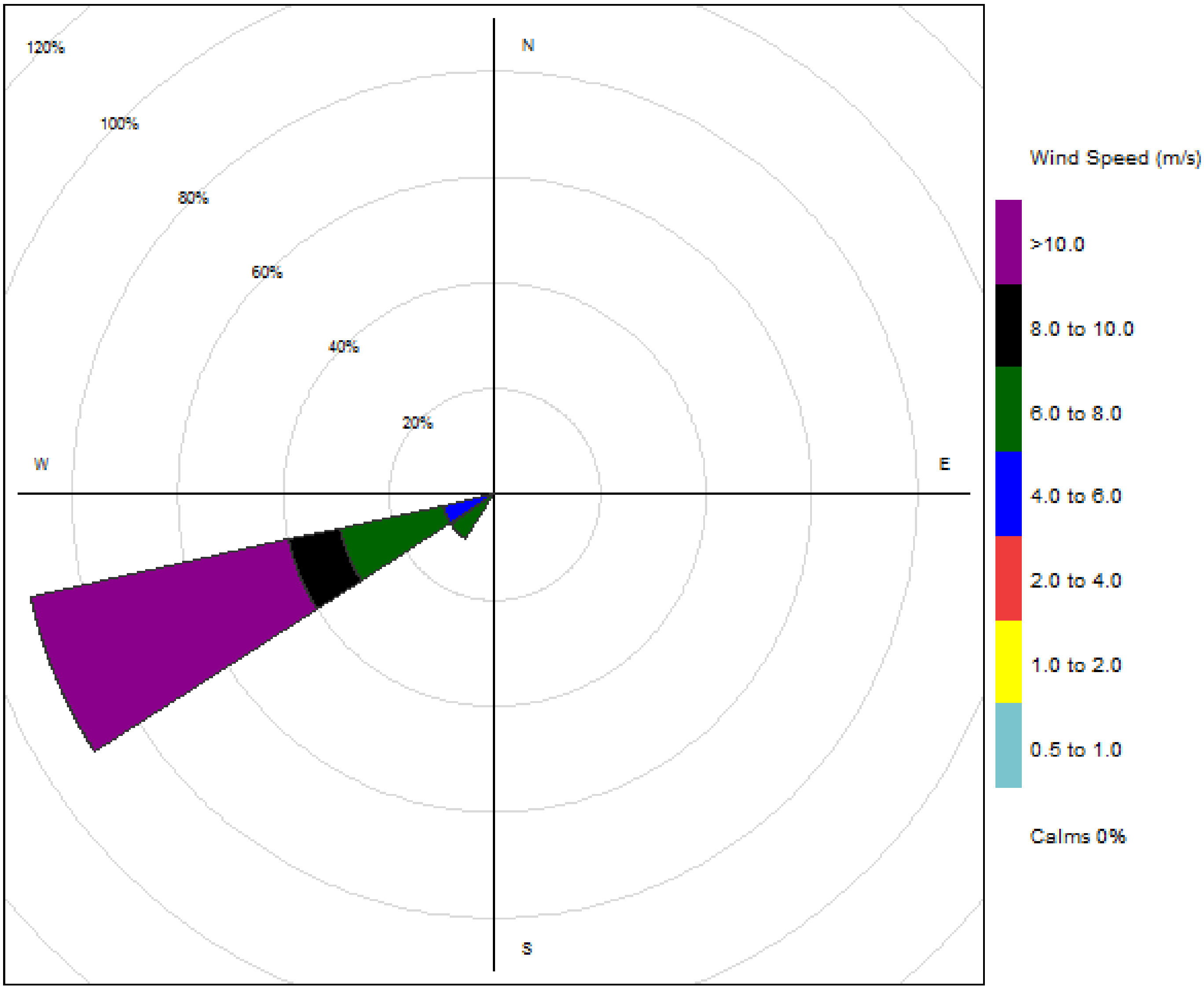


Figure E - 107: Wind rose during the alert event period, October 15 to October 16, 2017.

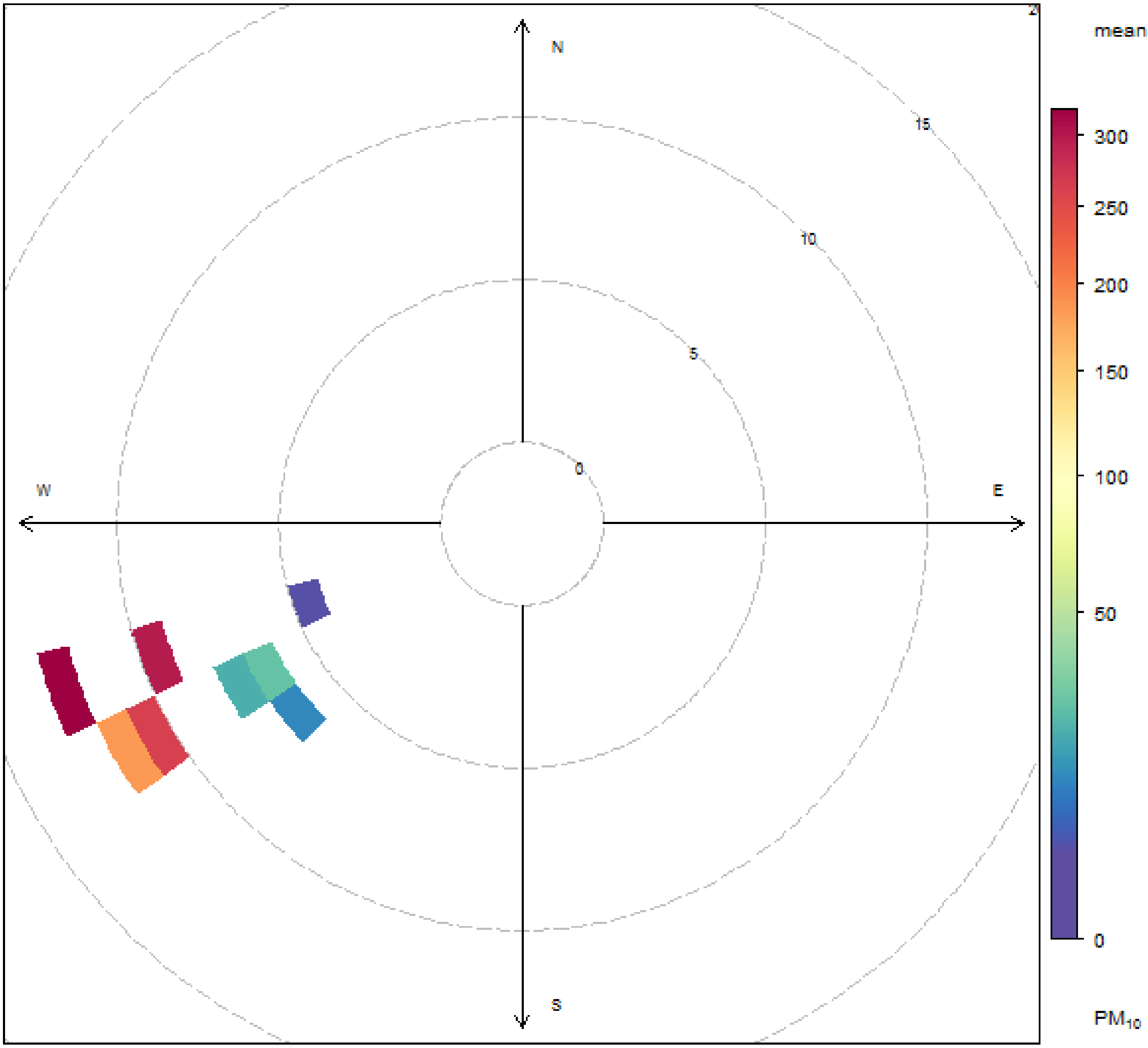


Figure E - 108: Polar frequency plot for PM_{10} during the alert event period, October 15 to October 16, 2017.

E-37. Station 7B $PM_{2.5}$ event on 2017-11-09

The 24 hour rolling average $PM_{2.5}$ concentrations at Station 7B were greater than the BC MOE 24-hour AAQO of 25 µg/m^3 from 10:00 on November 09, 2017, until 09:00 on November 10, 2017 (see time series, Figure E - 109). The figure shows that this event was characterized by a single 24-hour peak of high hourly concentrations (greater than 50 µg/m^3). An Air Quality Advisory issued by BC MOE and Northern Health was in effect at the time of this event.

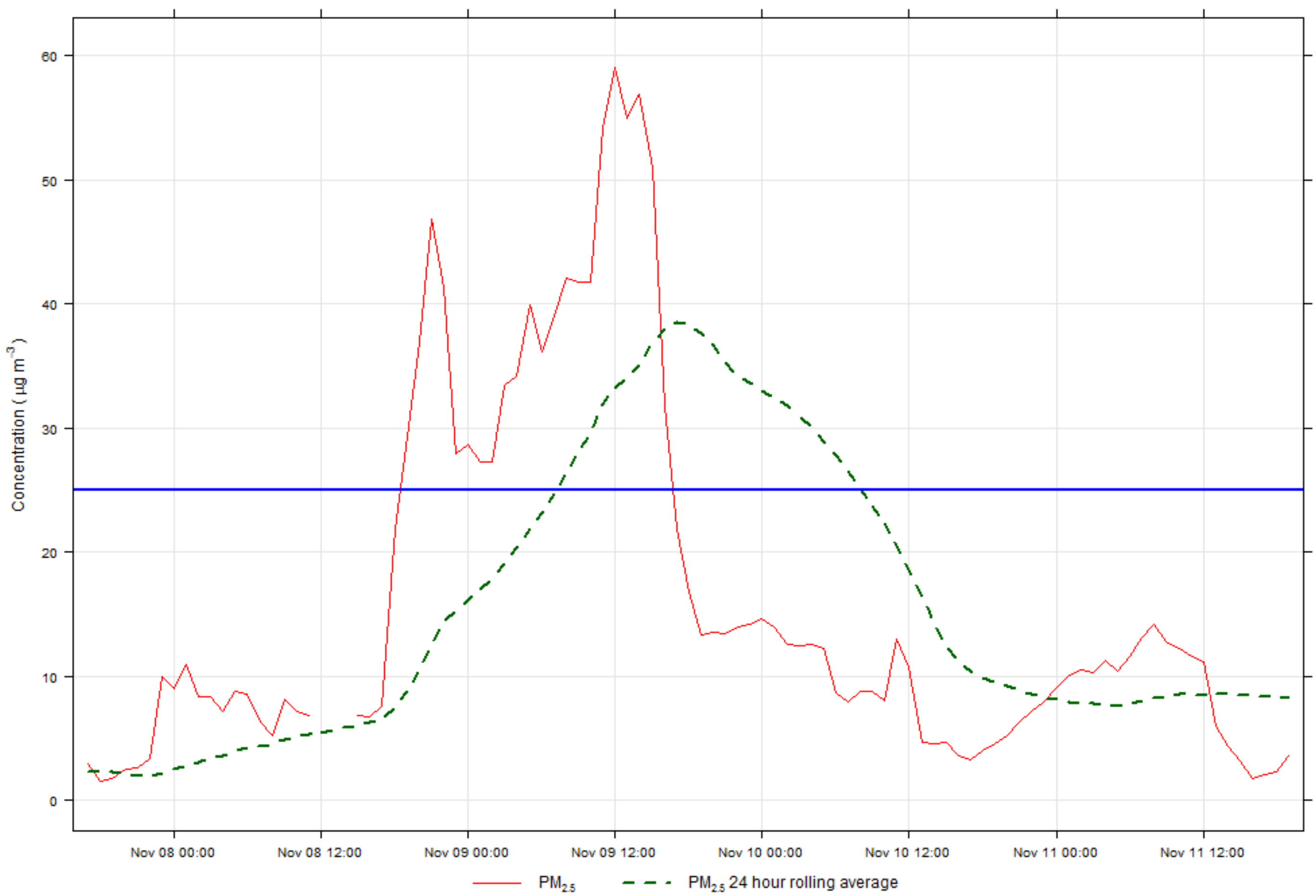


Figure E - 109: $PM_{2.5}$ time series plot for the period, November 09 to 10, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m^3

Wind directions at the time of the event were predominantly from the east. Wind speeds were recorded from 1 to 4 m/s (see wind rose, Figure E - 110). The greatest $PM_{2.5}$ concentrations were observed at low wind speeds (0-2 from the east-northeast (see polar frequency plot, Figure E - 111).

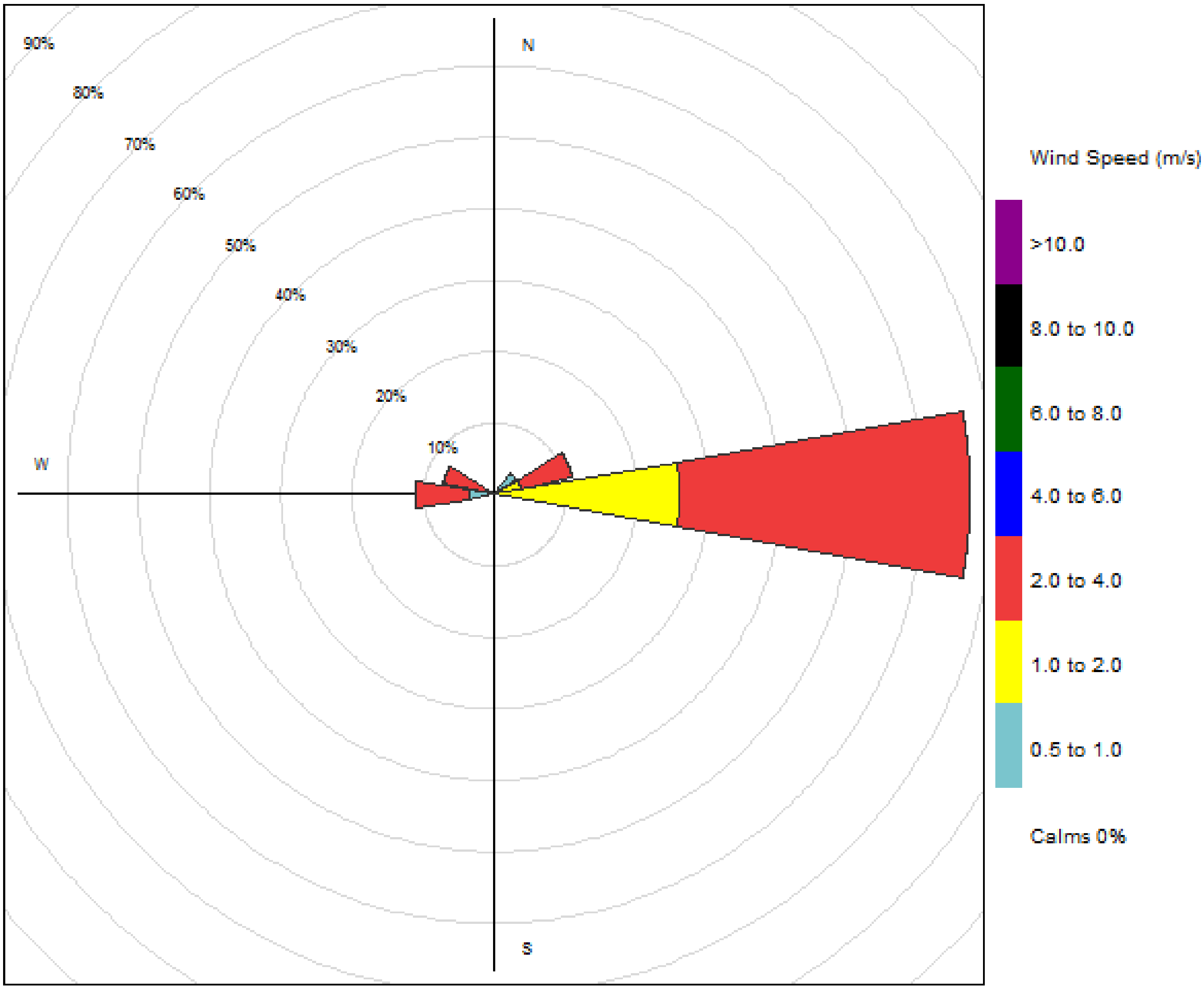


Figure E - 110: Wind rose during the alert event period, November 09 to November 10, 2017.

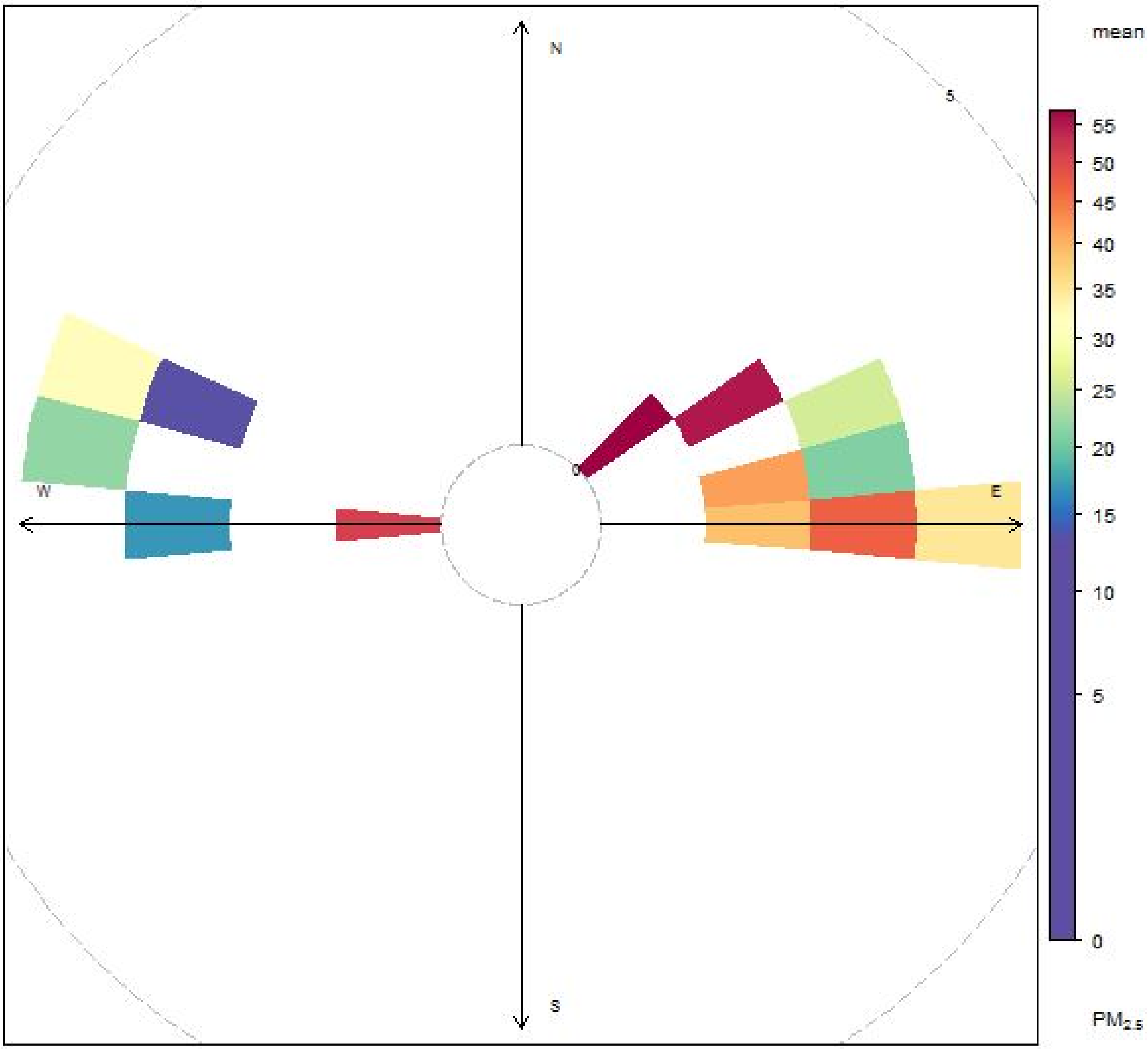


Figure E - 111: Polar frequency plot for $PM_{2.5}$ during the alert event period, November 09 to November 10, 2017.

E-38. Station 9 $PM_{2.5}$ event on 2017-11-09

The 24 hour rolling average $PM_{2.5}$ concentrations at Station 9 were greater than the BC MOE 24-hour AAQO of 25 µg/m³ from 11:00 on November 09, 2017, until 6:00 on November 10, 2017 (see time series, Figure E - 112). The figure shows that this event was characterized by a single spike of high hourly concentrations (greater than 40 µg/m³). An Air Quality Advisory issued by BC MOE and Northern Health was in effect at the time of this event.

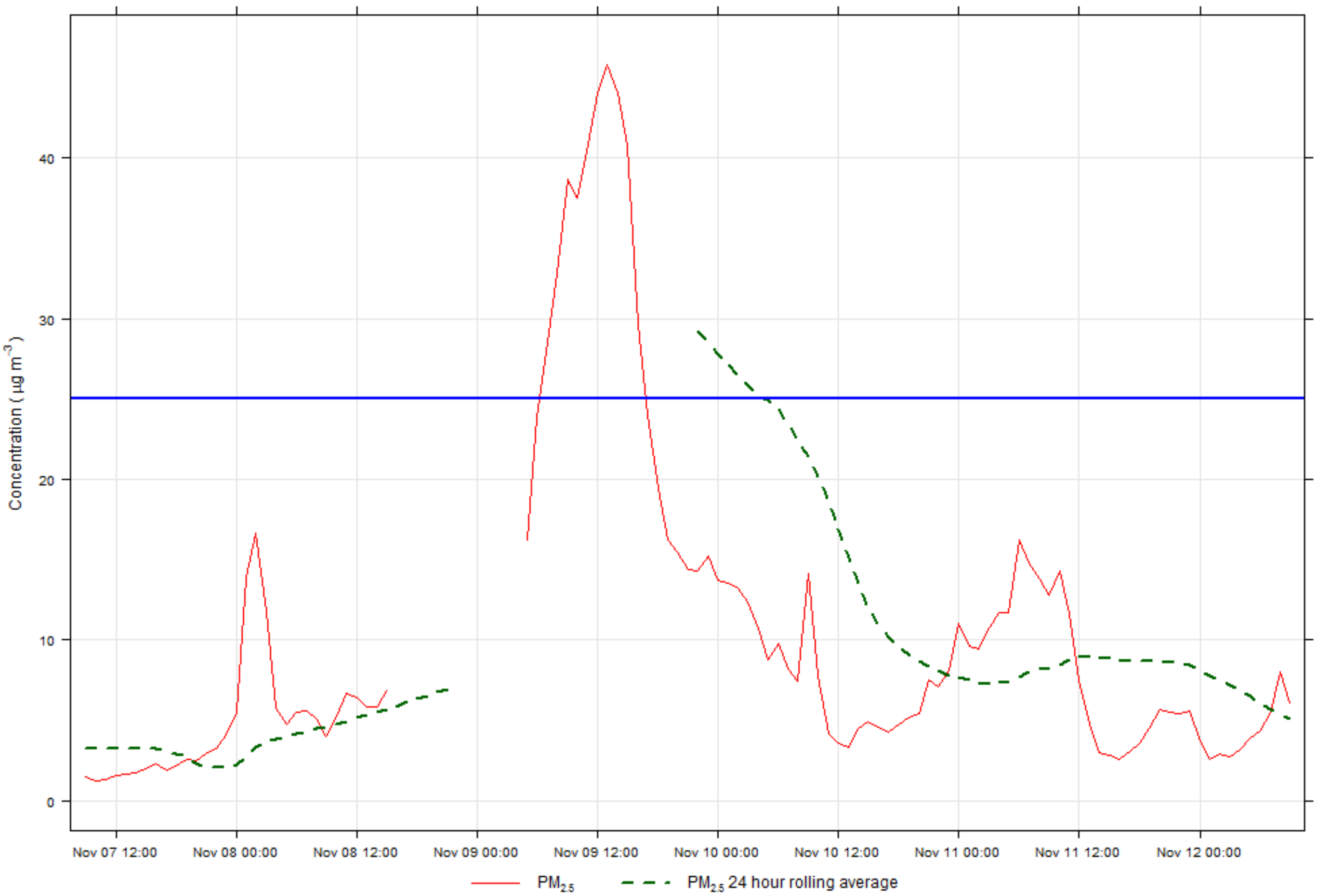


Figure E - 112: $PM_{2.5}$ time series plot for the period, November 09 to 10, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m³

Wind directions at the time of the event were predominantly from the west. Wind speeds were recorded from 0.5 to 4 m/s (see wind rose, Figure E - 113). The greatest $PM_{2.5}$ concentrations were observed at low wind speeds (0-1 m/s) from the northeast (see polar frequency plot, Figure E - 114). A secondary maximum was observed at 0 to 2 m/s from the southeast.

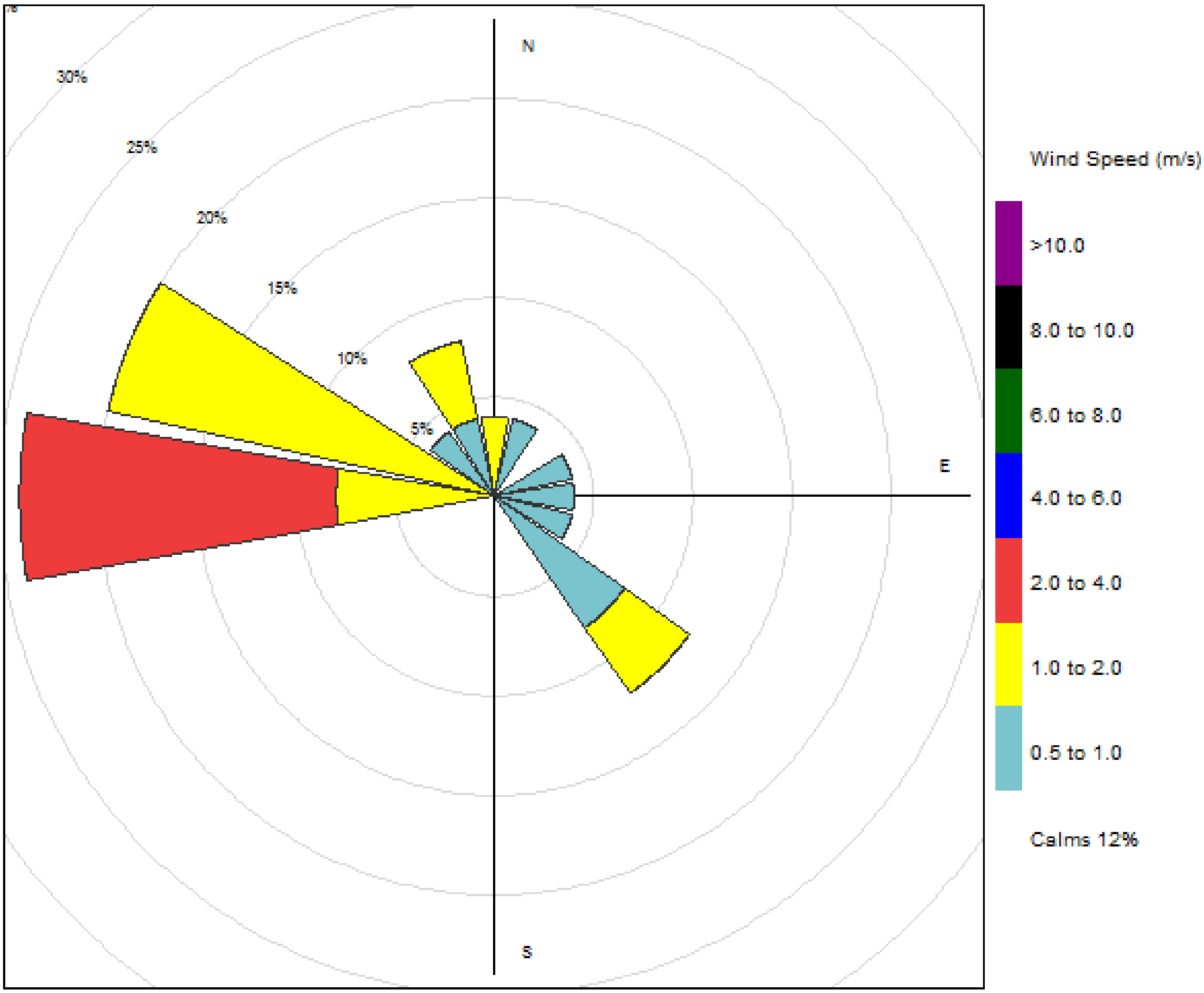


Figure E - 113: Wind rose during the alert event period, November 09 to November 10, 2017.

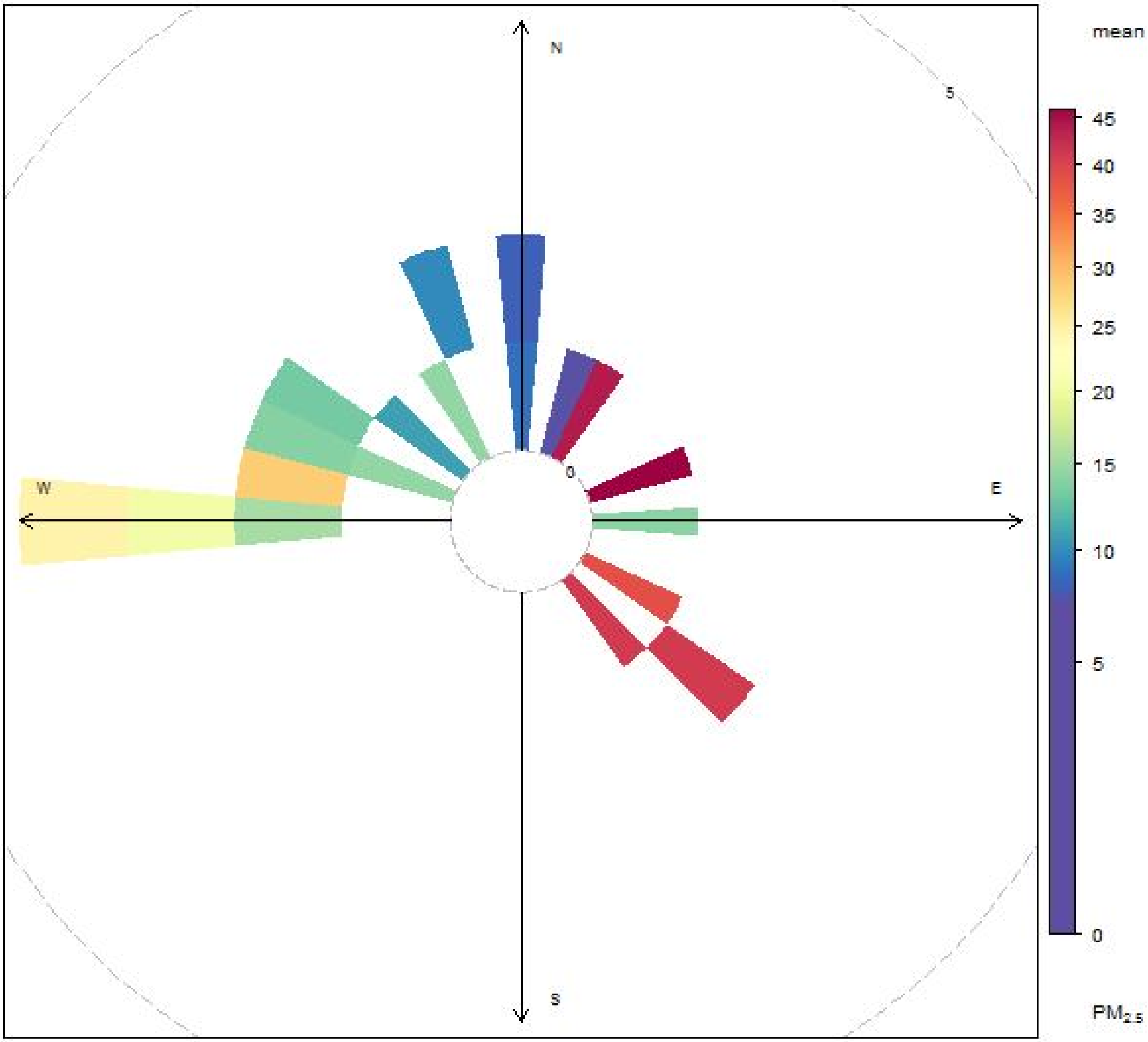


Figure E - 114: Polar frequency plot for $PM_{2.5}$ during the alert event period, November 09 to November 10, 2017.

E-39. Station 8 $PM_{2.5}$ event on 2017-11-09

The 24 hour rolling average $PM_{2.5}$ concentrations at Station 8 were greater than the BC MOE 24-hour AAQO of 25 µg/m^3 from 13:00 on November 09, 2017, until 11:00 on November 10, 2017 (see time series, Figure E - 115). The figure shows that this event was characterized by a single broad peak of high hourly concentrations (greater than 60 µg/m^3). An Air Quality Advisory issued by BC MOE and Northern Health was in effect at the time of this event.

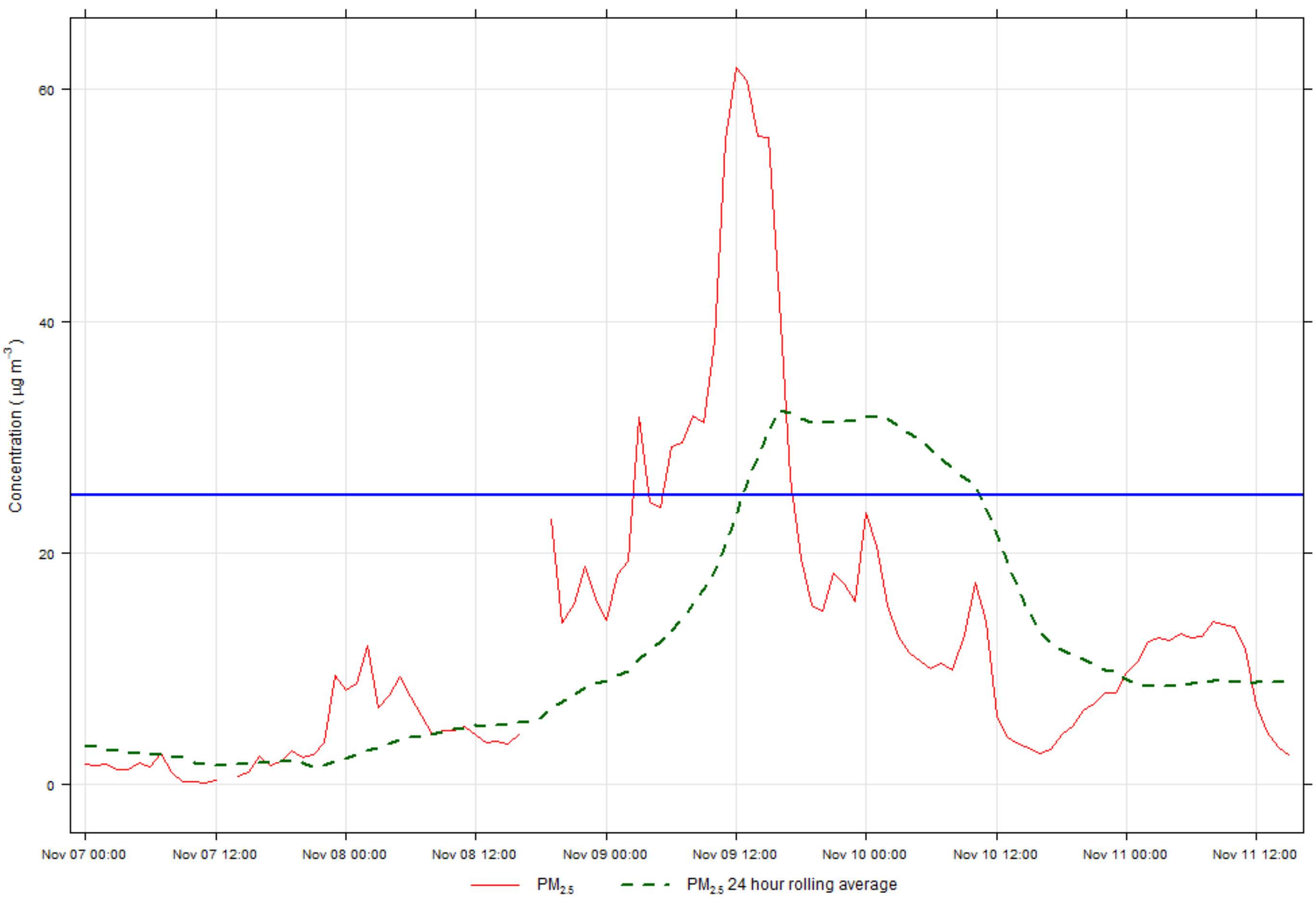


Figure E - 115: $PM_{2.5}$ time series plot for the period, November 09 to 10, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m^3

Wind directions at the time of the event were predominantly from the east-southeast. Wind speeds were recorded from 0.5 to 4 m/s (see wind rose, Figure E - 116). The greatest $PM_{2.5}$ concentrations were observed at low wind speeds (0-1 m/s) from the northeast (see polar frequency plot, Figure E - 117). A secondary maximum was observed during winds of 1-2 m/s from the southeast.

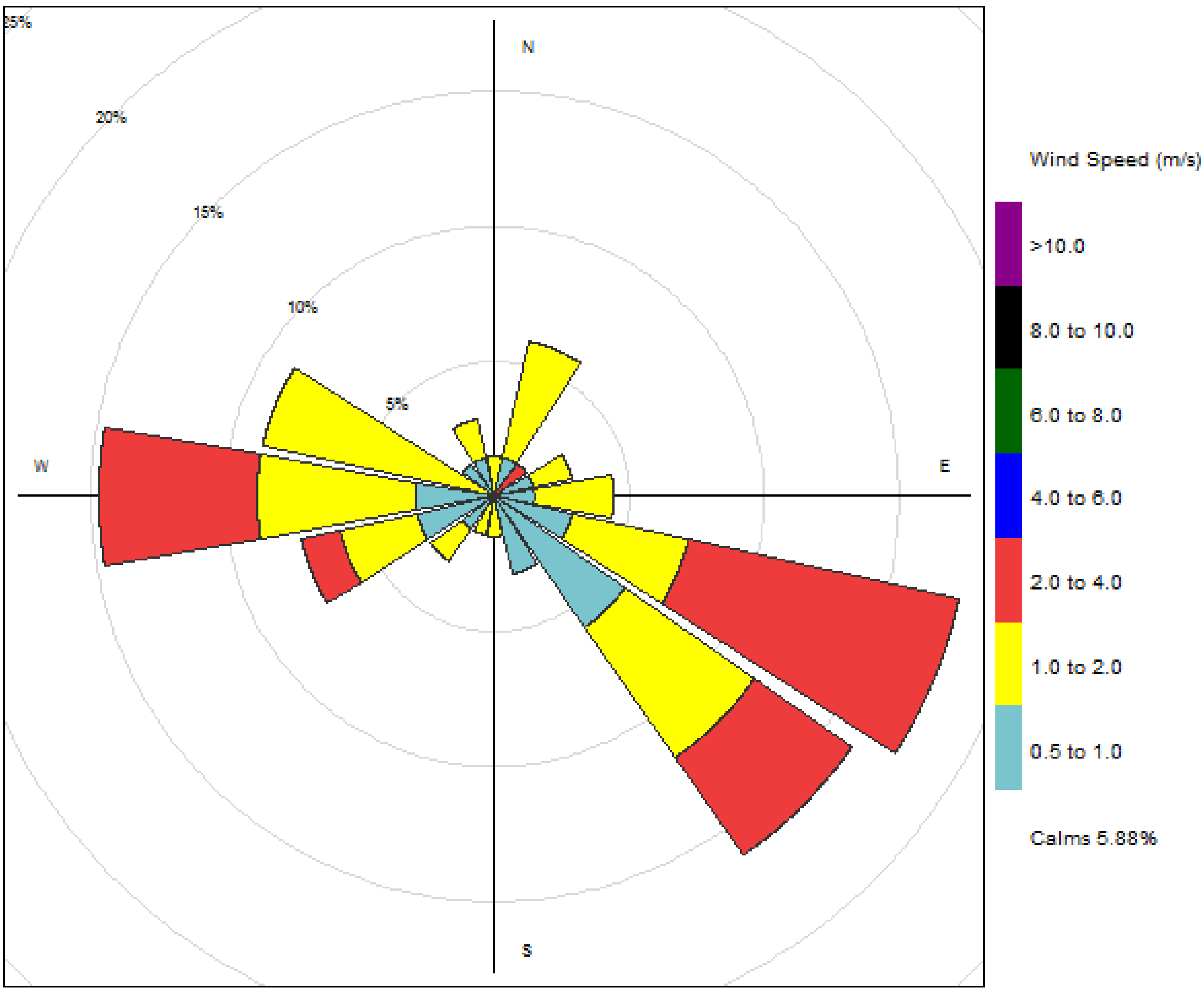


Figure E - 116: Wind rose during the alert event period, November 09 to November 10, 2017.

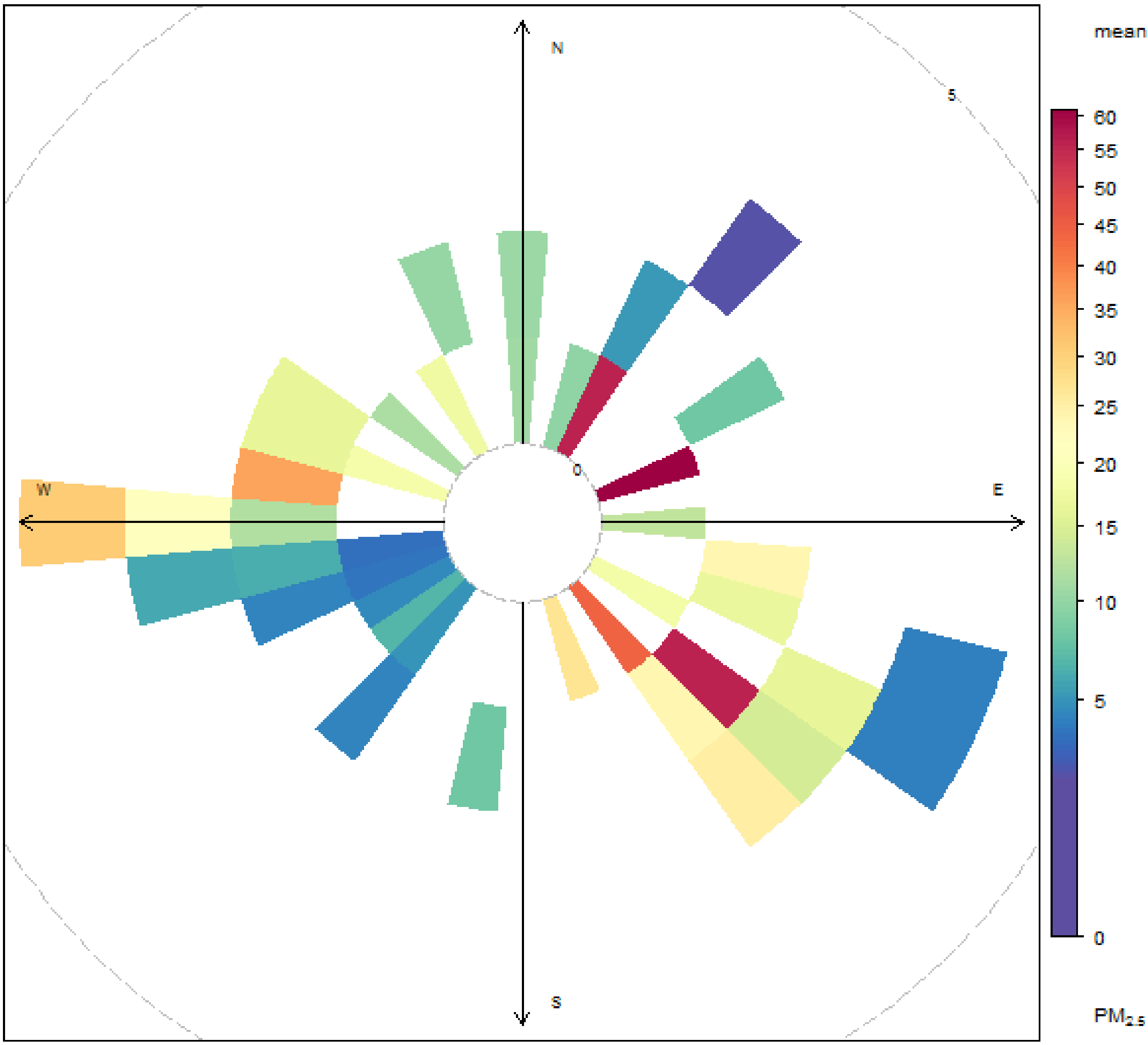


Figure E - 117: Polar frequency plot for $PM_{2.5}$ during the alert event period, November 09 to November 10, 2017.

E-40. Station 1 $PM_{2.5}$ event on 2017-11-09

The 24 hour rolling average $PM_{2.5}$ concentrations at Station 1 were greater than the BC MOE 24-hour AAQO of 25 µg/m^3 from 15:00 on November 09, 2017, until 01:00 on November 10, 2017 (see time series, Figure E - 118). The figure shows that this event was characterized by a single broad peak of high hourly concentrations (greater than 30 µg/m^3). An Air Quality Advisory issued by BC MOE and Northern Health was in effect at the time of this event.

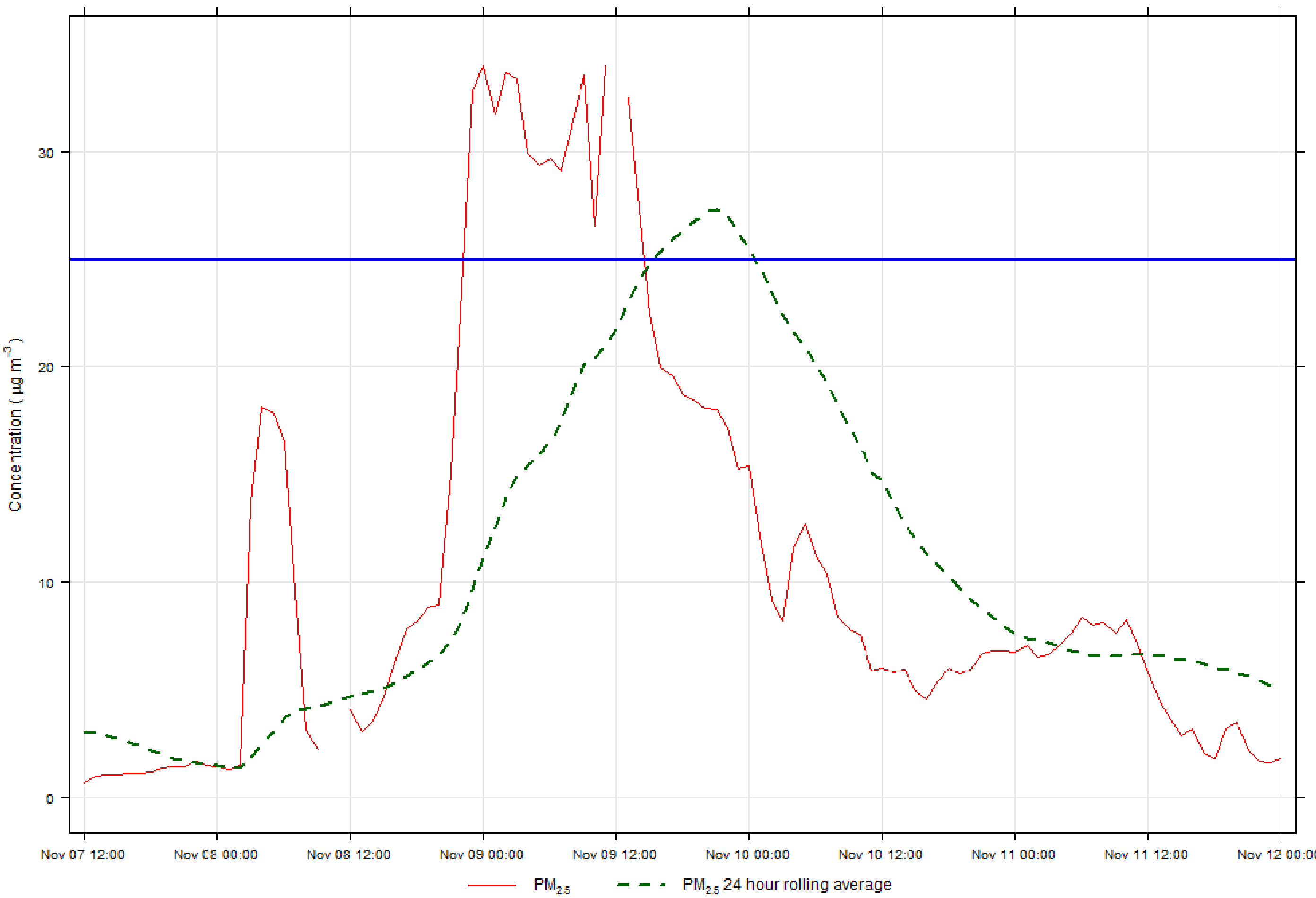


Figure E - 118: $PM_{2.5}$ time series plot for the period, November 09 to 10, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m^3

Wind directions at the time of the event were predominantly from the east-northwest. Wind speeds were recorded from 1 to 6 m/s (see wind rose, Figure E - 119). The greatest $PM_{2.5}$ concentrations were observed at low to moderate wind speeds (0-4 m/s) from the east (see polar frequency plot, Figure E - 120). A secondary maximum was observed during winds of 1-2 m/s from the southeast.

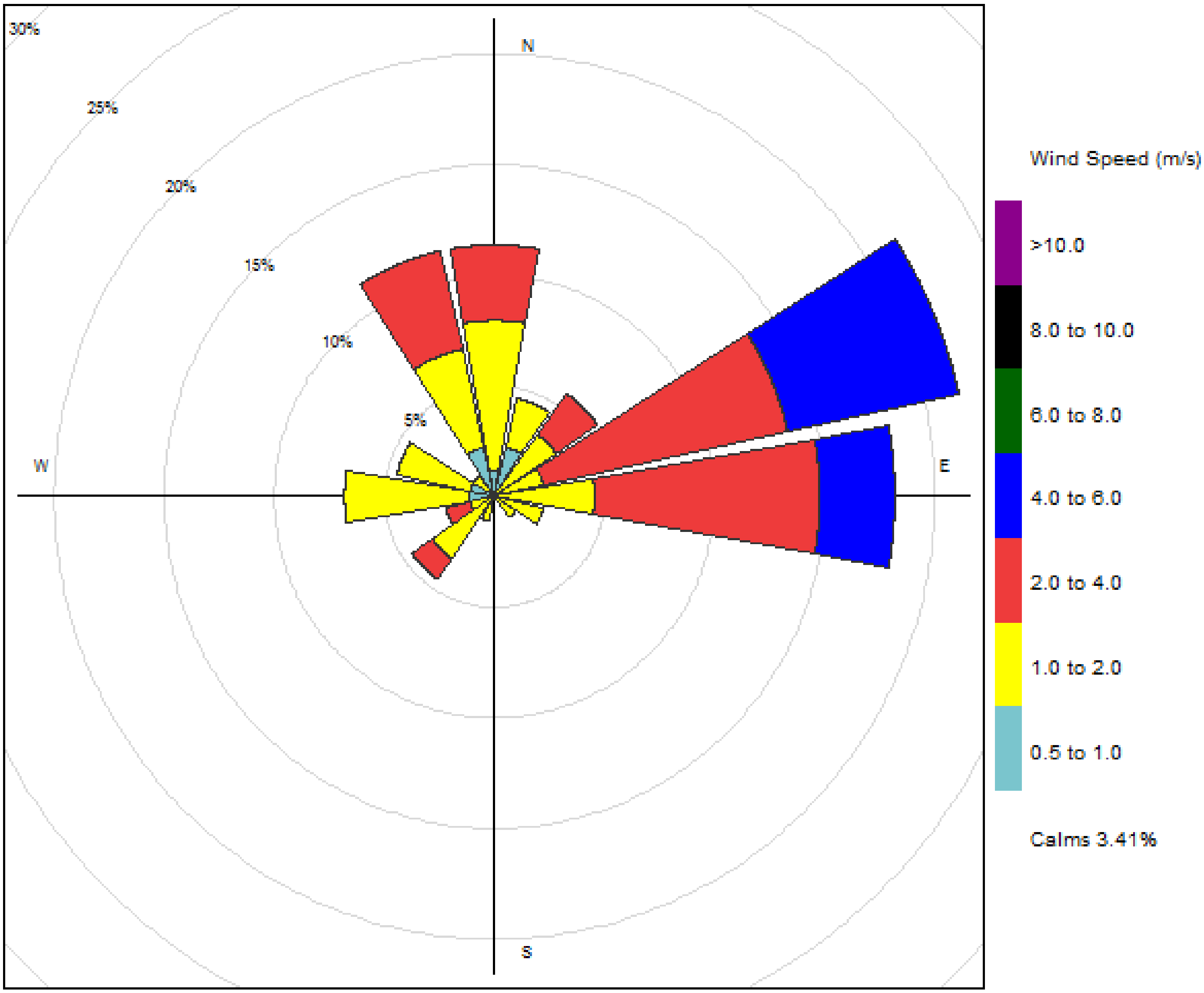


Figure E - 119: Wind rose during the alert event period, November 09 to November 10, 2017.

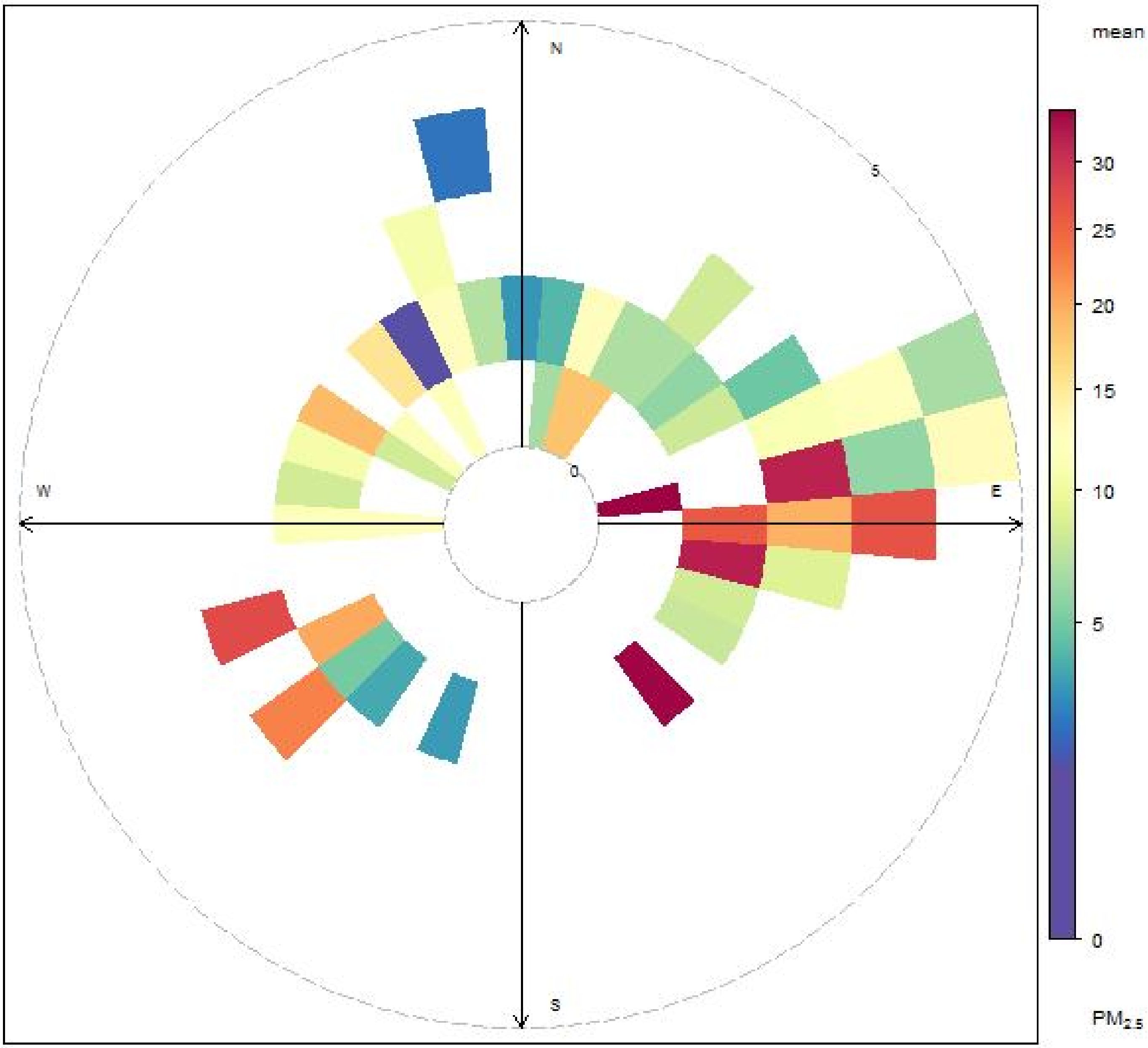


Figure E - 120: Polar frequency plot for $PM_{2.5}$ during the alert event period, November 09 to November 10, 2017.

E-41. Station 1 $PM_{2.5}$ event on 2017-12-21

The 24 hour rolling average PM_{10} concentrations at Station 1 were greater than the BC MOE 24-hour AAQO of 25 µg/m^3 from 05:00 on December 21, 2017, until 07:00 on December 22, 2017 (see time series, Figure E - 121). The figure shows that this event was characterized by an initial 12-hour peak of very high hourly concentrations (greater than 100 µg/m^3) followed by a period of near baseline $PM_{2.5}$ and another short-lived spike with periods of generally elevated $PM_{2.5}$ concentrations (> 90 µg/m^3) and a return to baseline conditions.

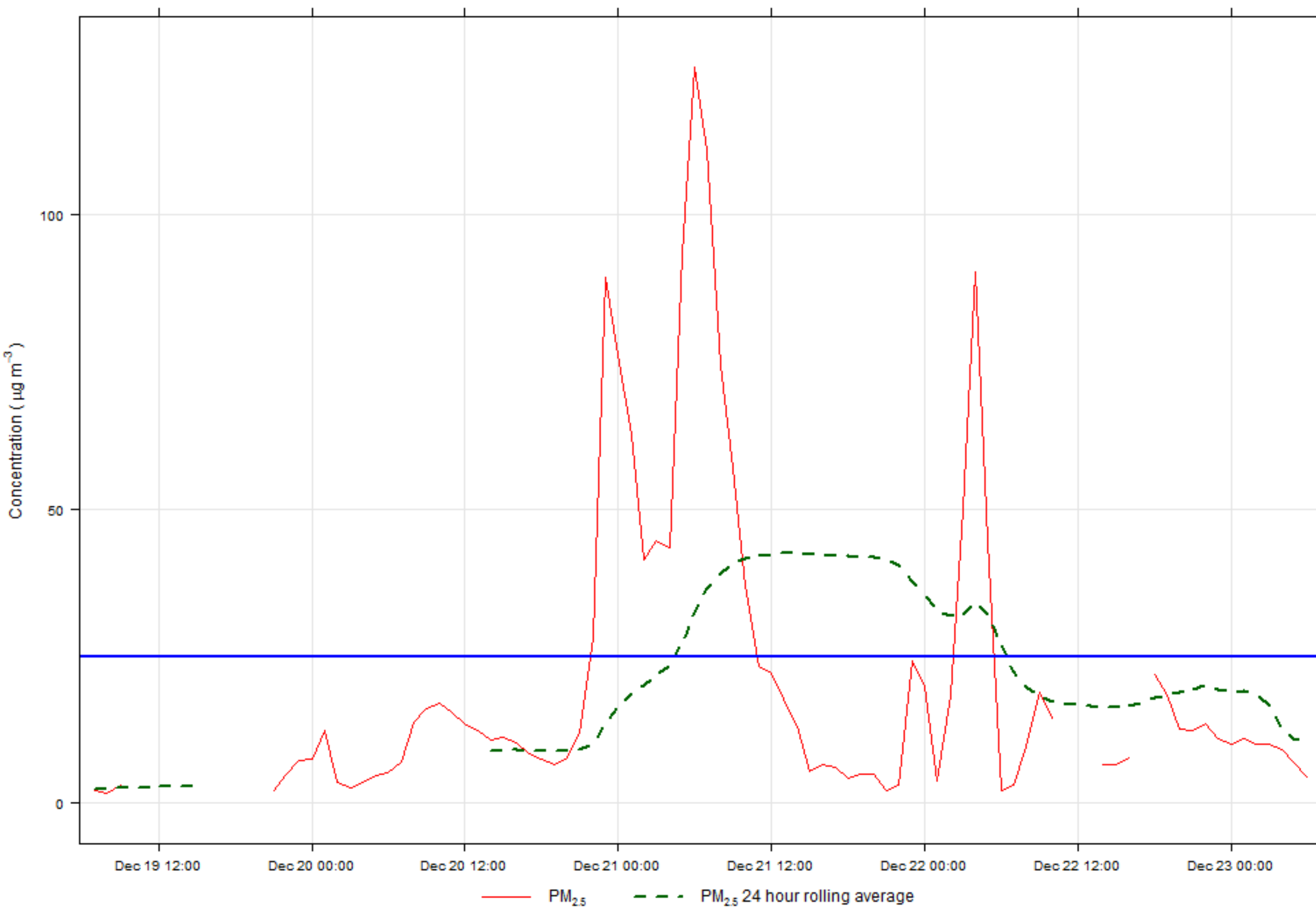


Figure E - 121: $PM_{2.5}$ time series plot for the period, December 21 to 22, 2017. Blue line indicates the 24-hour BC AAQO of 25 µg/m^3

Wind directions at the time of the event were predominantly from the west-southwest. Wind speeds were recorded from 0.5 to 4 m/s (see wind rose, Figure E - 122). The greatest $PM_{2.5}$ concentrations were observed during winds of 0-1 m/s from the east, 1-2 m/s from the northwest and 2-3 m/s from the west-southwest (see polar frequency plot, Figure E - 123).

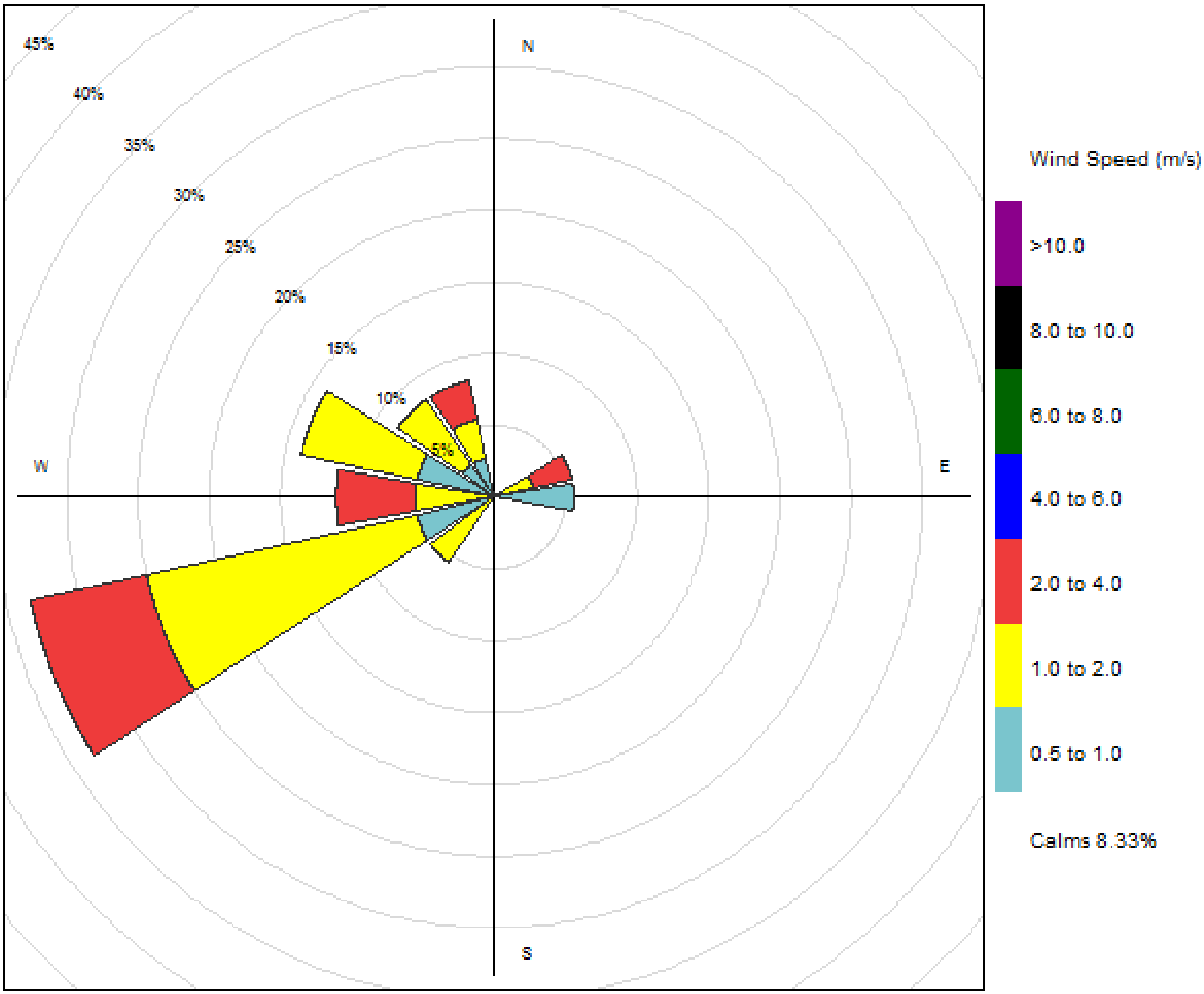


Figure E - 122: Wind rose during the alert event period, December 21 to December 22, 2017.

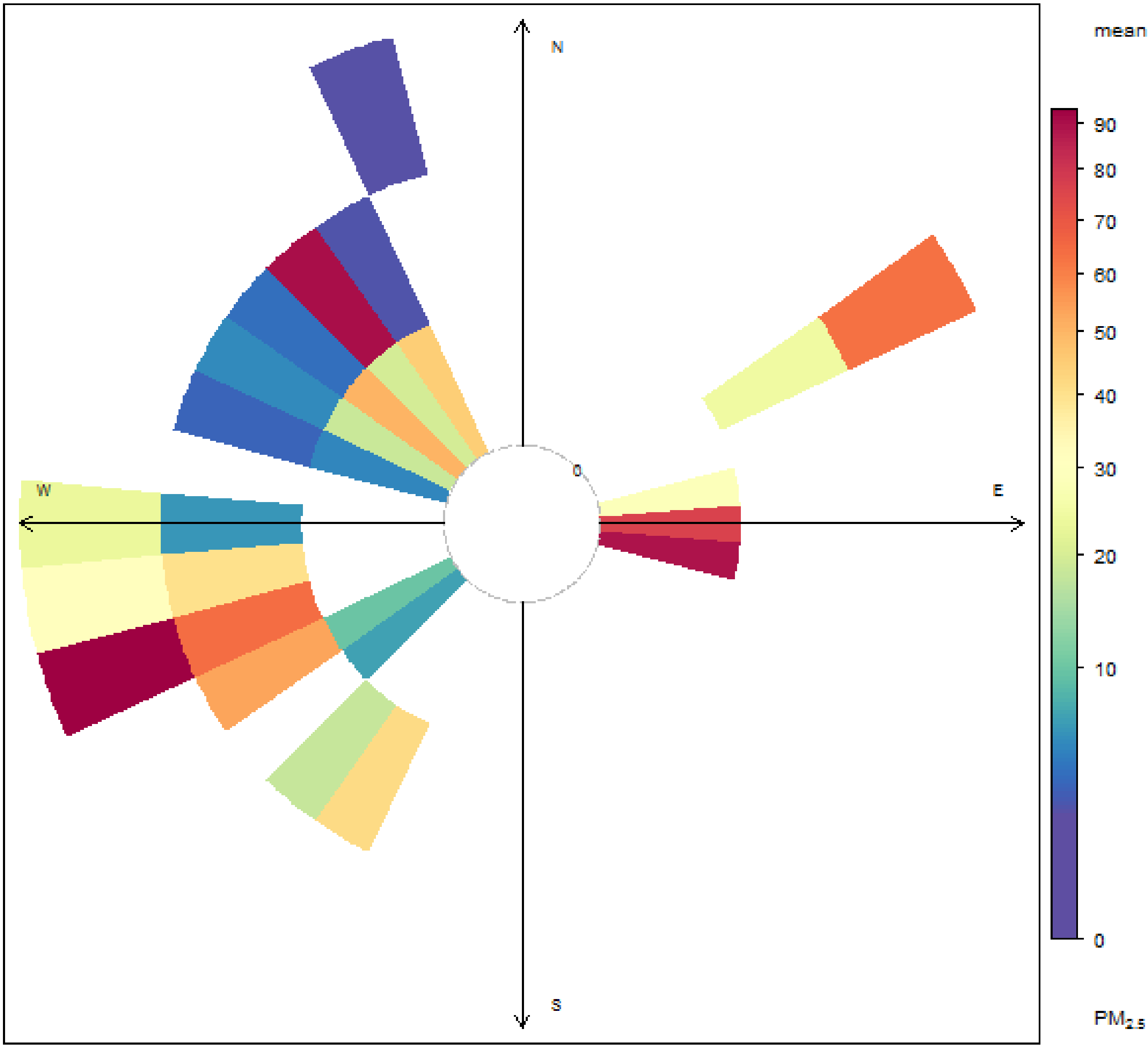
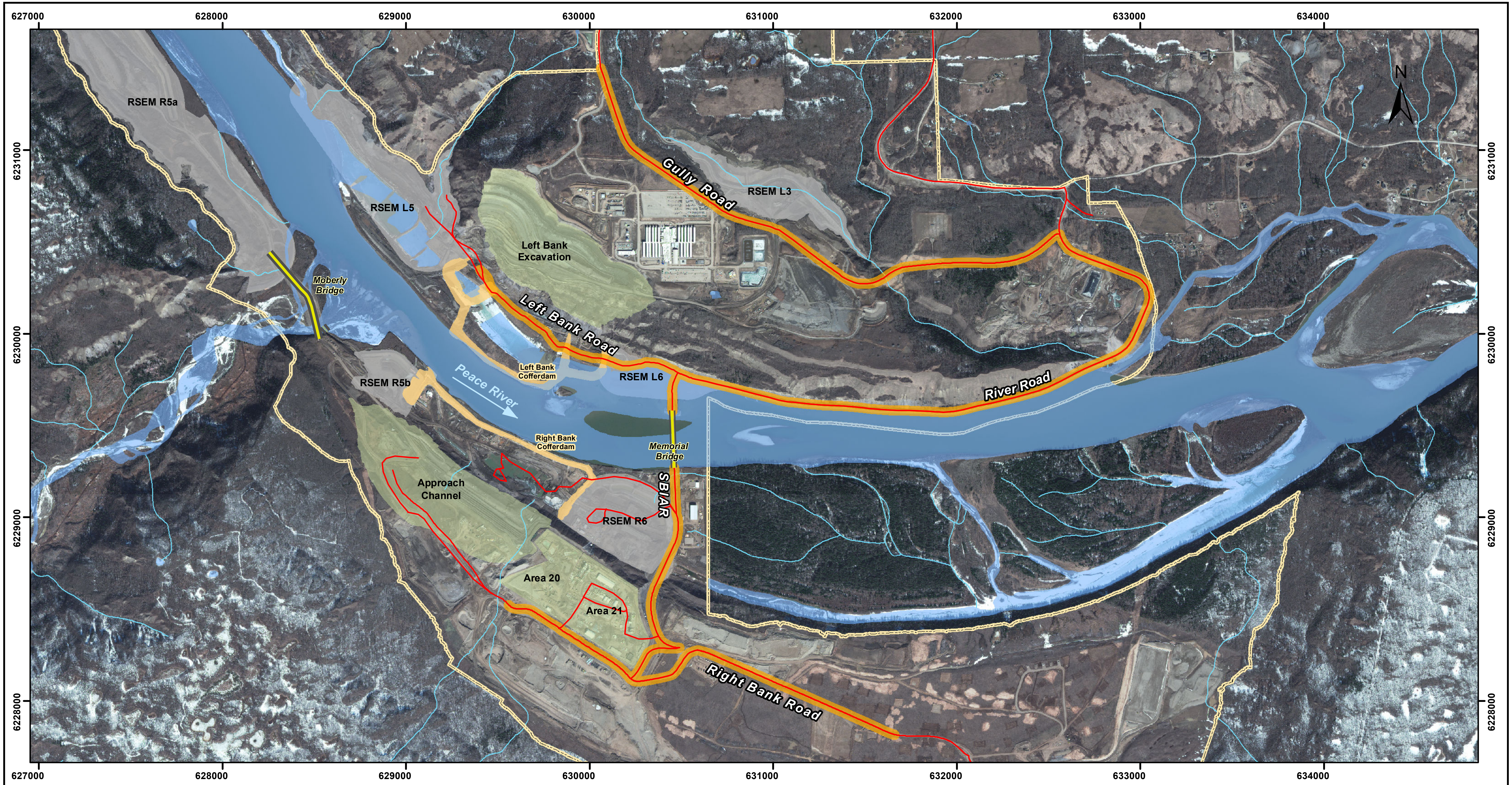


Figure E - 123: Polar frequency plot for $PM_{2.5}$ during the alert event period, December 21 to December 22, 2017.

APPENDIX F

EXAMPLES OF ROADWAY DUST SUPPRESSION WITH CALCIUM CHLORIDE APPLICATION



Site C Clean Energy Project

Calcium Chloride Application Areas
(May 25, 2017)

PEACE RIVER HYDRO PARTNERS

Legend

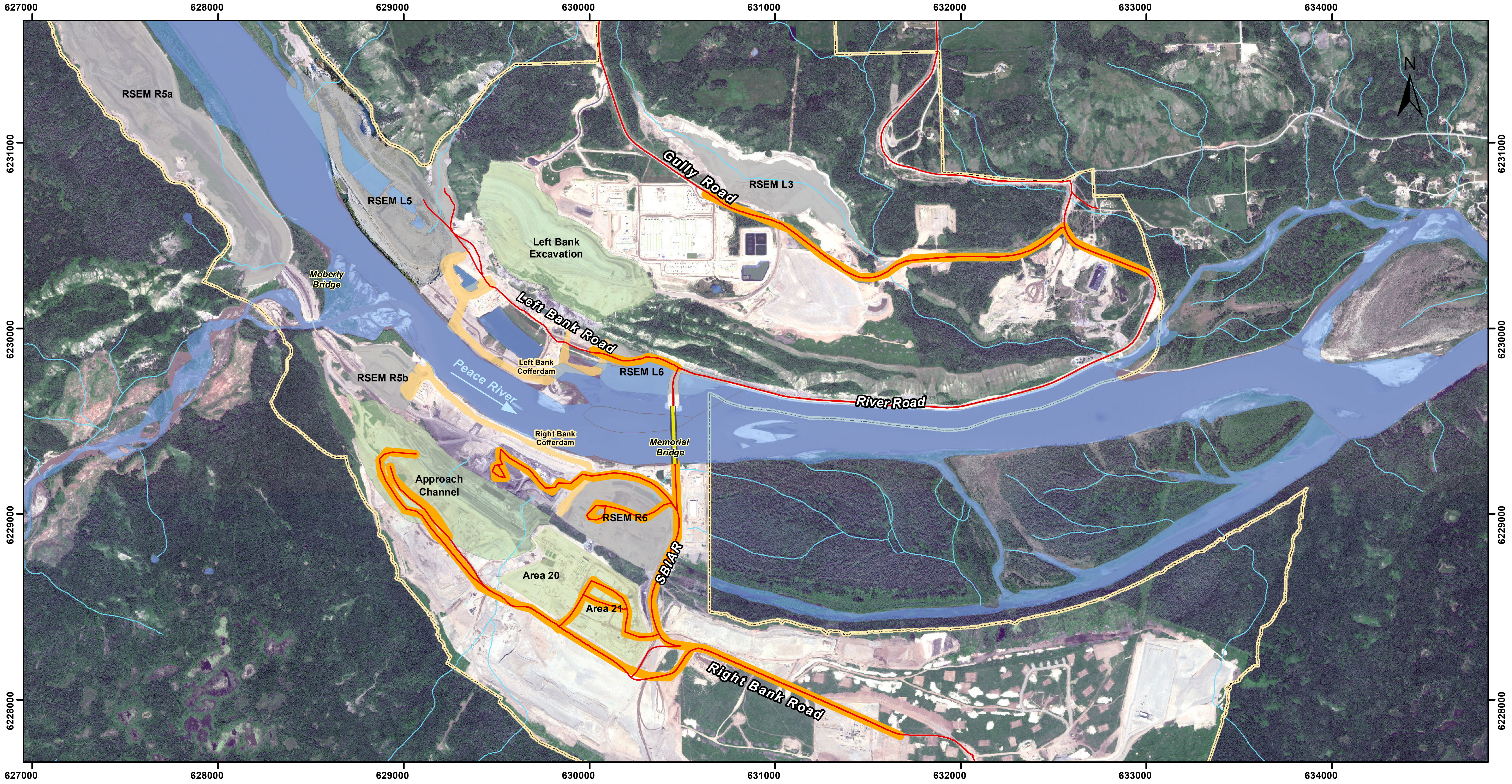
- Main Road
- Calcium Chloride Application Areas
- Site C Project Boundary

Data Source:
Site C - Satellite Image North (April 25, 2016)
Datum: NAD 83 Zone 10N

Created By:	Date Created:	Revision No:
PRHP Environmental Dept.	May 25, 2017	0

Figure F-1 Scale 1:15,500

0 0.75 1.5 Kilometers



Site C Clean Energy Project

Calcium Chloride Application Areas
(October 10 & 11, 2017)

PEACE RIVER HYDRO PARTNERS

Legend

- Main Roads
- Calcium Chloride Application Areas
- Site C Project Boundary

Data Source:
Site C - Satellite Image North (April 25, 2016)
Datum: NAD 83 Zone 10N

Created By:	Date Created:	Revision No:
PRHP Environmental Dept.	October 24, 2017	0

Figure F-2

Scale 1:15,500

0 0.75 1.5 Kilometers