



Fw: ConocoPhillips Chukchi CALPUFF - Wind Field Analysis
Herman Wong to: Doug Hardesty

08/05/2010 01:05 PM

PYR

----- Forwarded by Herman Wong/R10/USEPA/US on 08/05/2010 12:12 PM -----

From: "Damiana, Thomas" <Thomas.Damiana@aecom.com>
To: Herman Wong/R10/USEPA/US@EPA
Date: 03/29/2010 12:42 PM
Subject: ConocoPhillips Chukchi CALPUFF - Wind Field Analysis

Herman,

Attached for your review is the MM5 versus National Weather Service wind data comparisons that I promised you during our March 4, 2010 meeting. I would appreciate it if you could have at least a quick review of the plots I have attached, so that you can then send to Bret for his input if you feel it is important. It is important to keep the ball rolling and that we are all on the same page regarding the performance of the MM5 model since it is pivotal to much of what we are working on right now.

I will call you by the end of the week to see what your plan is and to see if you have any preliminary thoughts.

Thanks! Tom

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MM5 Outer Domain Wind Field Analysis.pdf

Memorandum

To Herman Wong Page 1

CC Brad Thomas

Subject MM5 Outer Domain Wind Field Analysis

From Tom Damiana (AECOM)

Date March 29, 2010

Herman,

As a follow-up to our March 4, 2010 discussion about the 2002 WRAP MM5 outer domain (D0) wind field and Planetary Boundary Layer (PBL) thickness. I have compiled a number of bivariate wind frequency distribution (wind rose) analyses for your review. In addition to that I have included a graphical analysis of the PBL thicknesses derived from the MM5 data set by MMIF.

Once you have had a chance to review the attached wind field and PBL data, I would appreciate a teleconference with you to discuss your thoughts on the consistency of the MM5 produced meteorology with the measured data.

Sincerely yours,



Tom Damiana
thomas.damiana@aecom.com
970.530.3465

Wind Rose Analysis

The data used for the wind rose analysis are:

- MM5 Overwater – Data extracted from the middle of the lowest layer (i.e., 10 meters) of the CALPUFF meteorological input file at an overwater location using the CALPUFF PRTMET utility. The CALPUFF meteorological input file was developed by processing the MM5 D0 data through the MMIF program. The location of the extracted node is from a grid cell completely overwater near the project and is shown in Figure 1-1.

- MM5 Overland – Data extracted from the middle of the lowest layer (i.e., 10 meters) of the CALPUFF meteorological input file at an overland location using the CALPUFF PRTMET utility. The CALPUFF meteorological input file was developed by processing the MM5 D0 data through the MMIF program. The location of the extracted node is from a grid cell completely overland between Wainwright and Barrow and is shown in Figure 1-1.
- Wainwright NWS – Data collected by the ASOS NWS station at Wainwright. Missing data was filled with concurrent data from the Barrow ASOS NWS station or by interpolation. This data set is described in Section 4.1 of Ambient Air Quality Impact Analysis for Proposed Exploratory Drilling (Devil's Paw Prospect) in the Chukchi Sea submitted to USEPA Region 10 on February 12, 2010 (CP Chukchi AQIA), and the process for filling the data is presented in Section 4.2, and Appendix H of the CP Chukchi AQIA.
- CPAI Research Vessel - Data collected by ConocoPhillips from two research vessels, the Bluefin and the Norseman, in the Devil's Paw and Burger prospects From July 27 through November 3, 2008 (i.e., nearly the entire drilling season). This data set and the process for filling missing data is fully described in Appendix I of the CP Chukchi AQIA.

The following comparisons are attached to directly evaluate the MM5 data relative to the nearest surface site:

Attachment A – A comparison of concurrent MM5 Overwater with Wainwright NWS data. The comparison is presented by month and for the July through November season.

Attachment B – A comparison of concurrent MM5 Overland with Wainwright NWS data. The comparison is presented by month and for the July through November season.

The following comparison is attached to evaluate the Wainwright NWS data relative to concurrent data collected offshore by the CPAI Research Vessel. This comparison helps to understand how well the overland data measured at Wainwright can be expected to compare to data measured overwater.

Attachment C – A comparison of concurrent Wainwright NWS and CPAI Research Vessel Data. The comparison is presented by month and for the July through November season.

The following comparison is attached to demonstrate that using a long-term data set better accounts for the inter-annual variability by comparing the 2002 MM5 Overland with Wainwright NWS data collected over a 5-year period. The comparison is made by month and for the July through November season.

Attachment D – A comparison of 2002 MM5 Overland with Wainwright NWS data collected over a 5-year period (1999, 2002, and 2004 through 2006). The comparison is presented by month and for the July through November season.

Planetary Boundary Layer Analysis

The data used for the planetary boundary layer analysis are:

- Barrow Mixing Heights – Mixing heights derived from the Barrow NWS upper air data using the NCDC Twice Daily Mixing Height Data format (TD9689) interpolated to hourly values using the Holzworth method.

- MM5 PBL Thickness Overwater - Height of the PBL at an overwater location derived from the MM5 D0 domain using MMIF. This data was extracted from the CALPUFF meteorological input file created by MMIF using the CALPUFF PRTMET utility. The location of the extracted node is from a grid cell completely overwater near the project and is shown in Figure 1-1. In this case, PBL thicknesses were derived from the MM5 data by MMIF using the Gryning and Batchvariva algorithms. Note that the minimum PBL thickness was set to 100 meters for this analysis.
- MM5 PBL Thickness Overland - Height of the PBL at an overland location derived from the MM5 D0 domain using MMIF. This data was extracted from the CALPUFF meteorological input file created by MMIF using the CALPUFF PRTMET utility. The location of the extracted node is from a grid cell completely overland between Wainwright and Barrow and is shown in Figure 1-1. Note that the minimum PBL thickness was set to 100 meters for this analysis.

The following comparison is attached to directly evaluate the MM5 data relative to the nearest surface site:

Attachment E – A comparison of concurrent Barrow Mixing Heights, MM5 PBL Thickness Overwater, and MM5 PBL Thickness Overland. The comparison is presented by month for the July through November season.

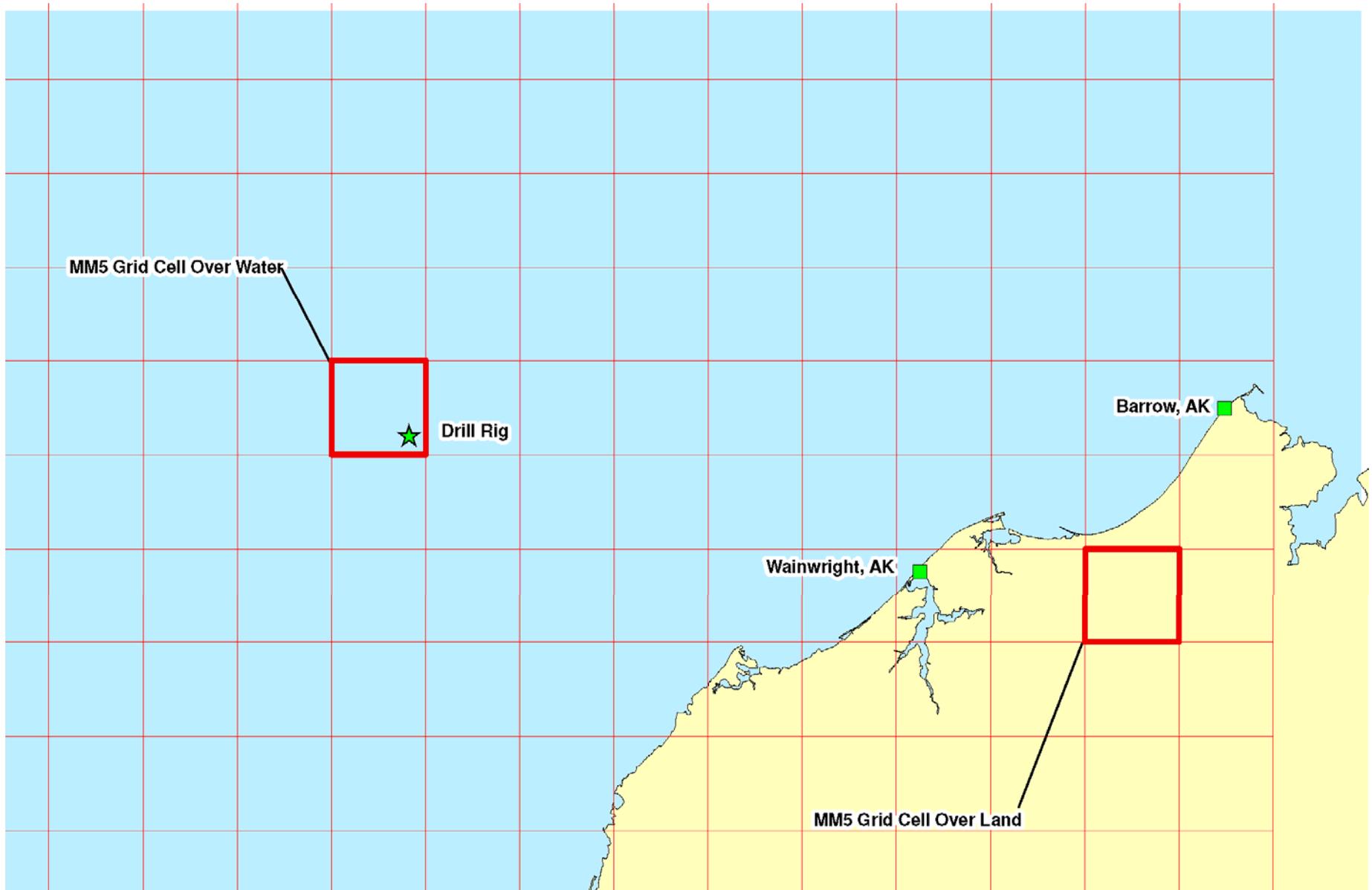


Figure 1-1 Location of Data Sets used to Produce the Various Analyses

Attachment A
A Comparison of Concurrent MM5 Overwater with Wainwright NWS Wind Data

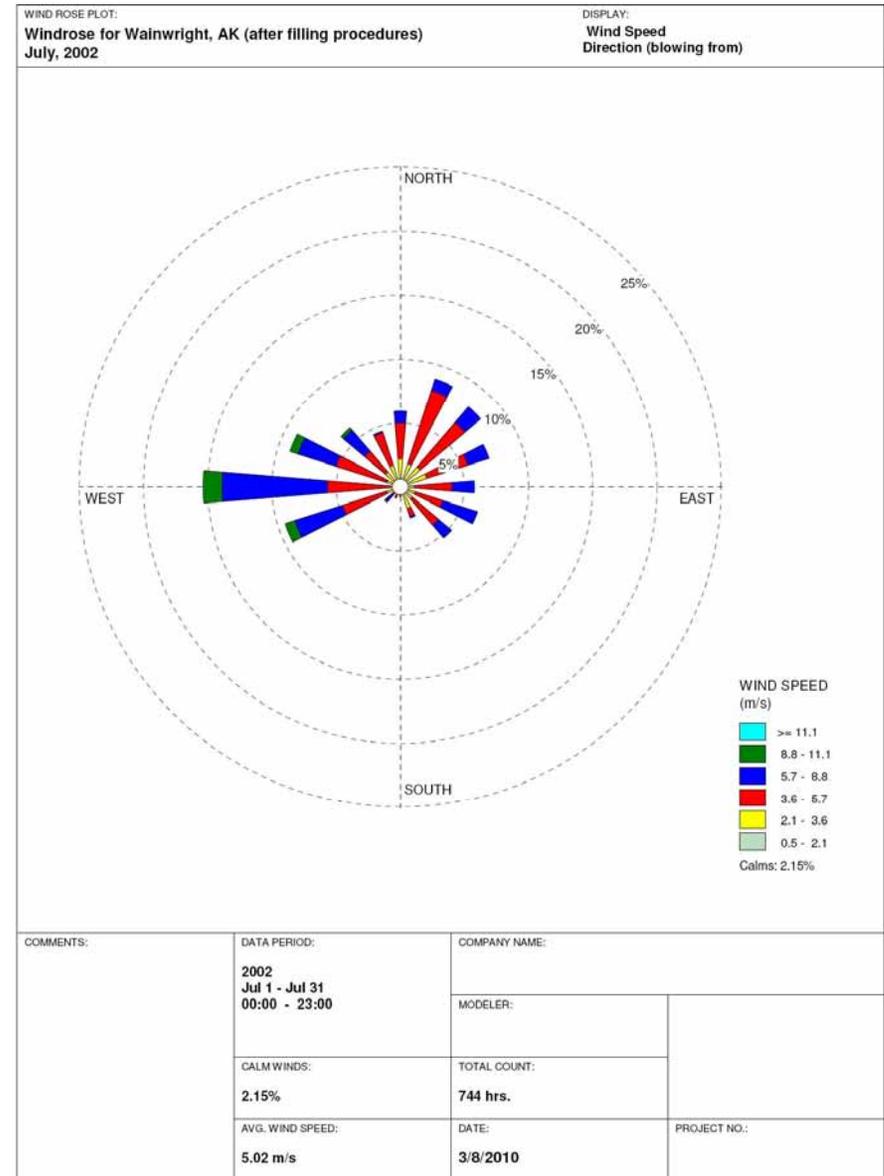
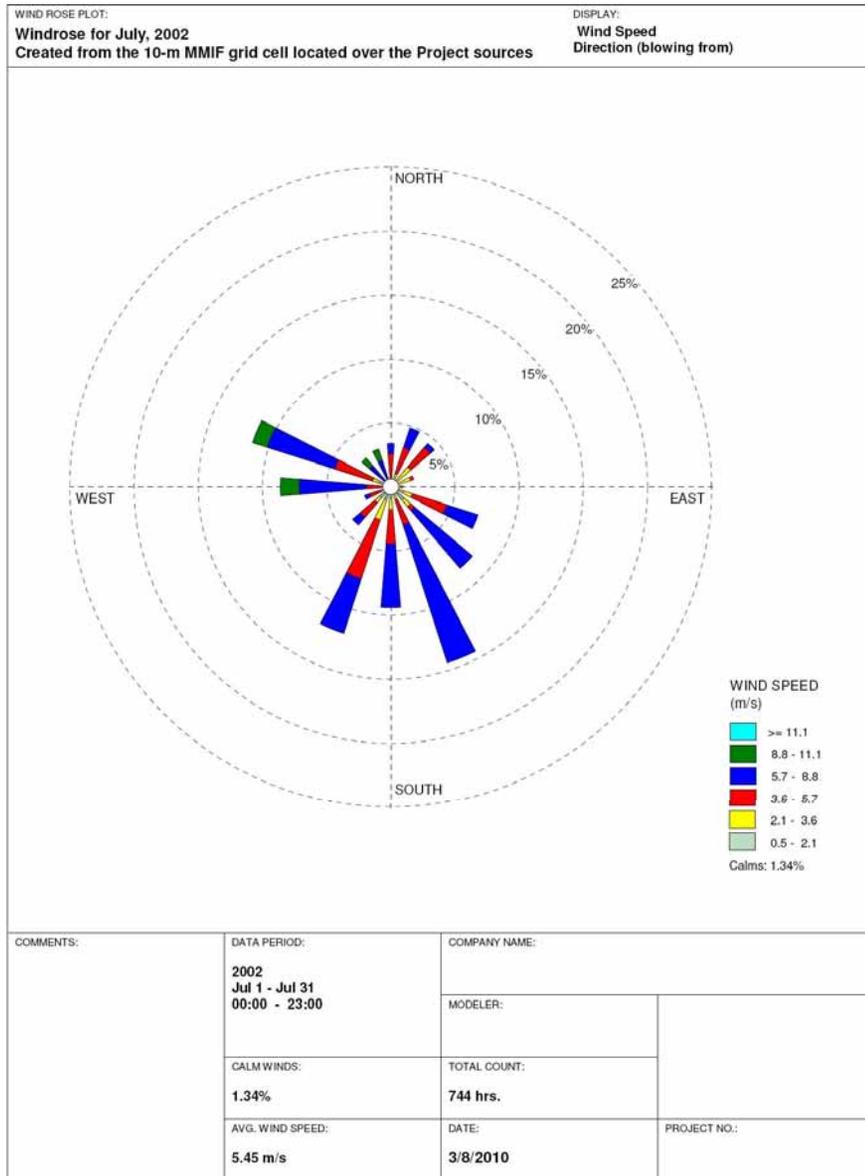


Figure A-1 A Comparison of Concurrent MM5 Overwater with Wainwright NWS Wind Data – July 2002

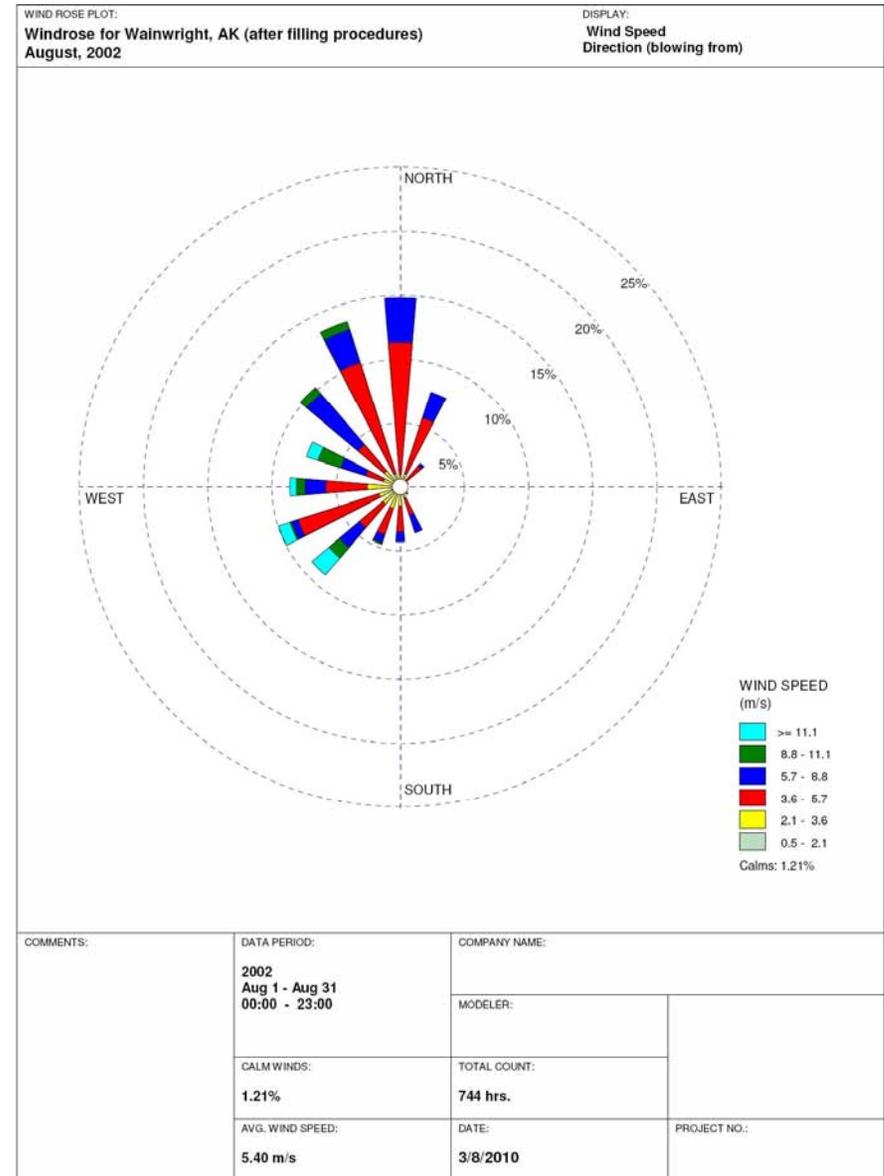
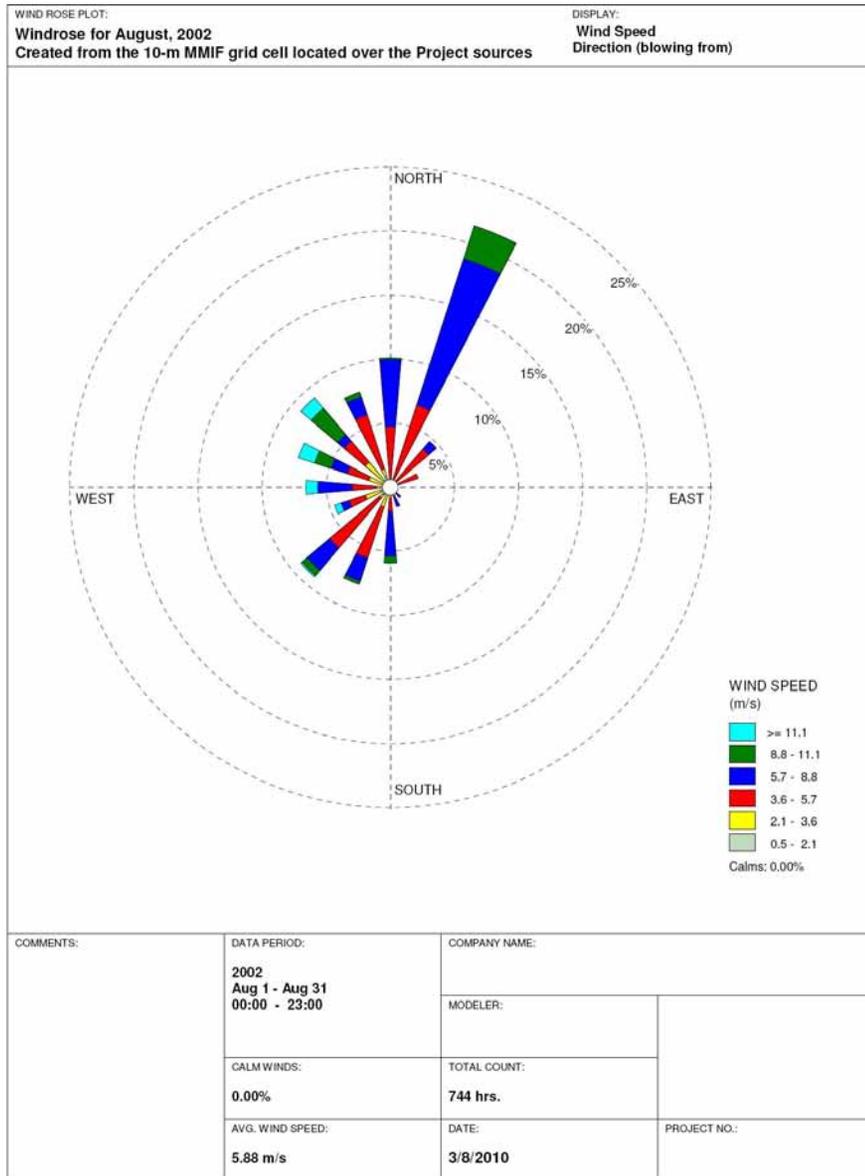


Figure A-2 A Comparison of Concurrent MM5 Overwater with Wainwright NWS Wind Data – August 2002

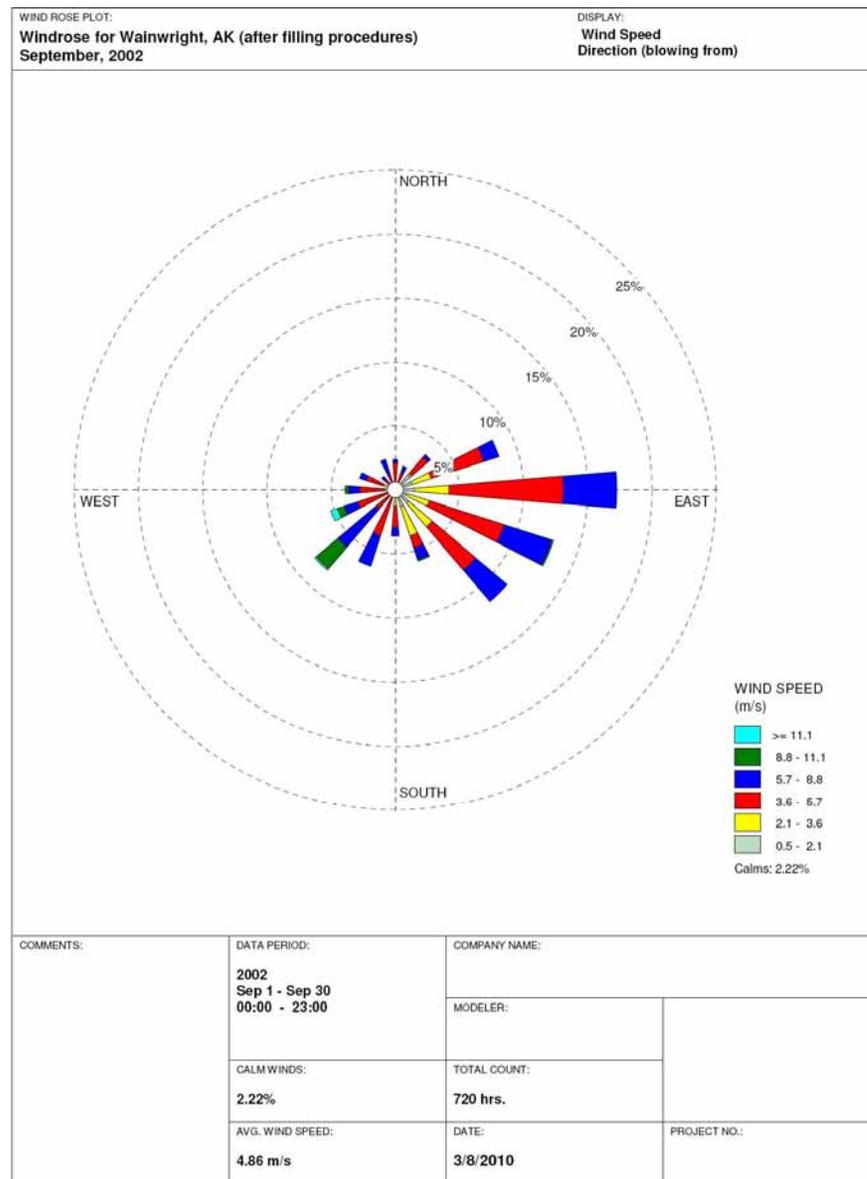
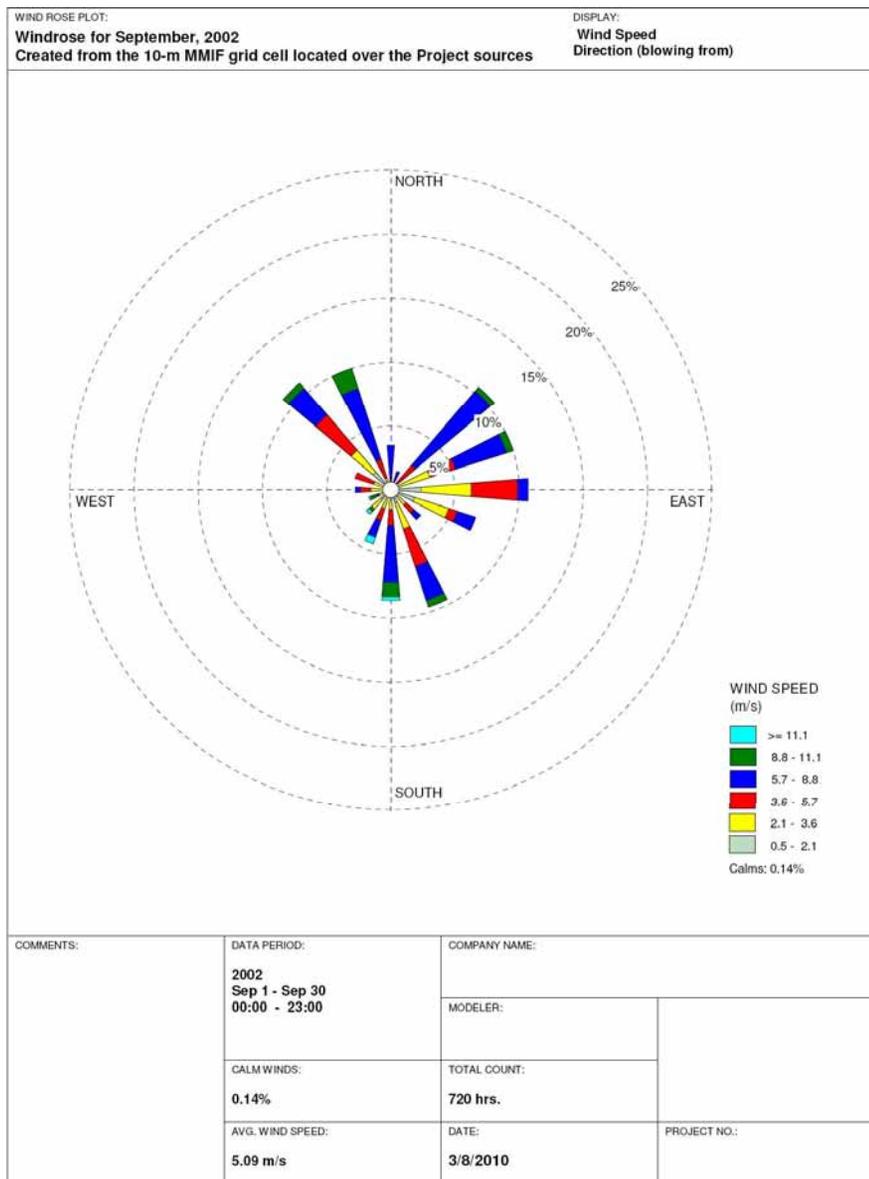


Figure A-3 A Comparison of Concurrent MM5 Overwater with Wainwright NWS Wind Data – September 2002

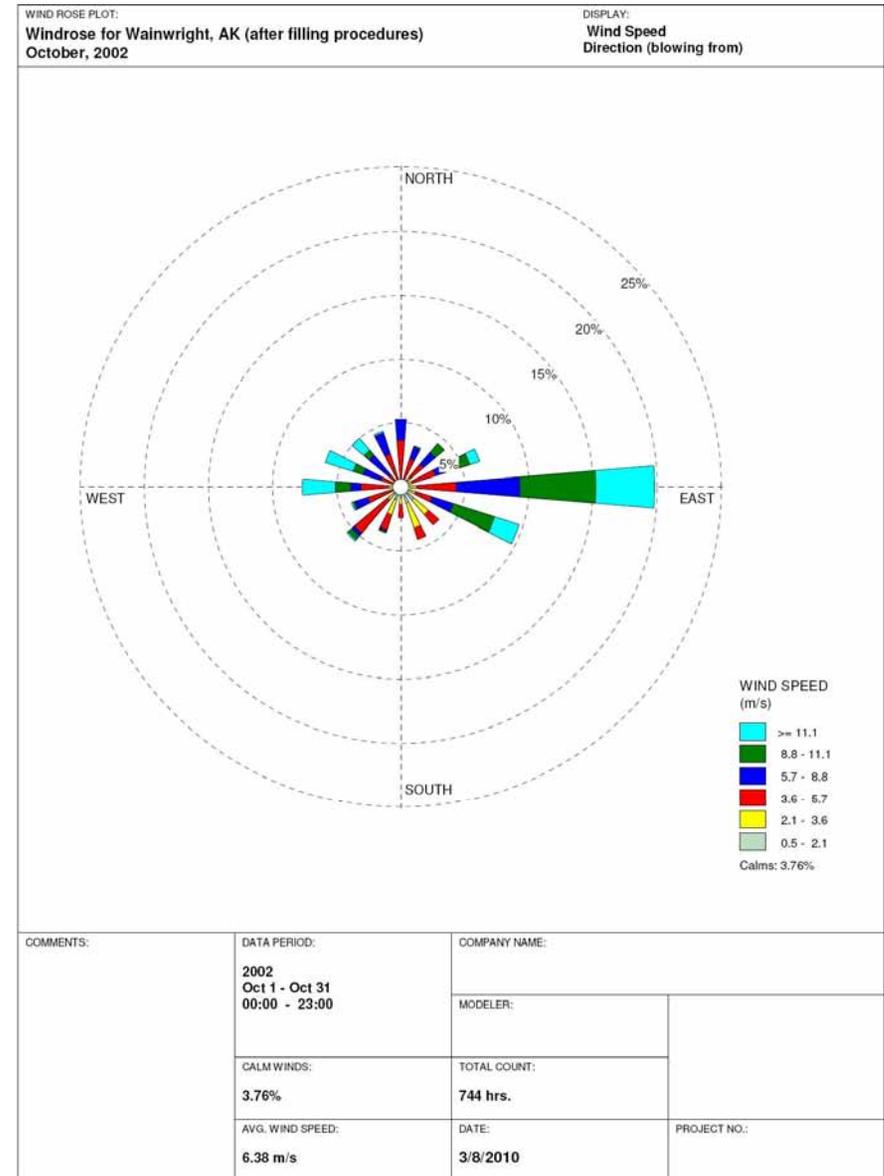
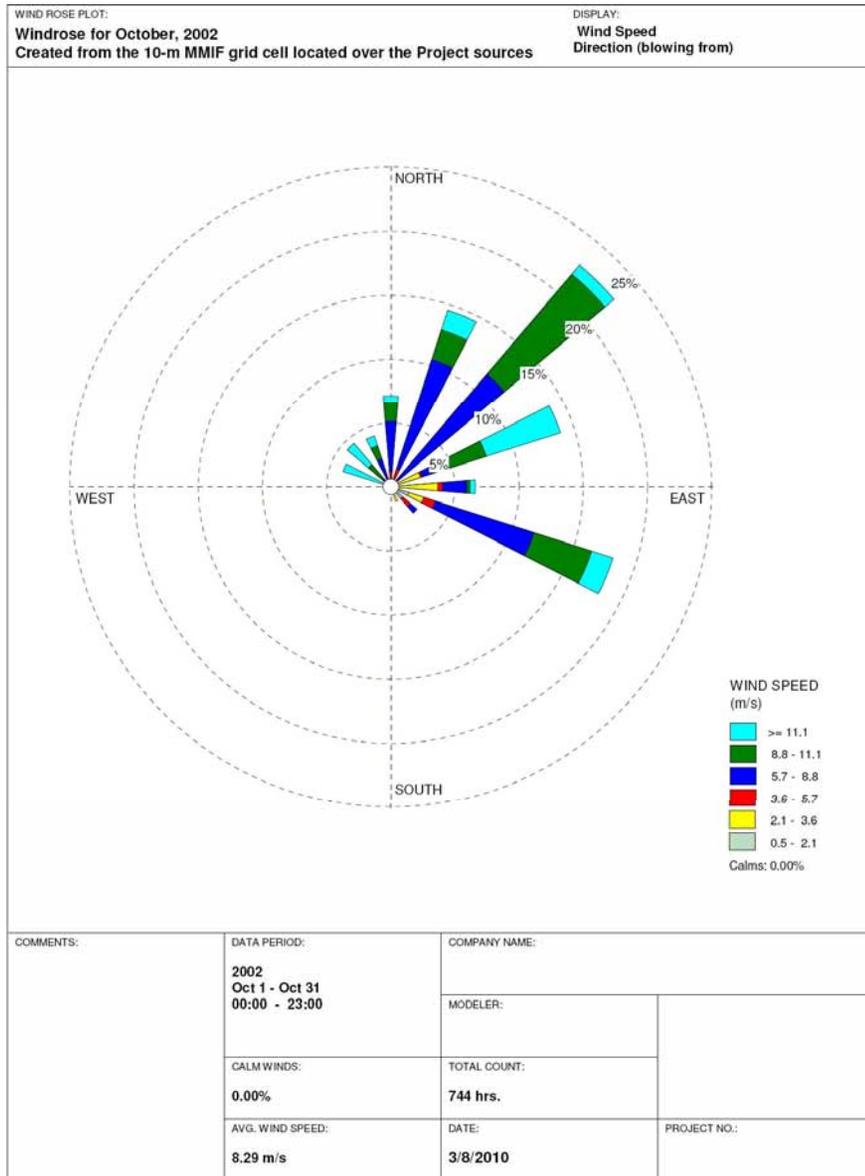


Figure A-4 A Comparison of Concurrent MM5 Overwater with Wainwright NWS Wind Data – October 2002

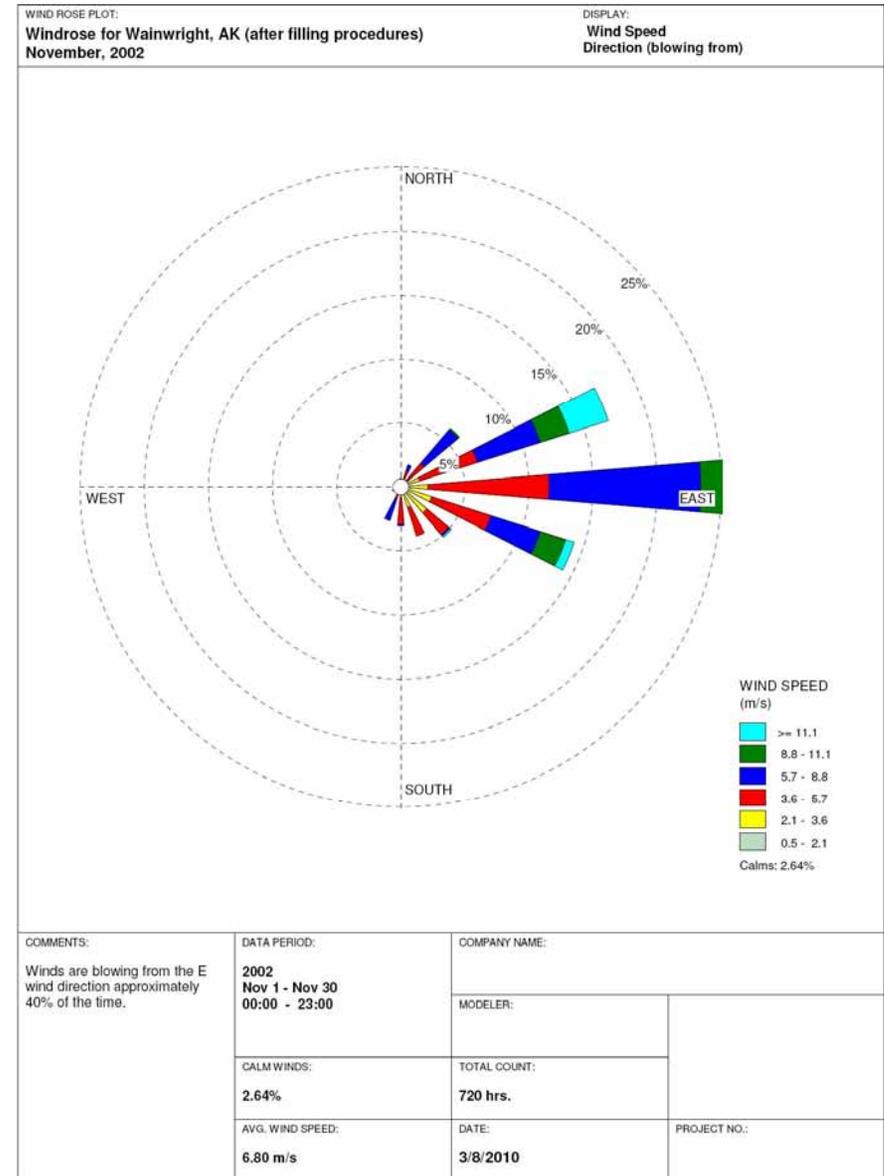
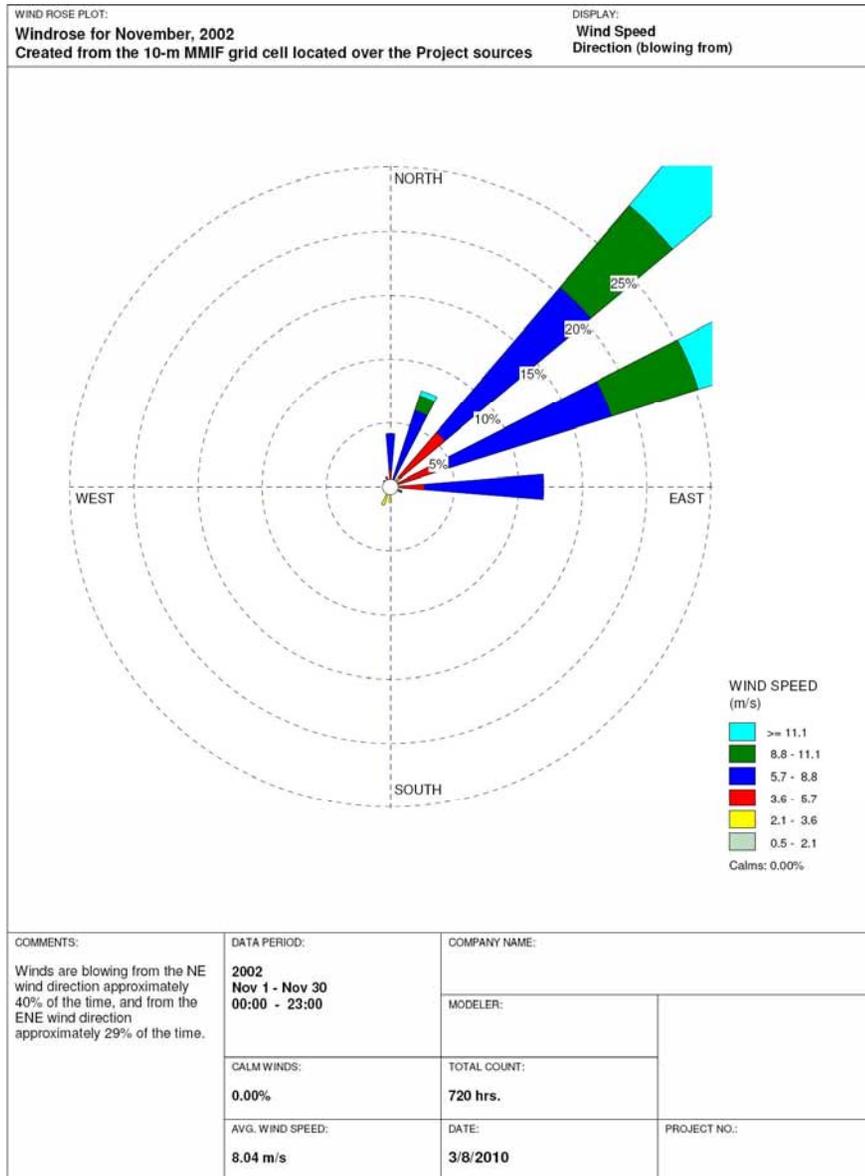


Figure A-5 A Comparison of Concurrent MM5 Overwater with Wainwright NWS Wind Data – November 2002

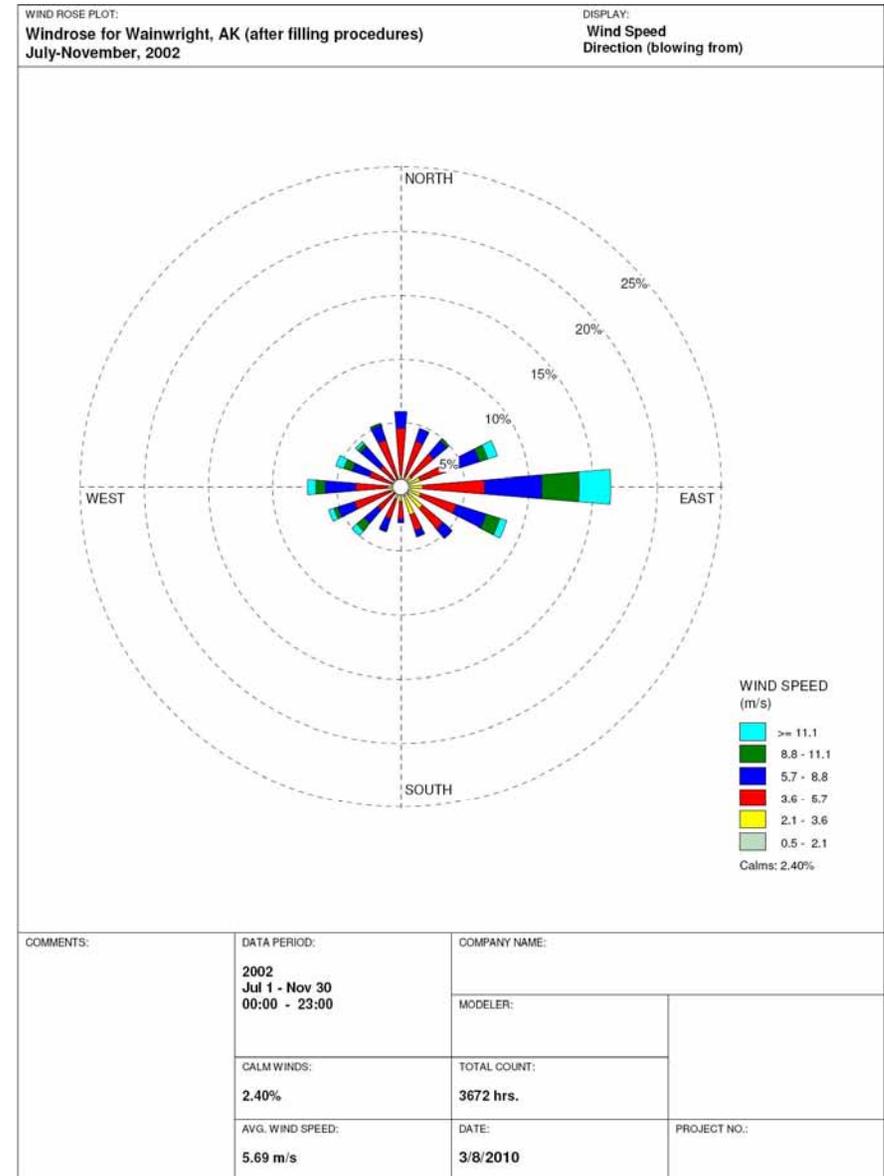
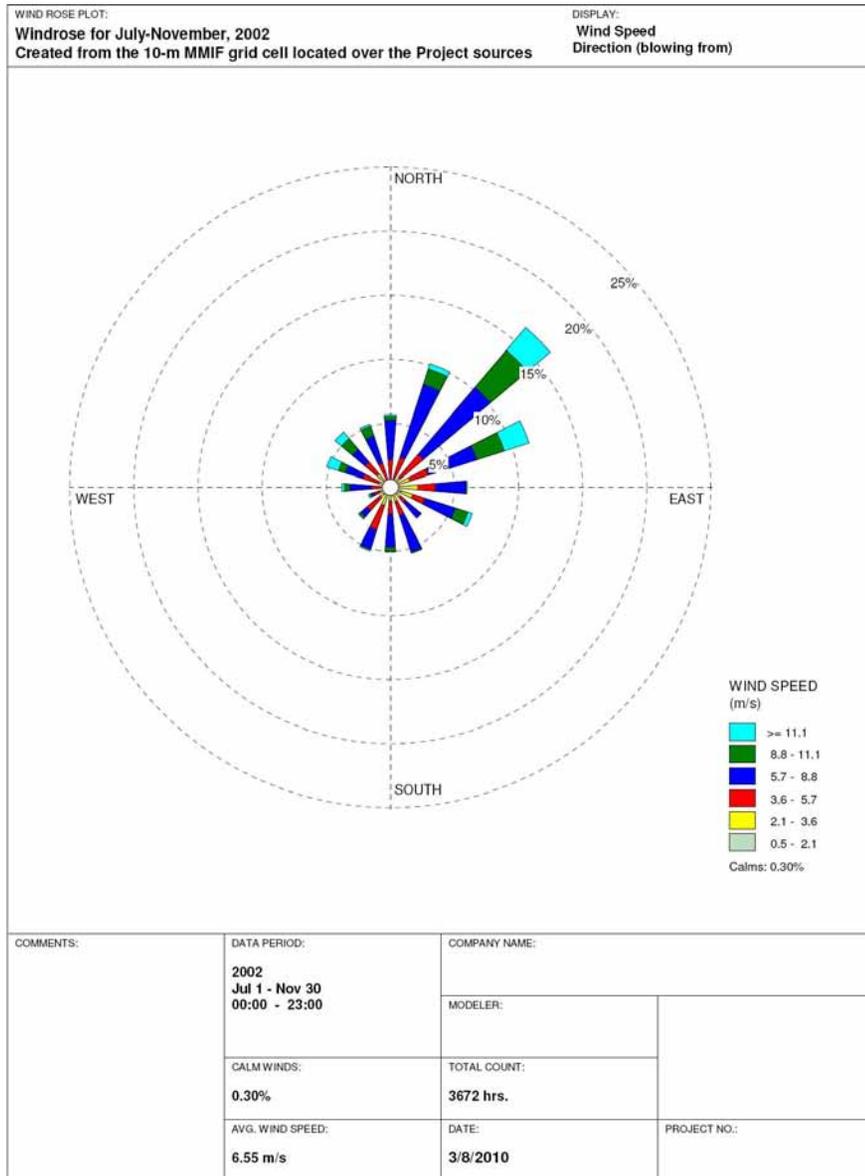


Figure A-6 A Comparison of Concurrent MM5 Overwater with Wainwright NWS Wind Data – July through November 2002

Attachment B
A Comparison of Concurrent MM5 Overland with Wainwright NWS Wind Data

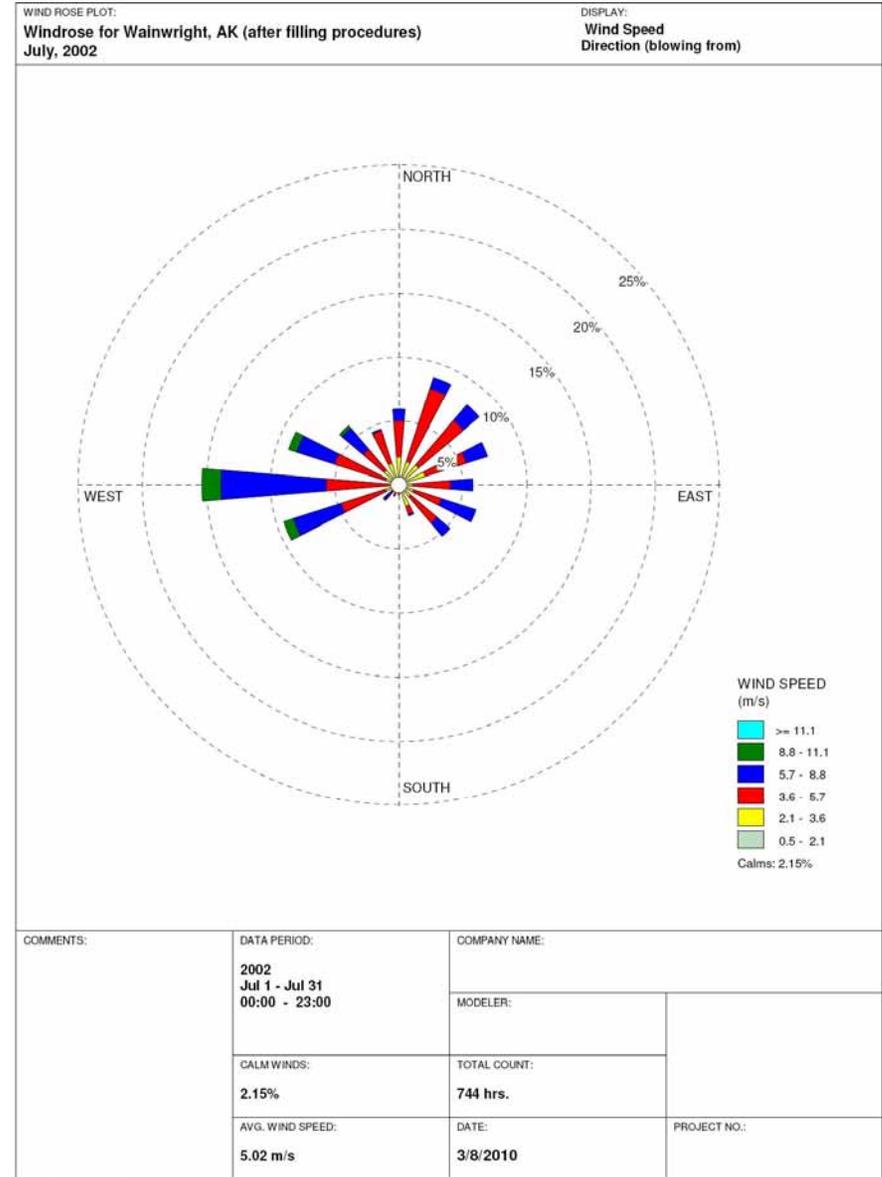
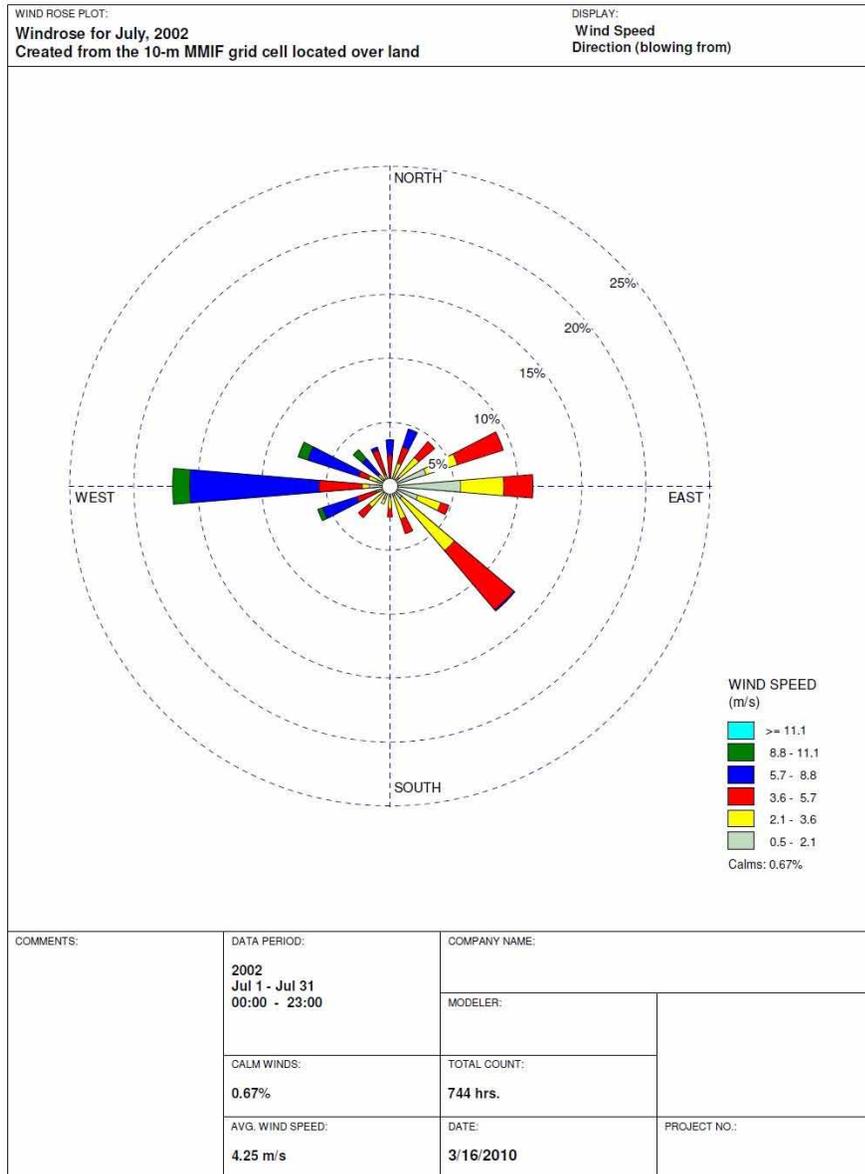


Figure B-1 A Comparison of Concurrent MM5 Overland with Wainwright NWS Wind Data – July 2002

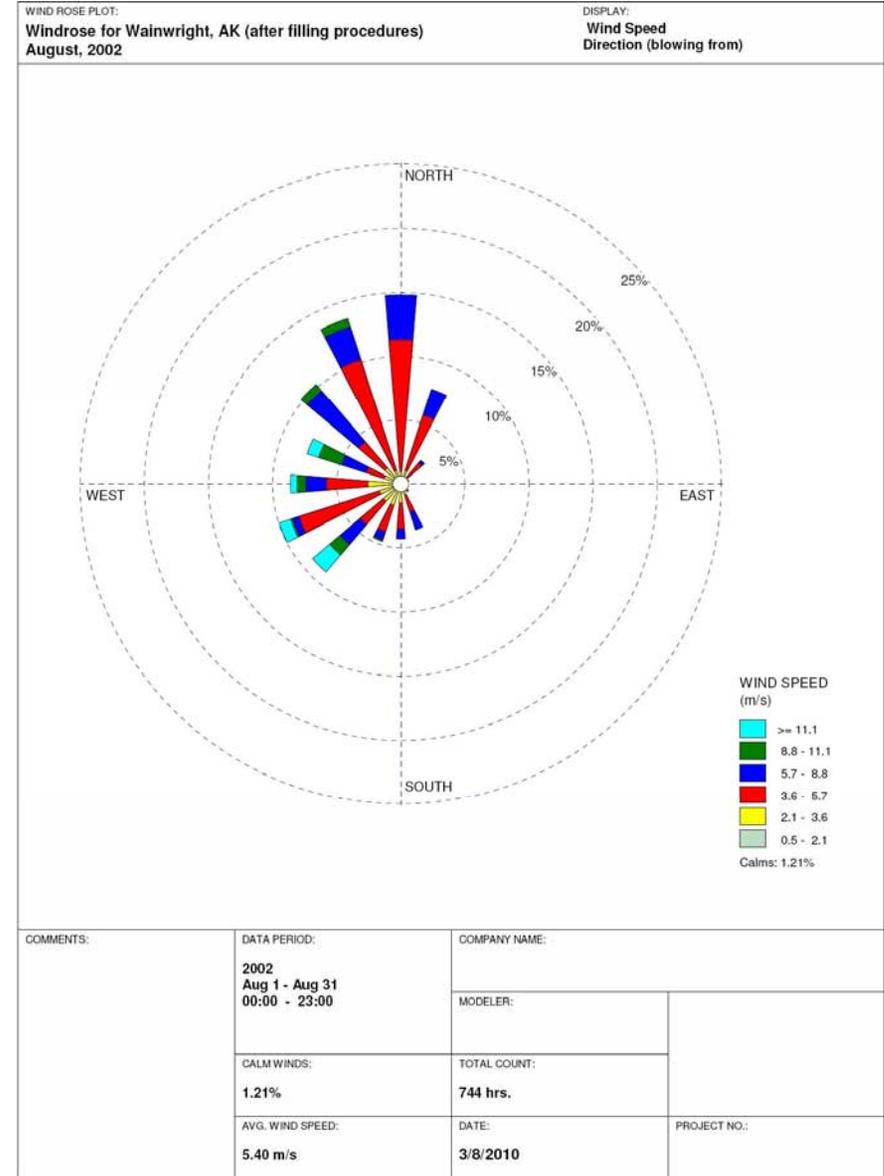
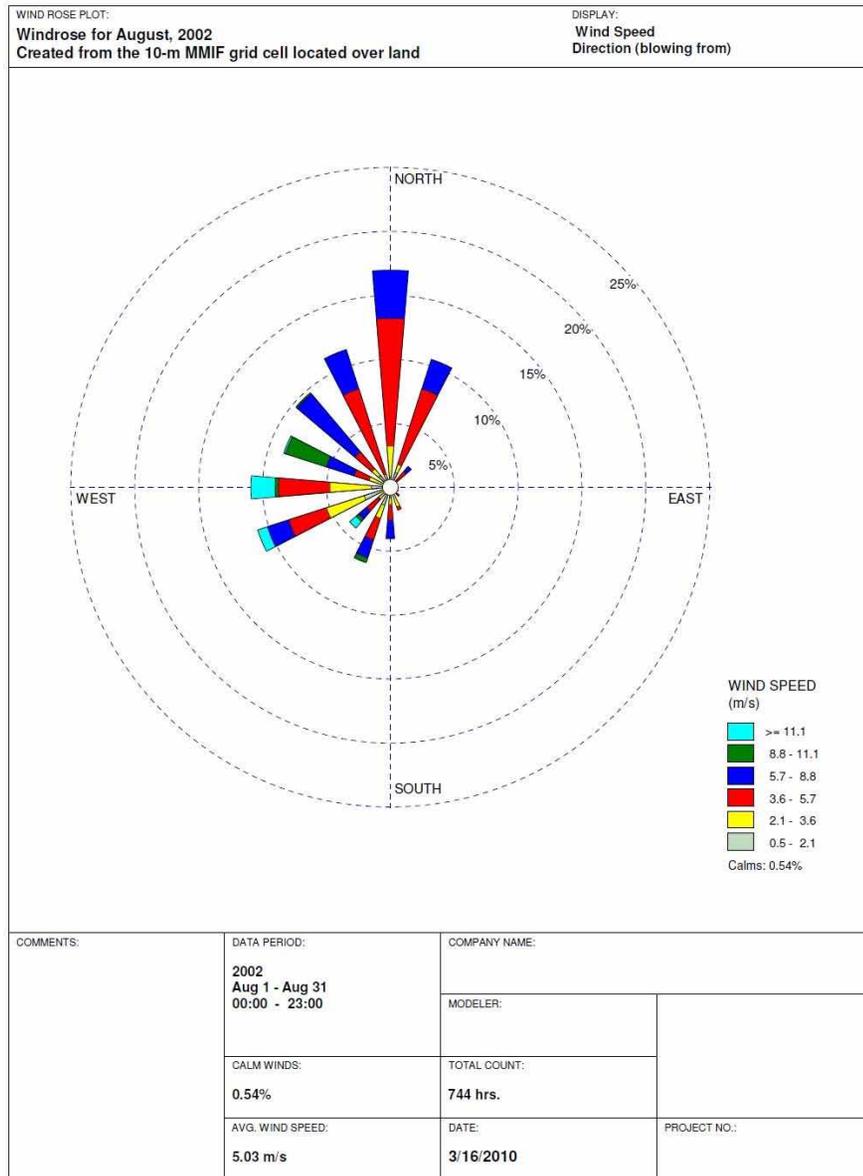


Figure B-2 A Comparison of Concurrent MM5 Overland with Wainwright NWS Wind Data – August 2002

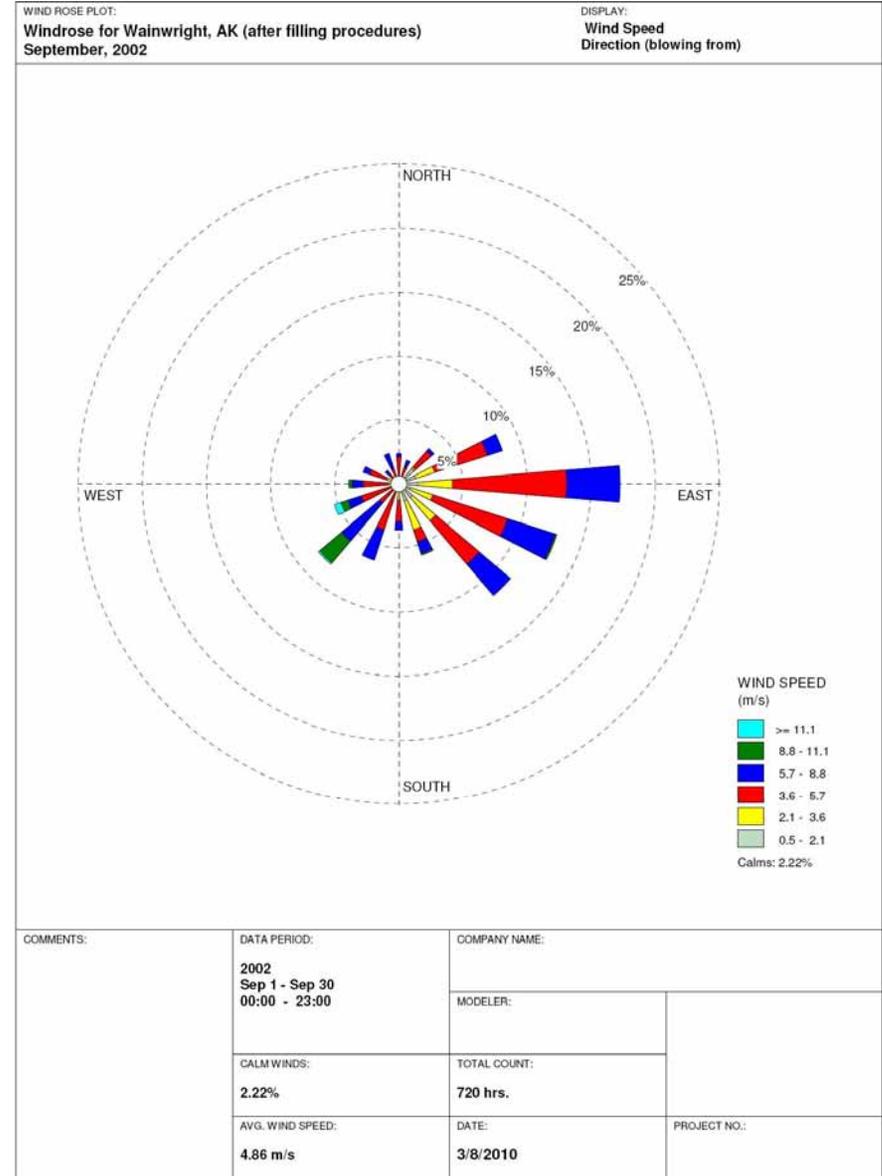
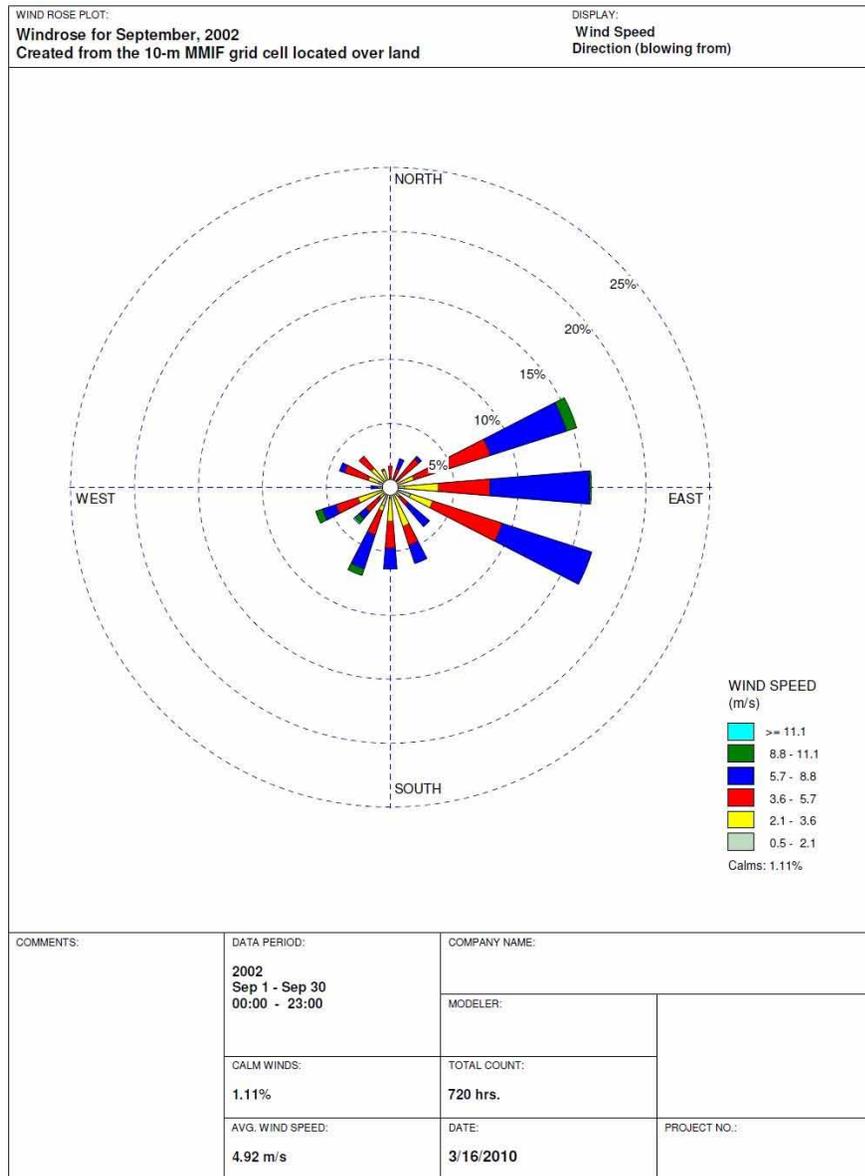


Figure B-3 A Comparison of Concurrent MM5 Overland with Wainwright NWS Wind Data – September 2002

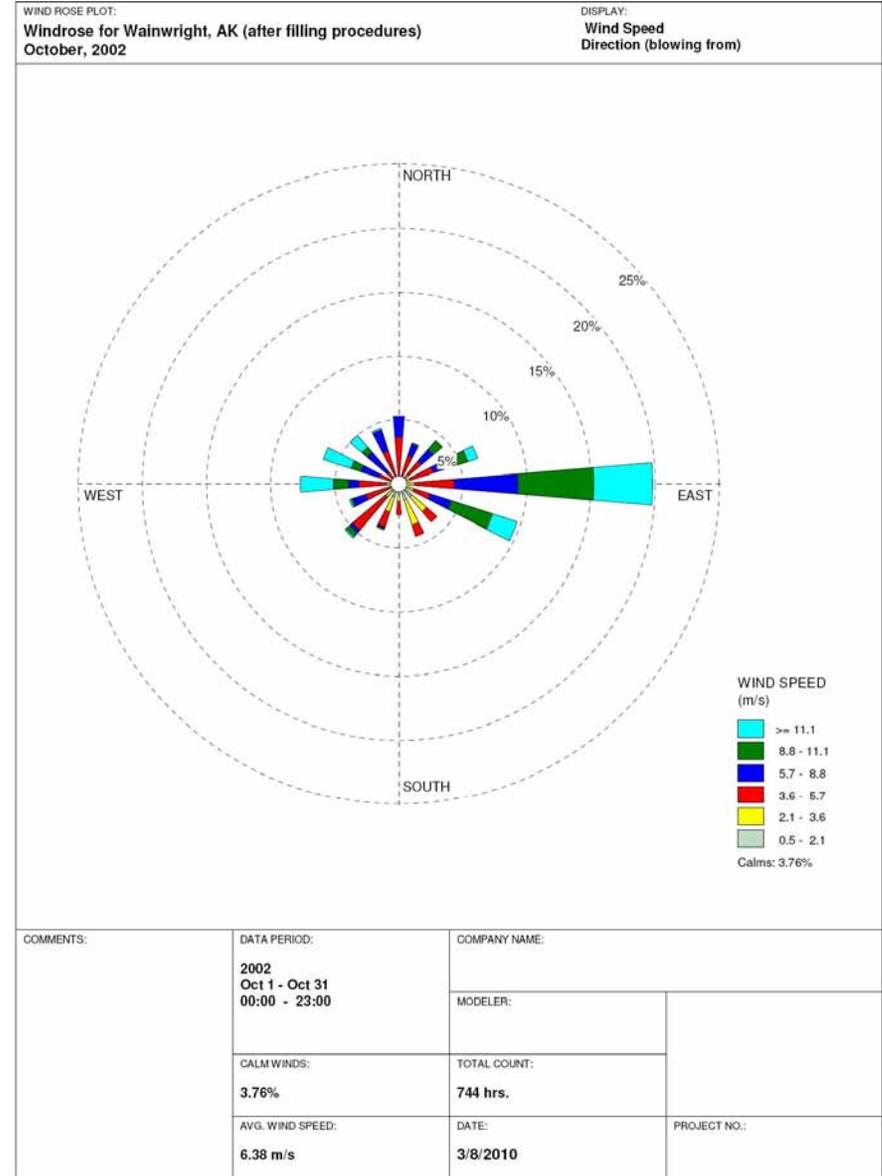
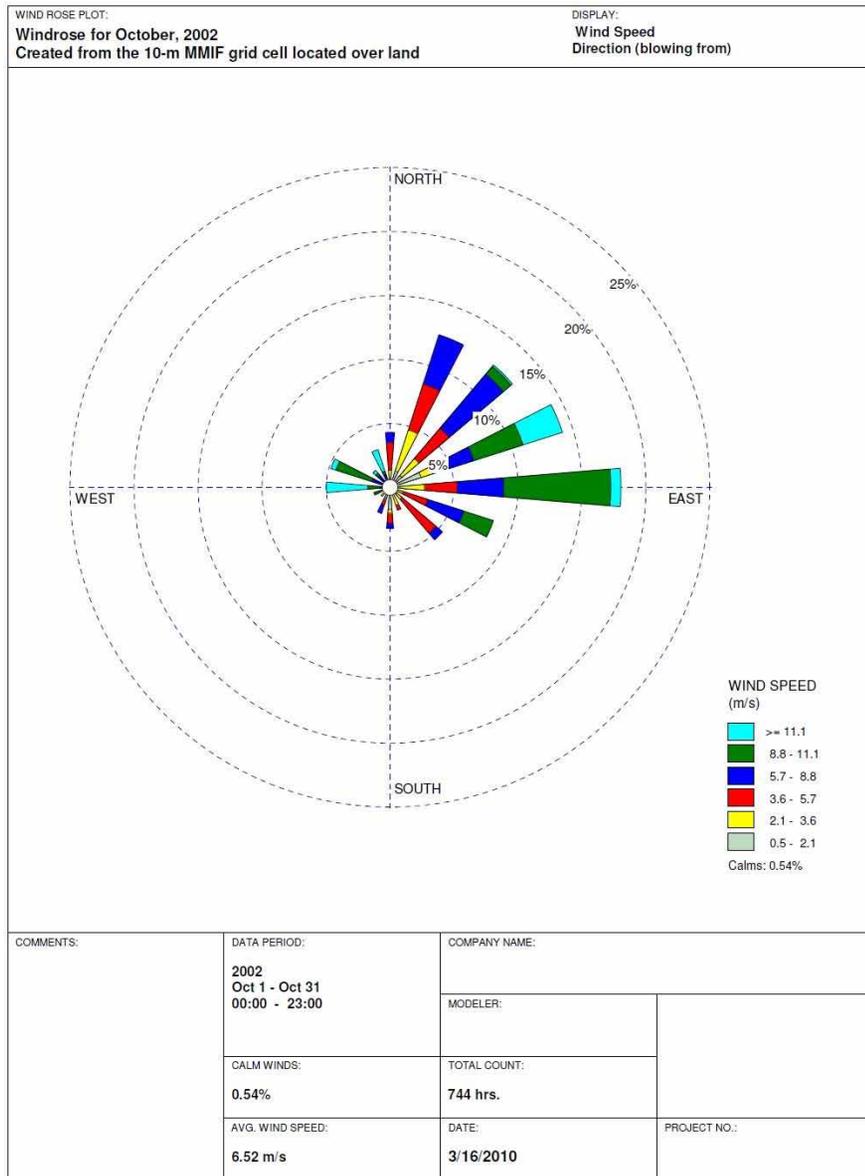


Figure B-4 A Comparison of Concurrent MM5 Overland with Wainwright NWS Wind Data – October 2002

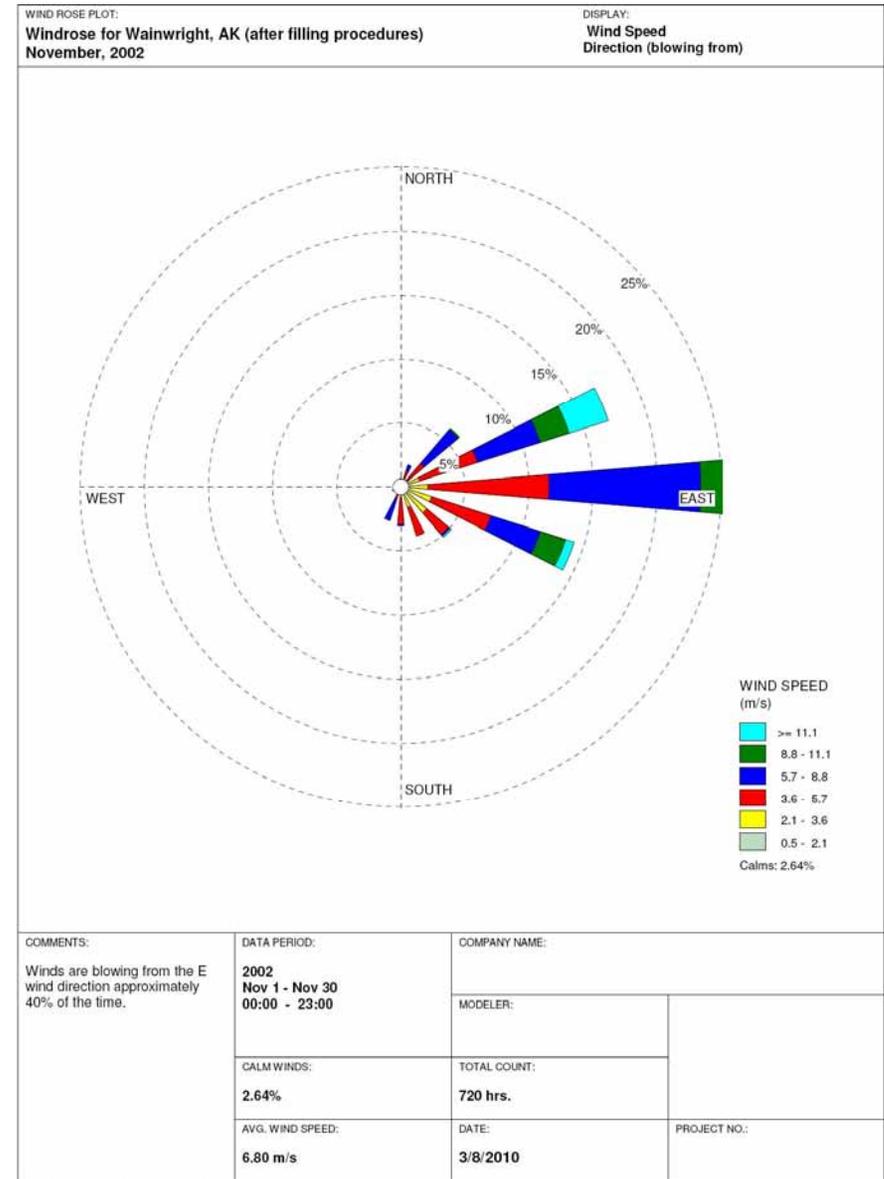
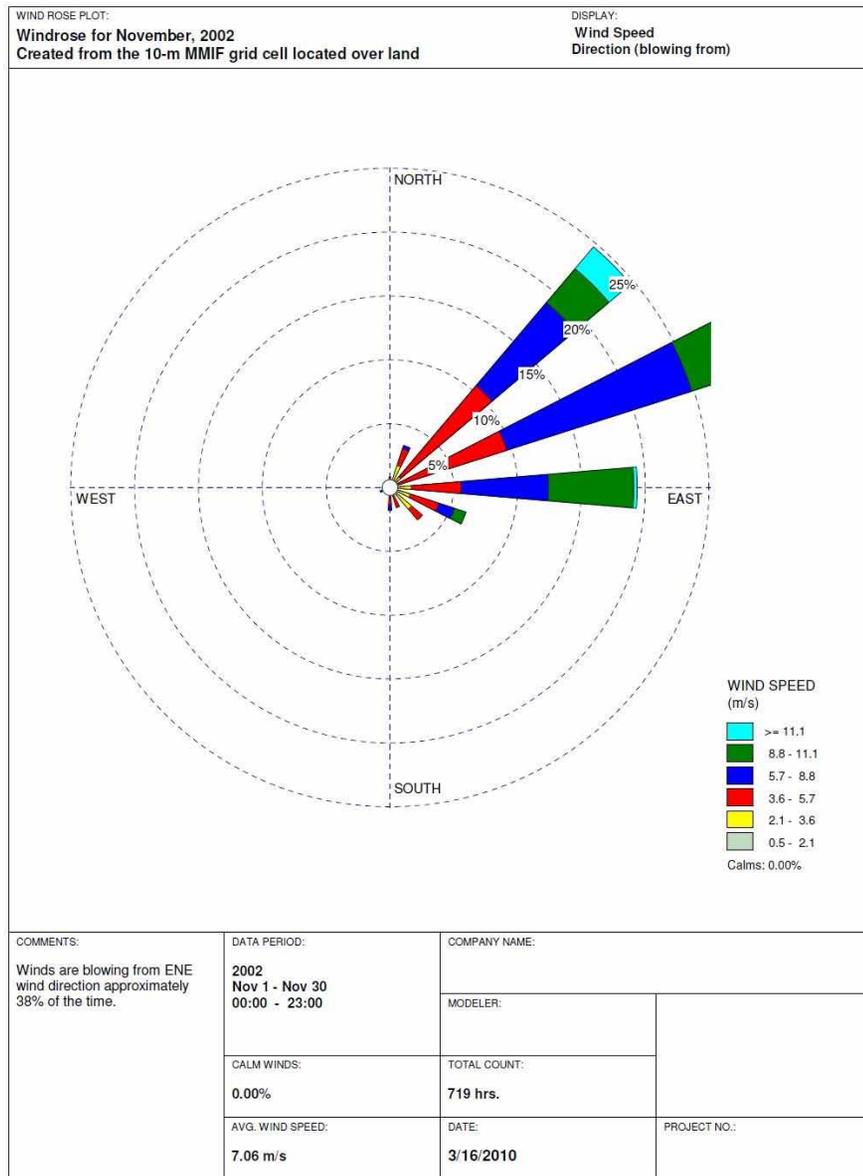
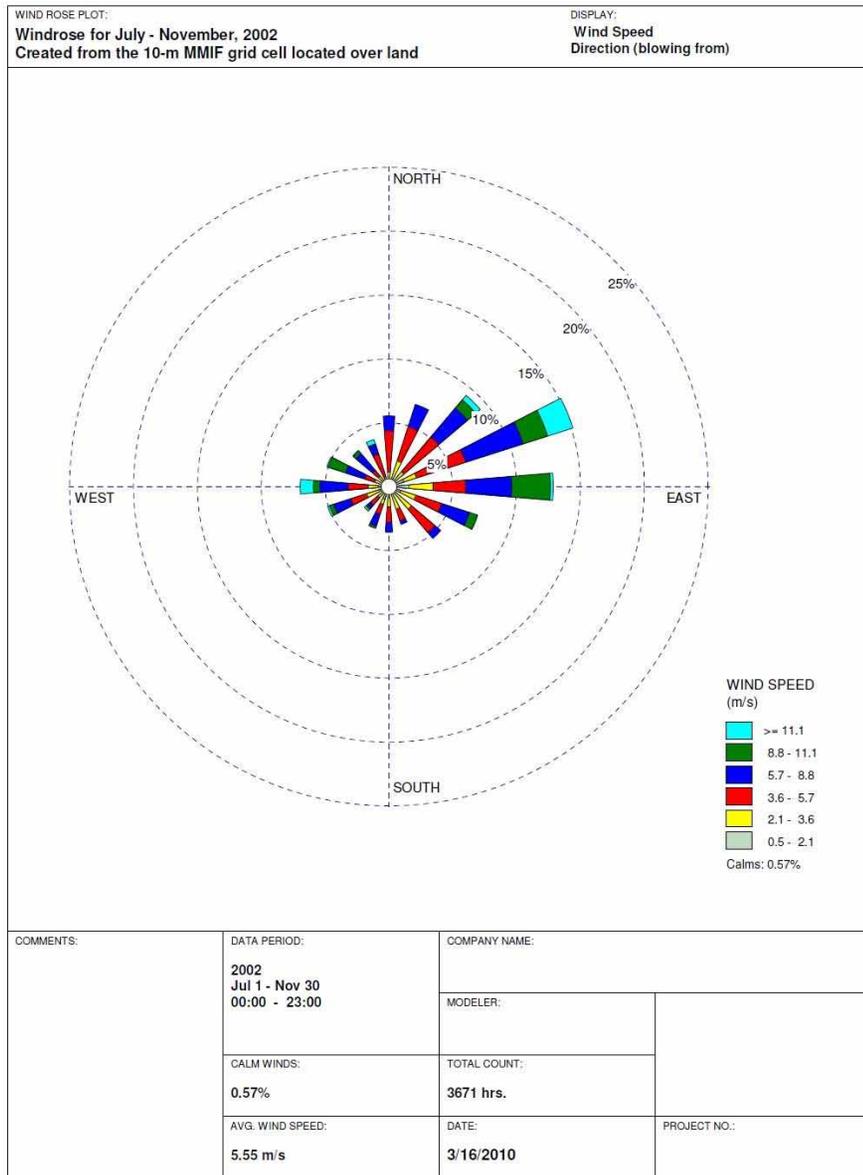
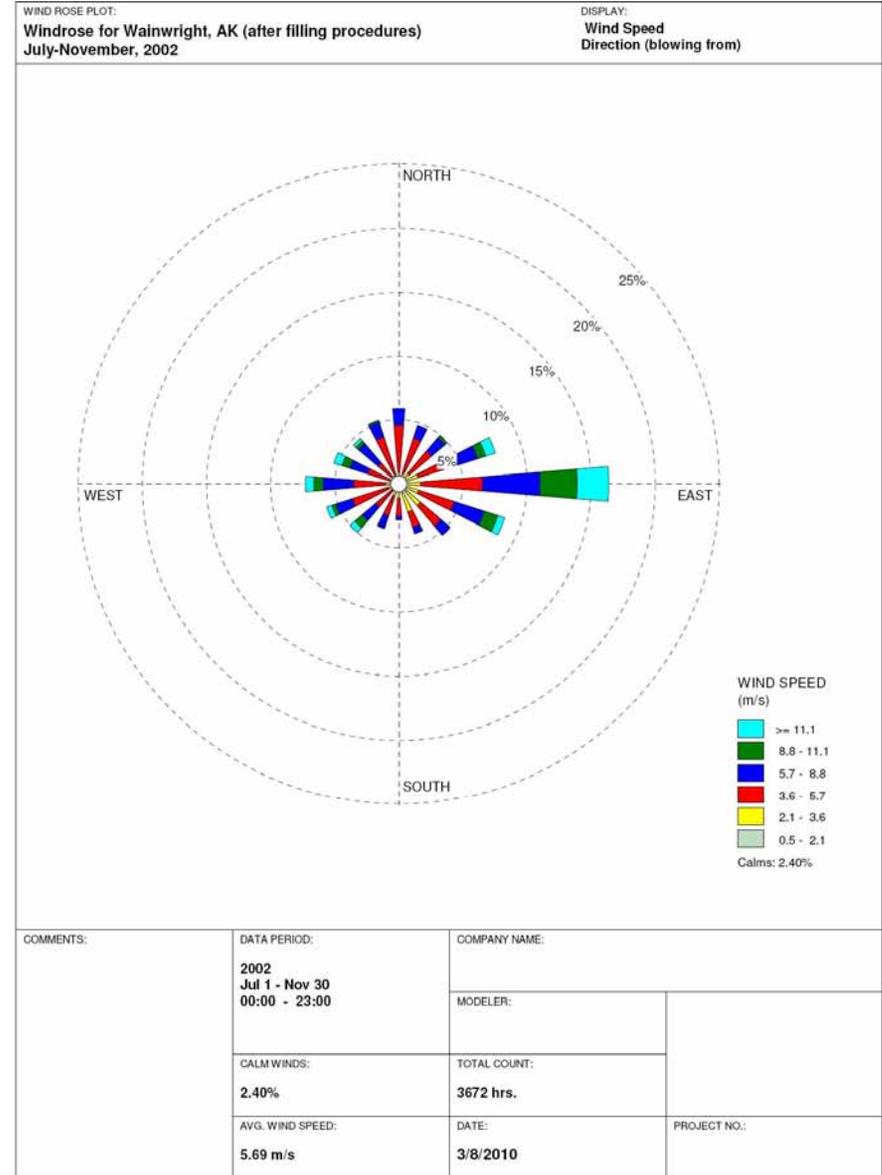


Figure B-5 A Comparison of Concurrent MM5 Overland with Wainwright NWS Wind Data – November 2002



WRPLOT View - Lakes Environmental Software



WRPLOT View - Lakes Environmental Software

Figure B-6 A Comparison of Concurrent MM5 Overland with Wainwright NWS Wind Data – July through November 2002

Attachment C

A Comparison of Concurrent Wainwright NWS and CPAI Research Vessel Wind Data

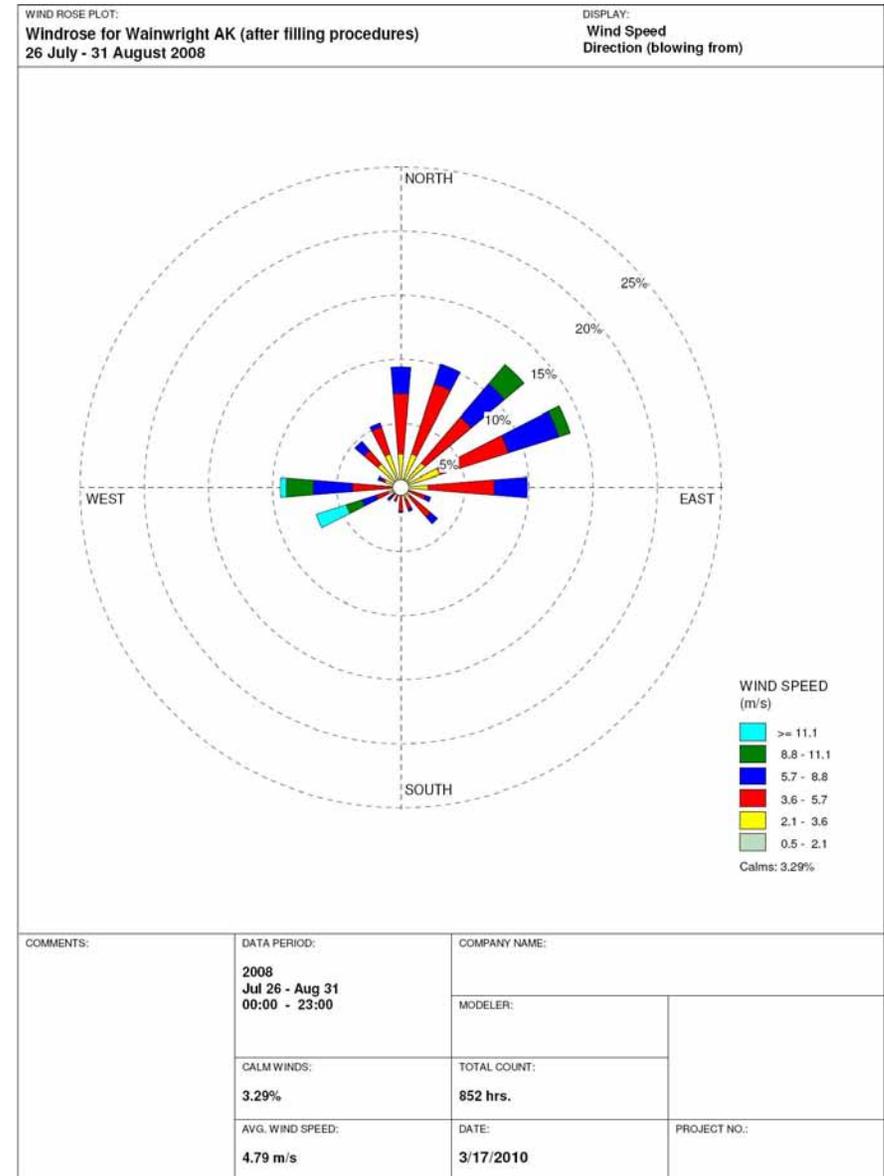
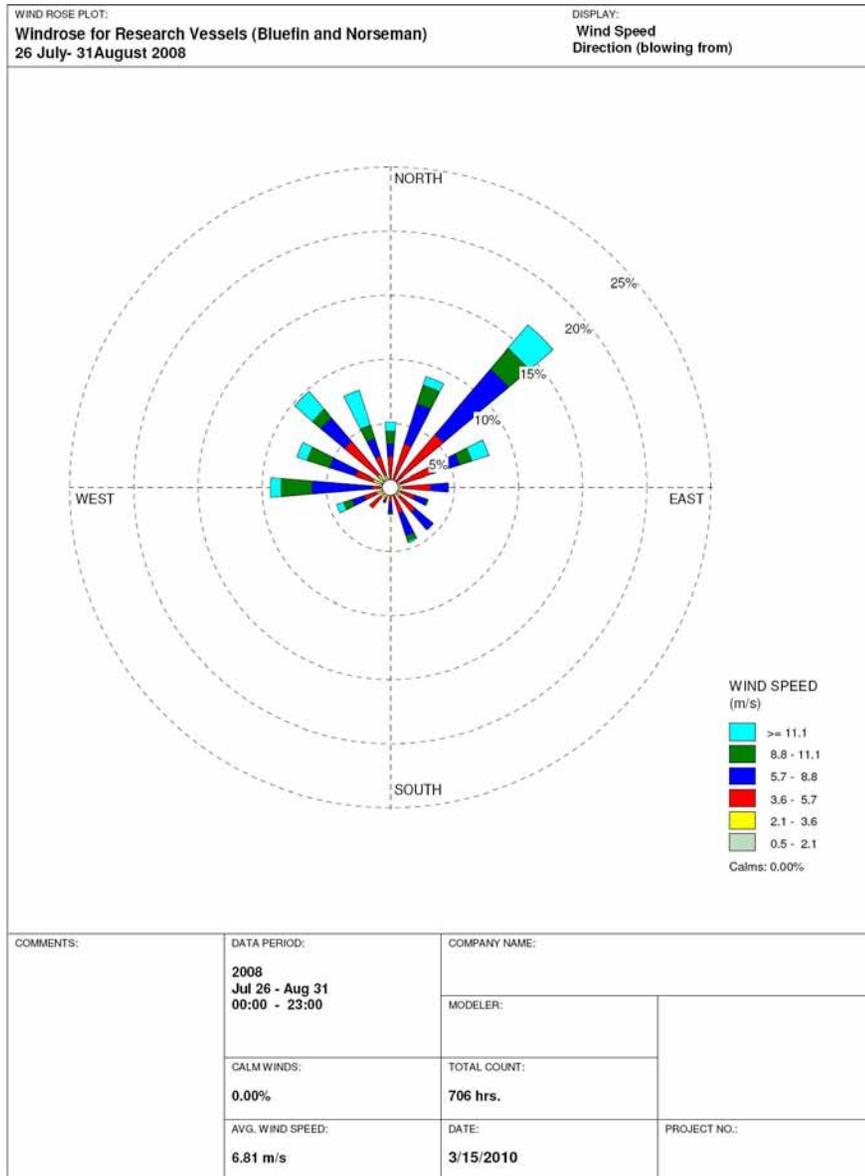


Figure C-1 A Comparison of Concurrent Wainwright NWS and CPAI Research Vessel Wind Data – August 2008

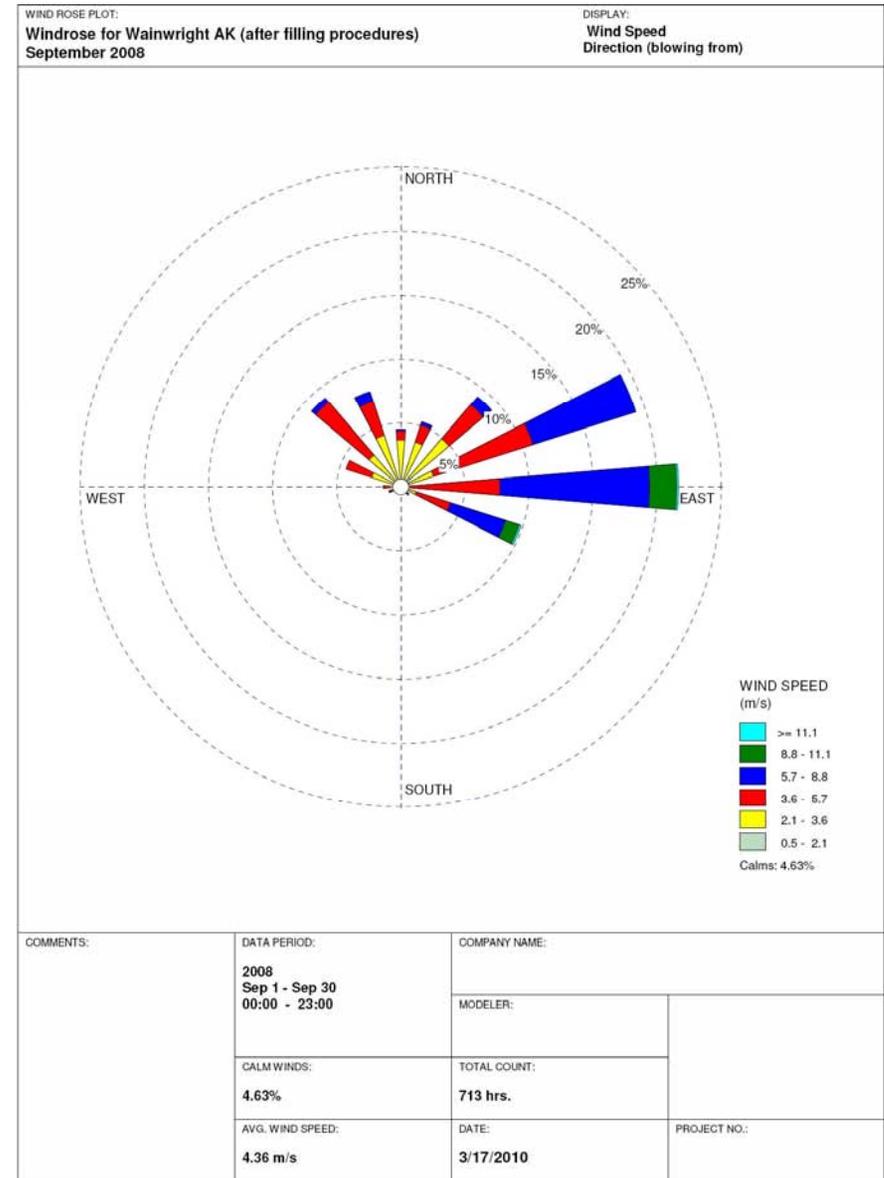
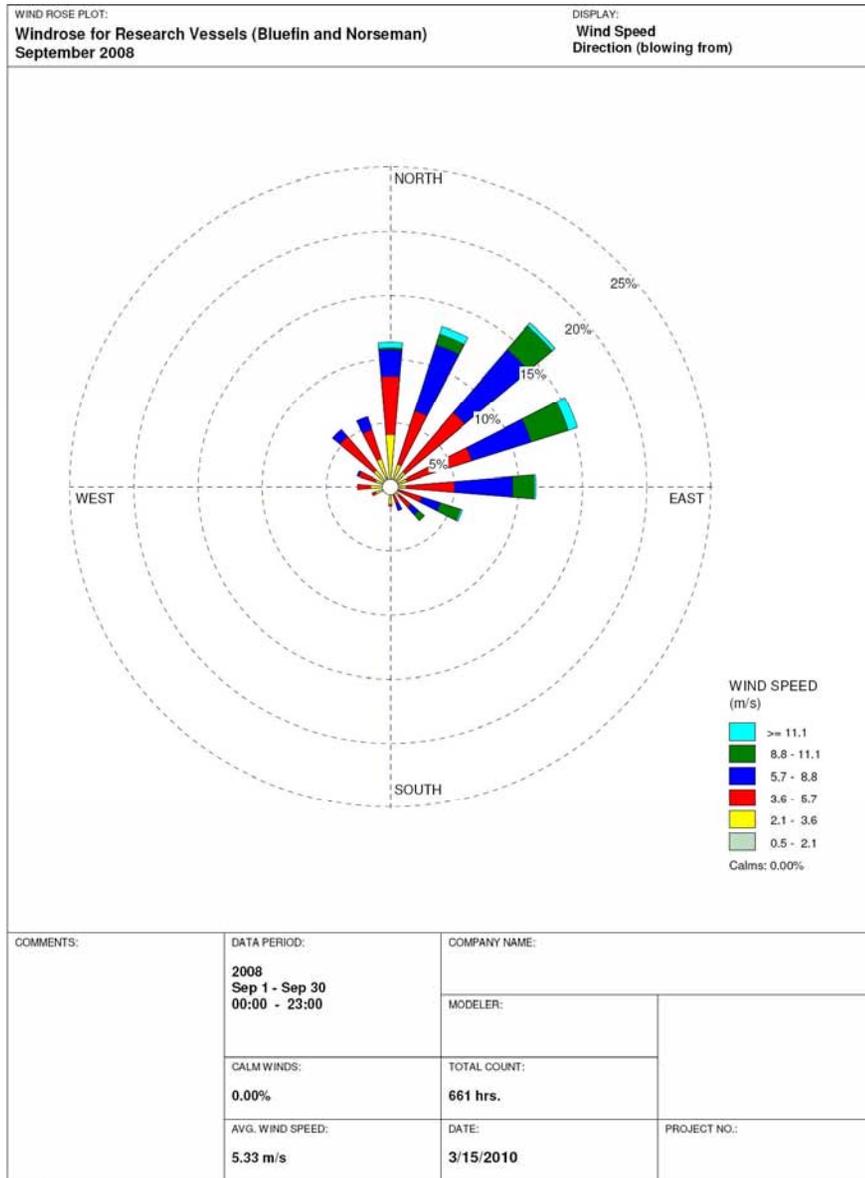


Figure C-2 A Comparison of Concurrent Wainwright NWS and CPAI Research Vessel Wind Data – September 2008

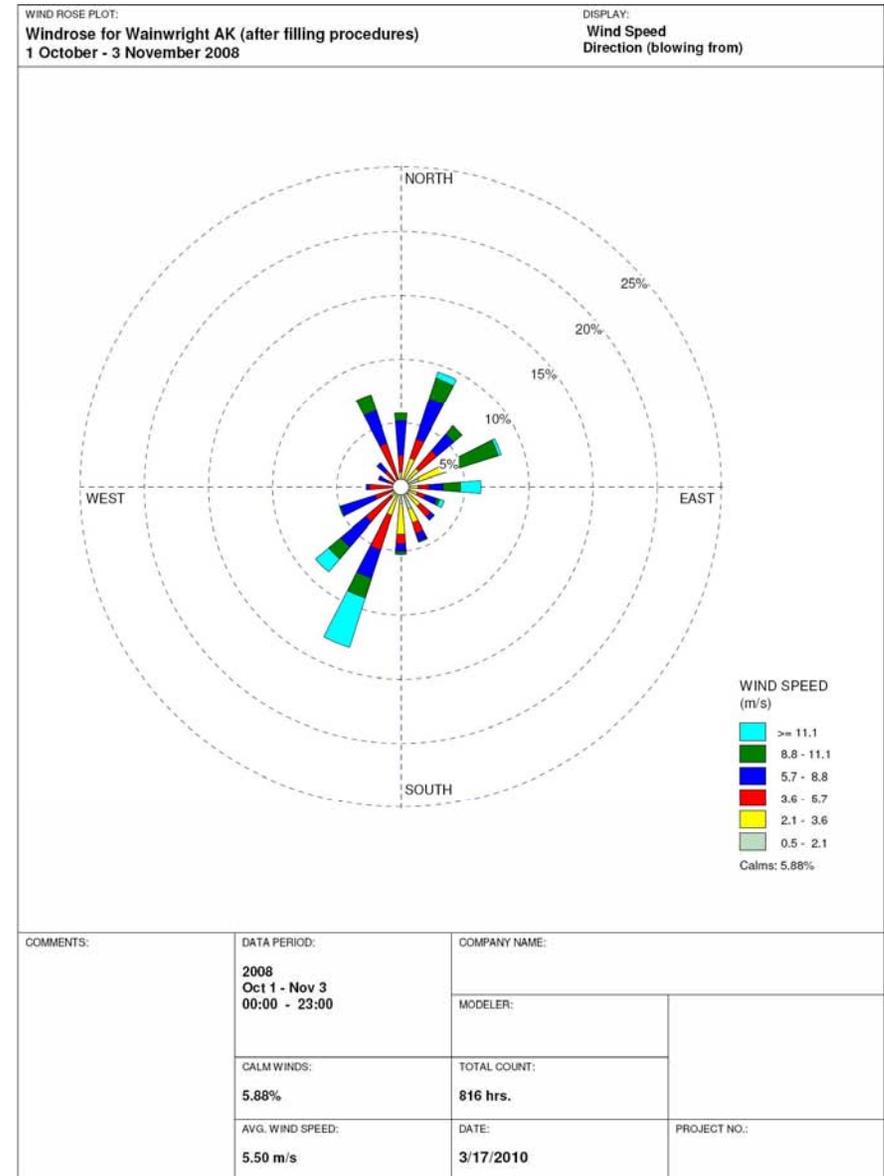
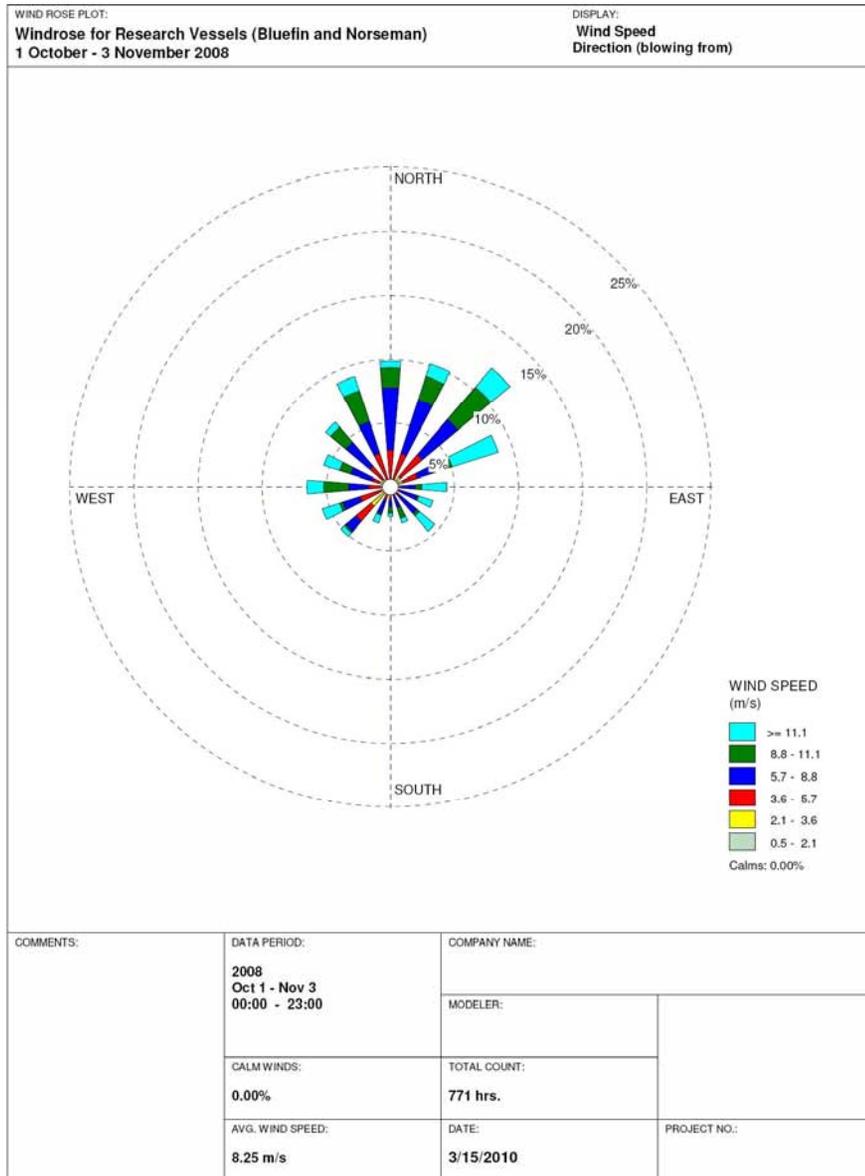


Figure C-3 A Comparison of Concurrent Wainwright NWS and CPAI Research Vessel Wind Data – October 2008

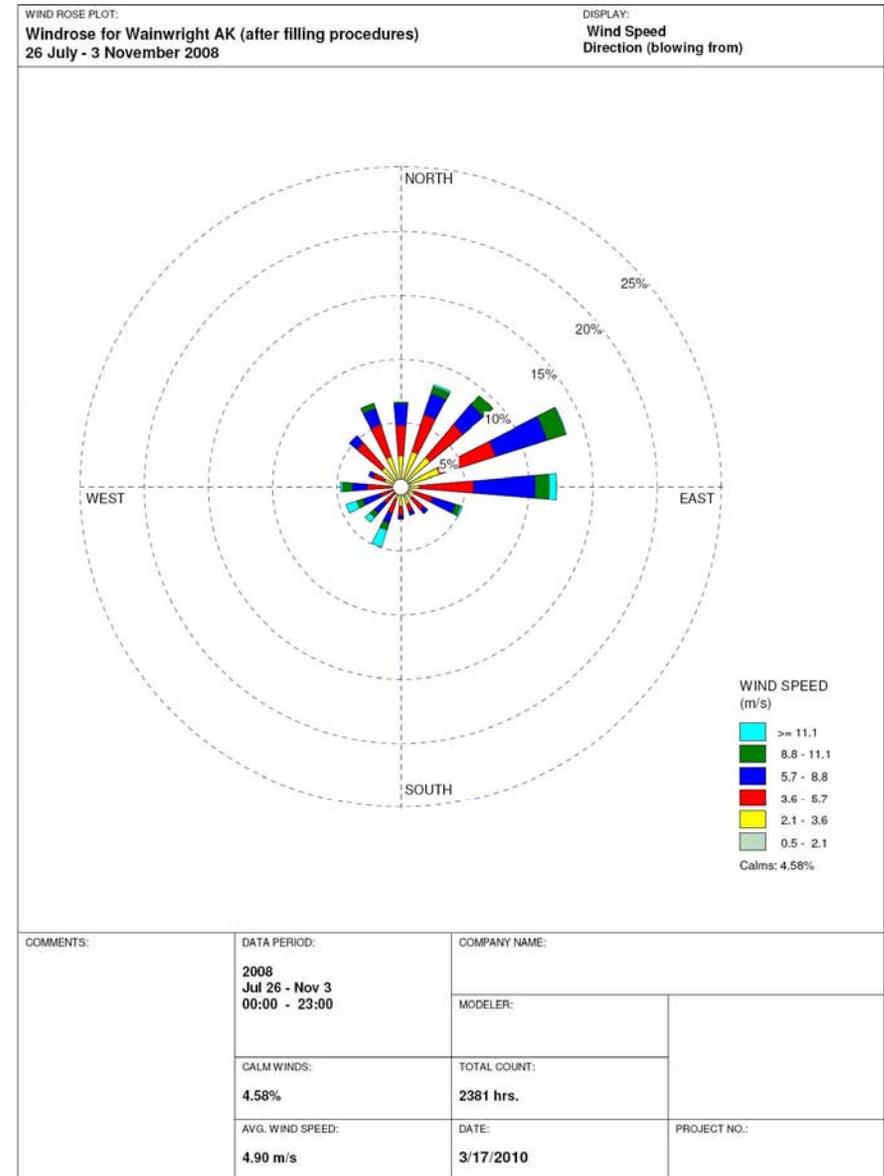
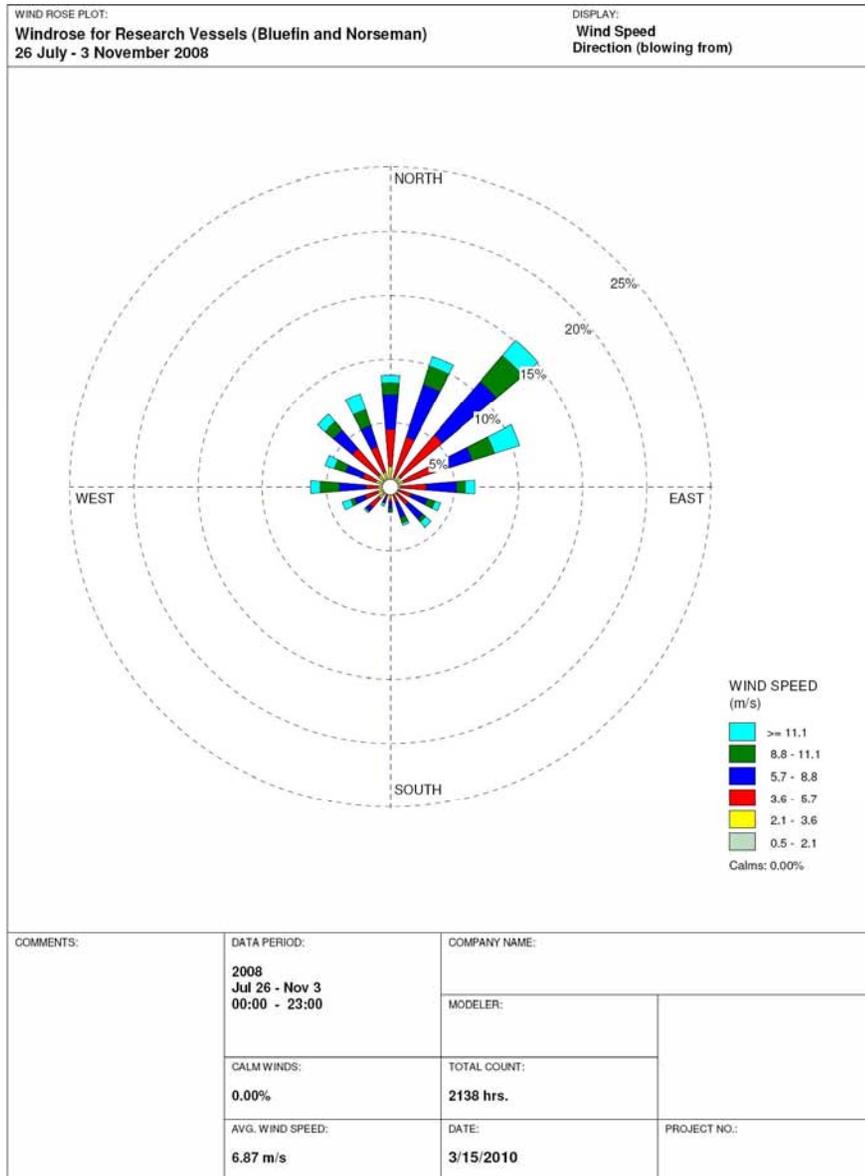


Figure C-4 A Comparison of Concurrent Wainwright NWS and CPAI Research Vessel Wind Data – August through October 2008

Attachment D

A Comparison of 2002 MM5 Overland with Wainwright NWS data Collected Over a 5-year Period (1999, 2002, and 2004 through 2006)

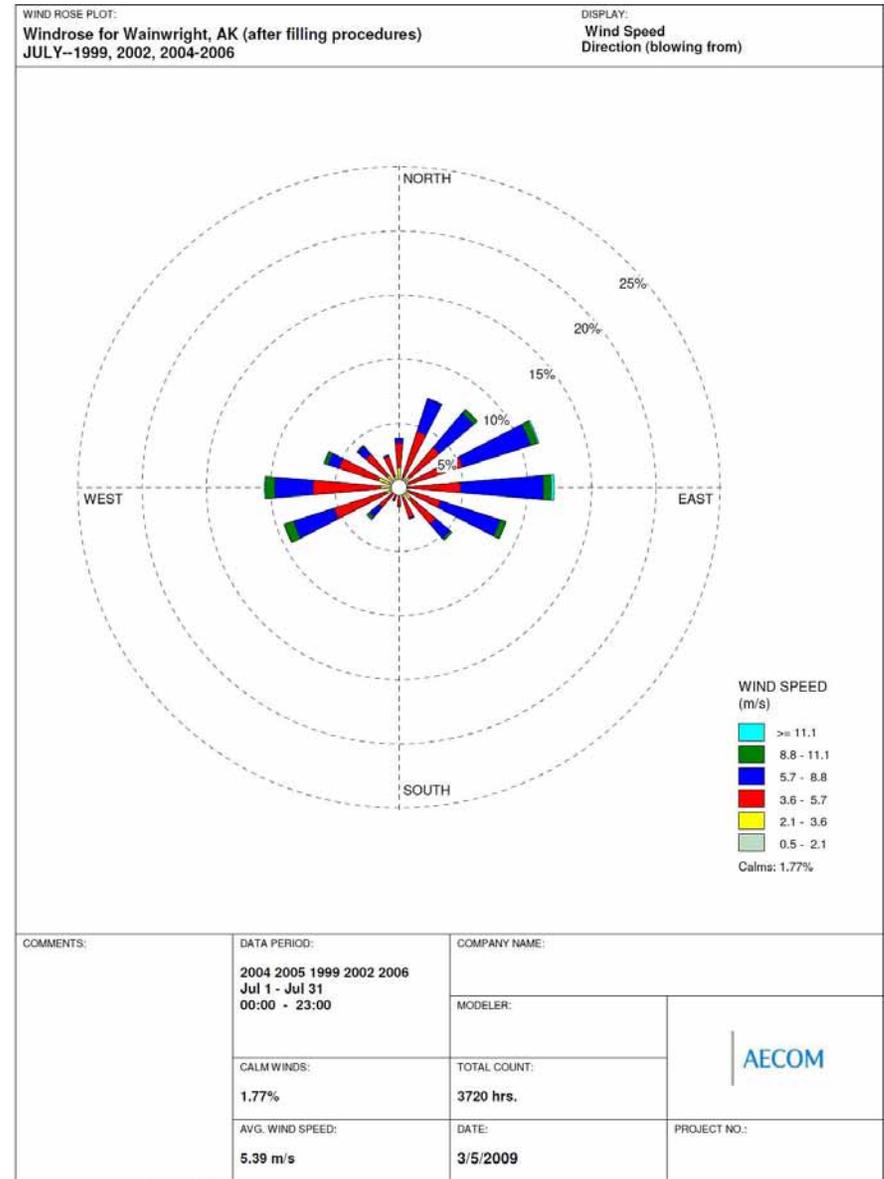
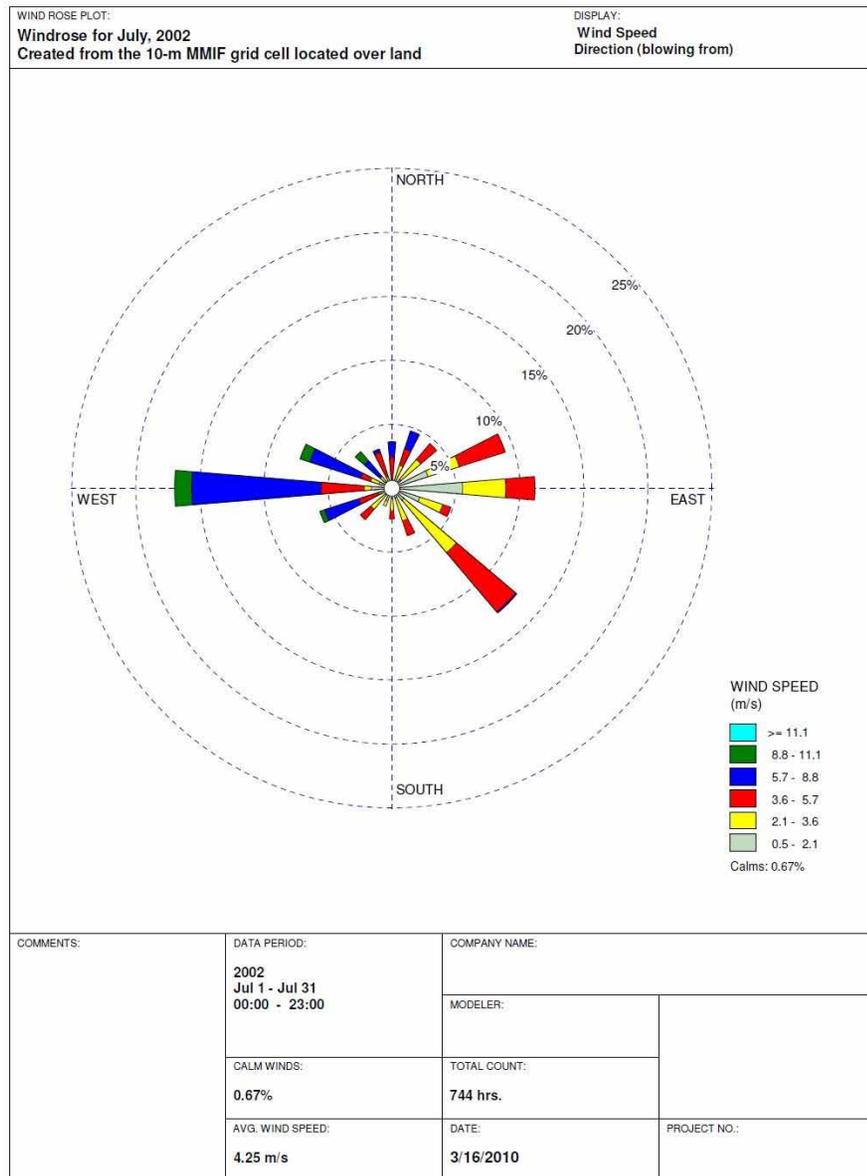


Figure D-1 A Comparison of 2002 MM5 Overland with Wainwright NWS Data Collected Over a 5-year Period During July

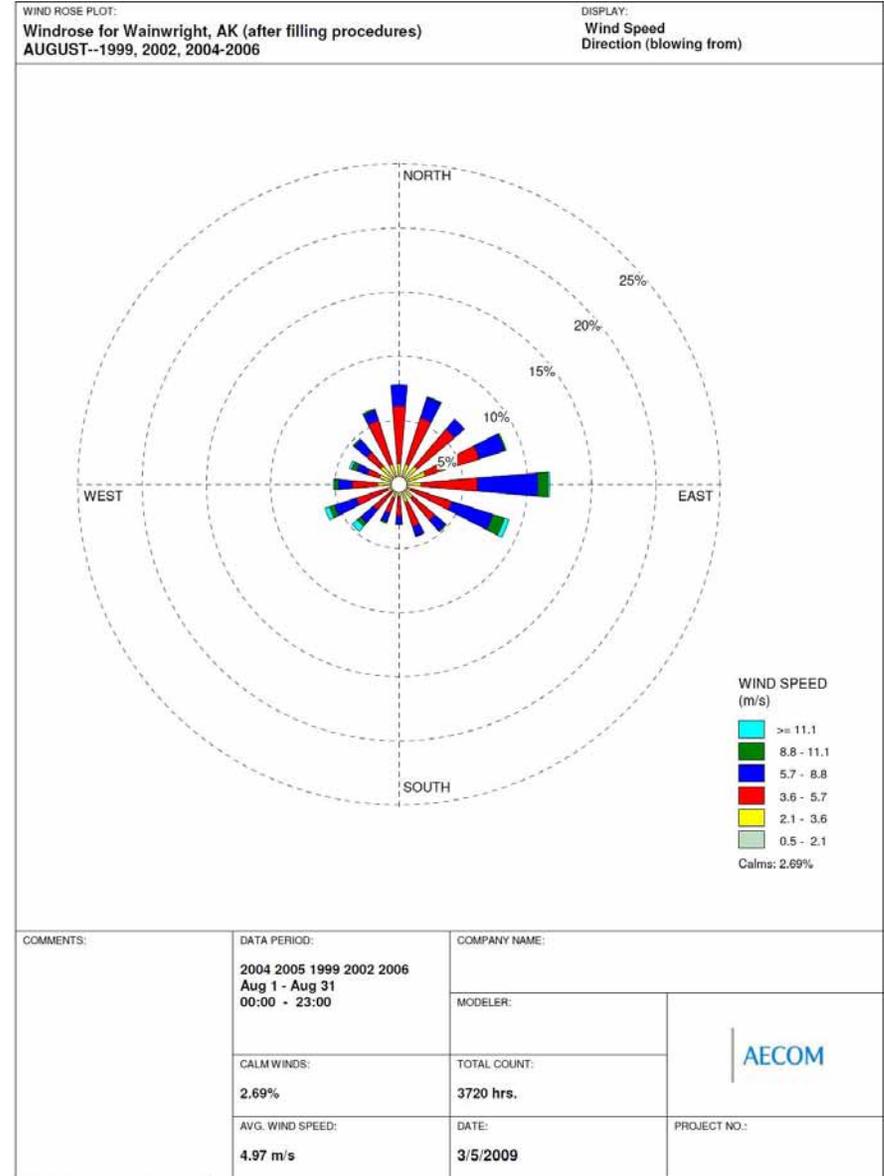
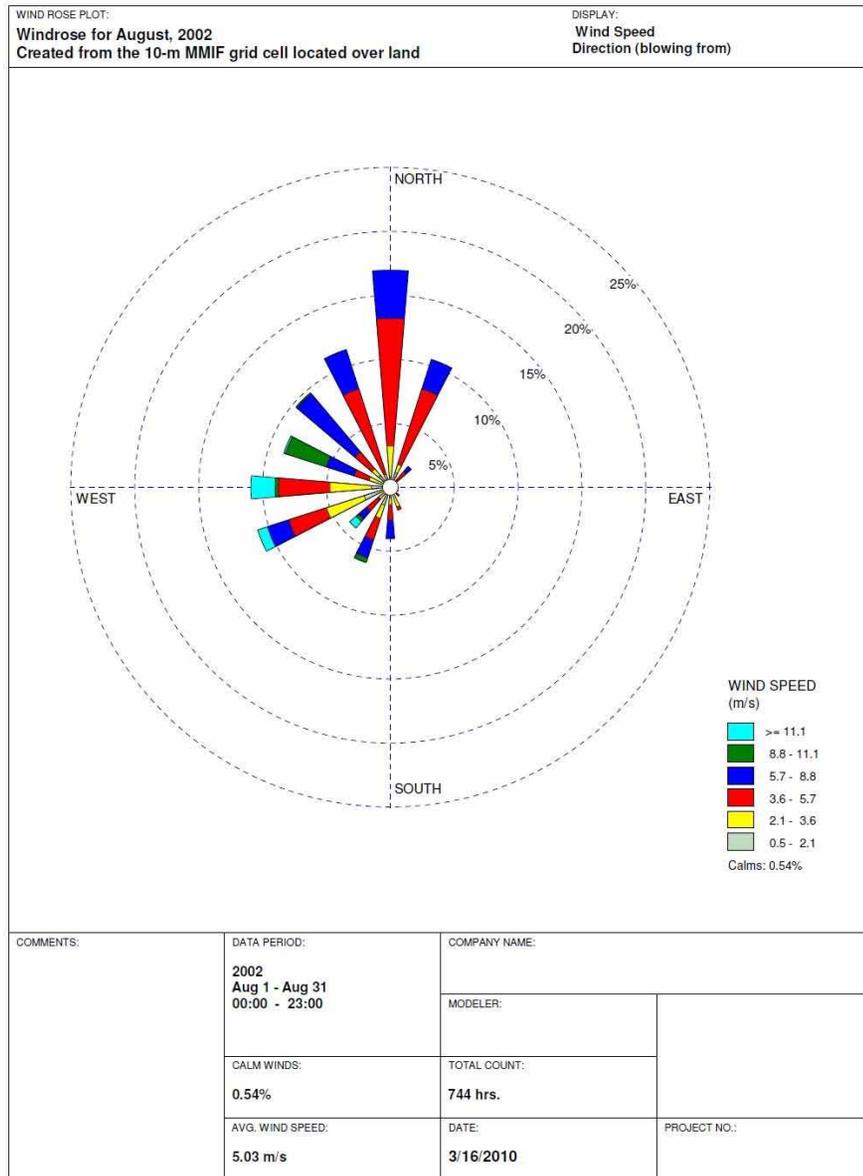


Figure D-2 A Comparison of 2002 MM5 Overland with Wainwright NWS Data Collected Over a 5-year Period During August

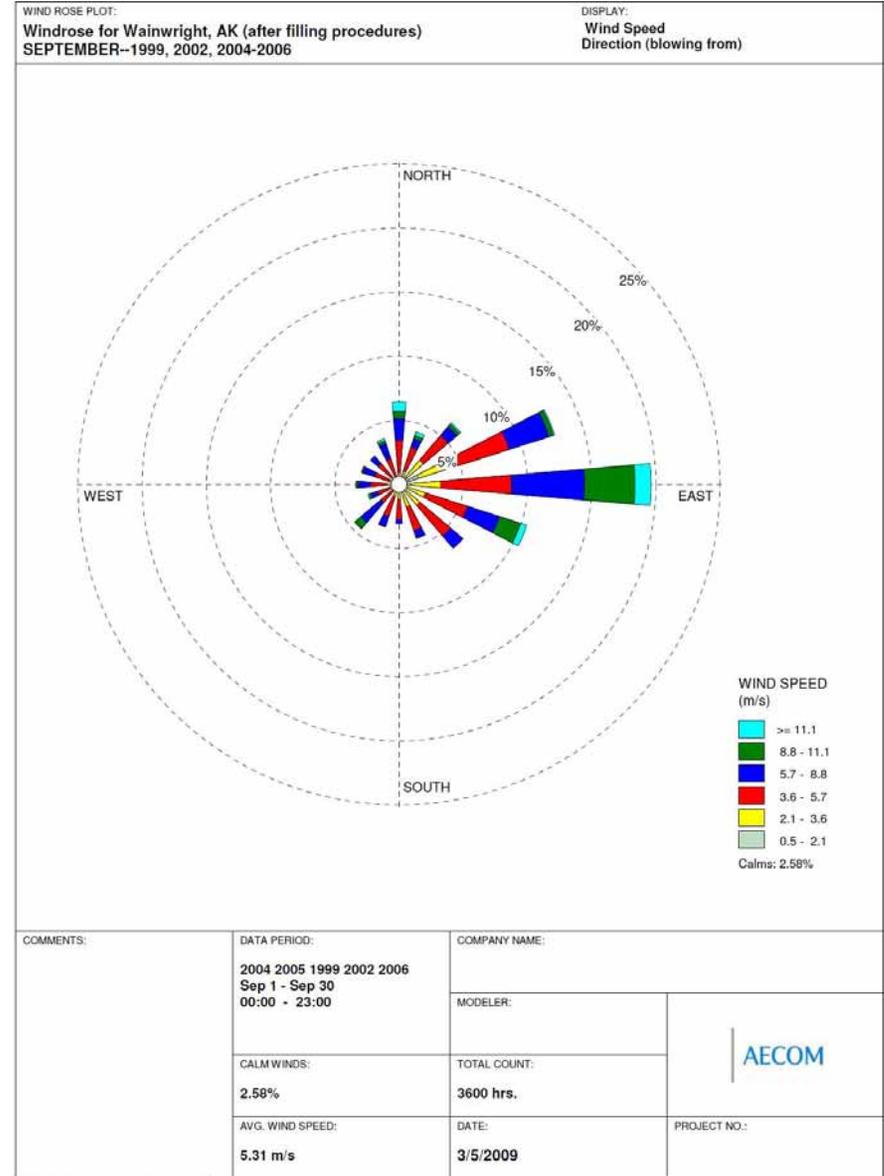
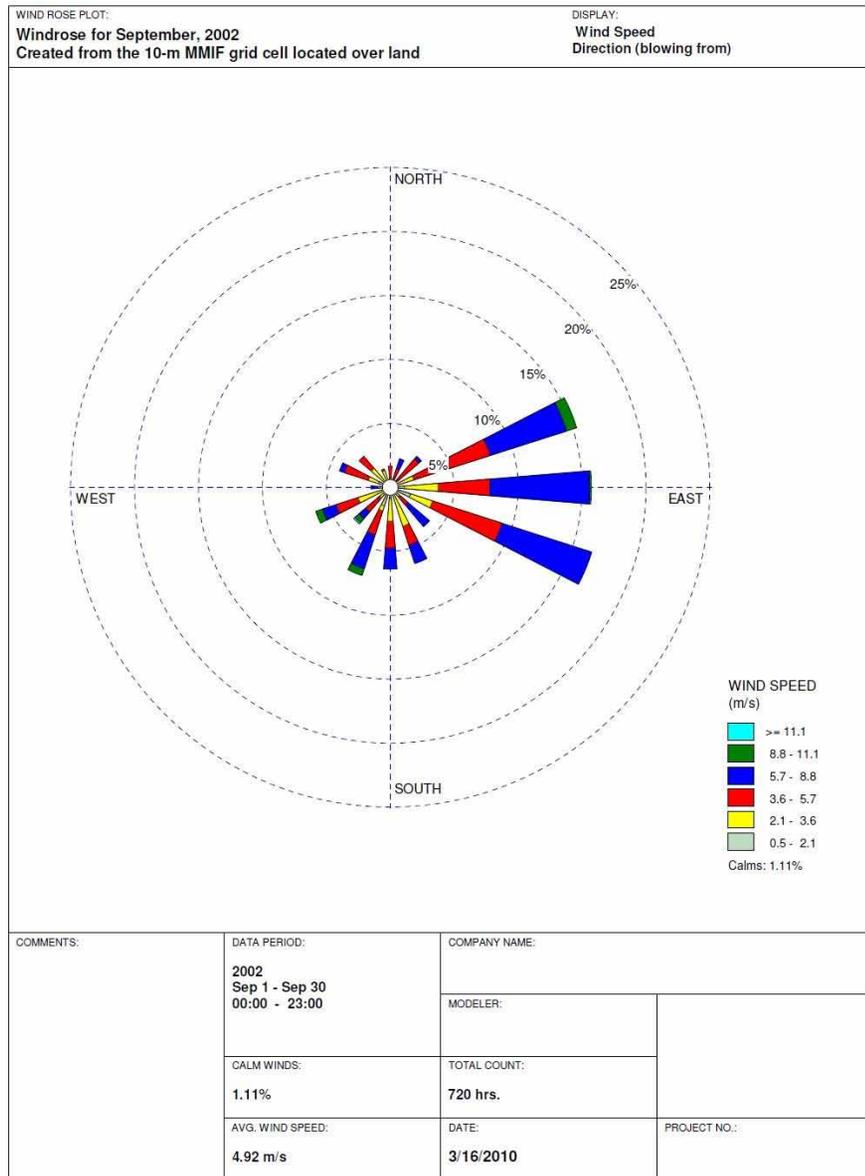


Figure D-3 A Comparison of 2002 MM5 Overland with Wainwright NWS Data Collected Over a 5-year Period During September

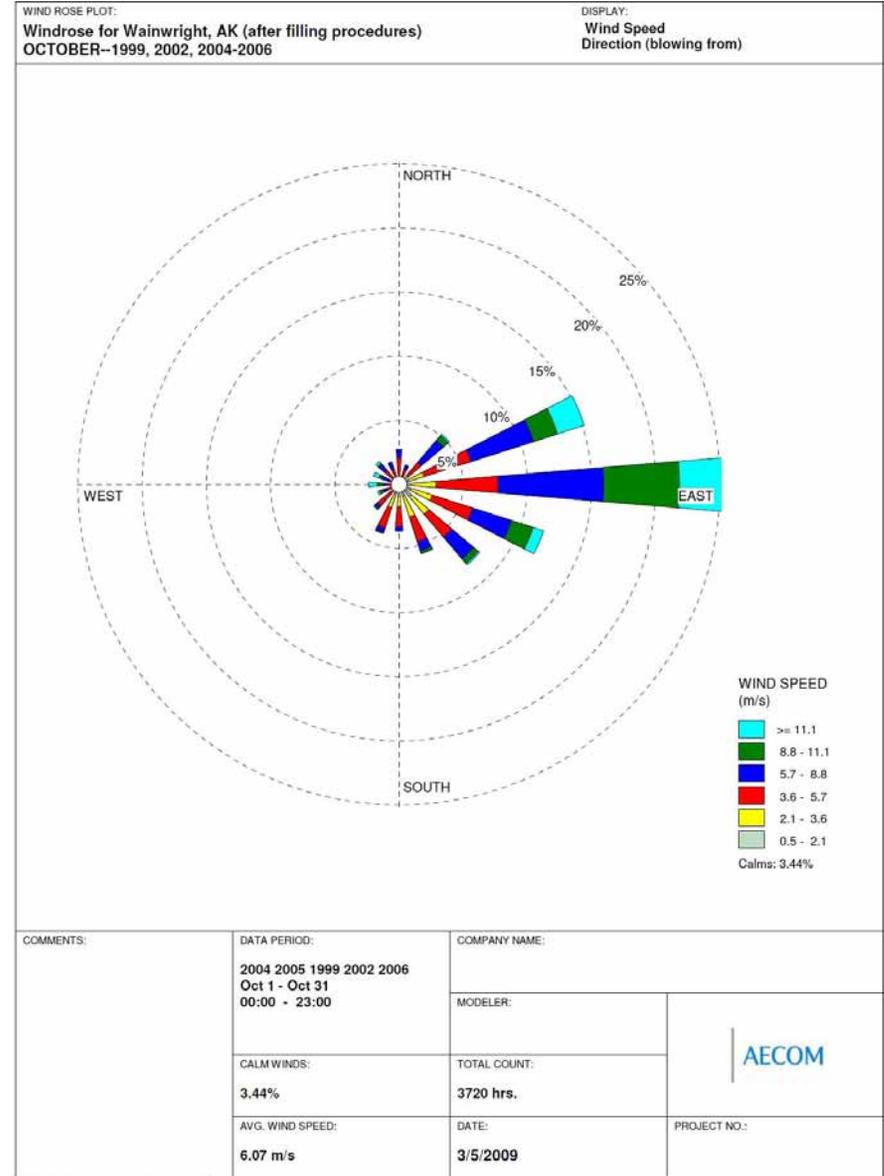
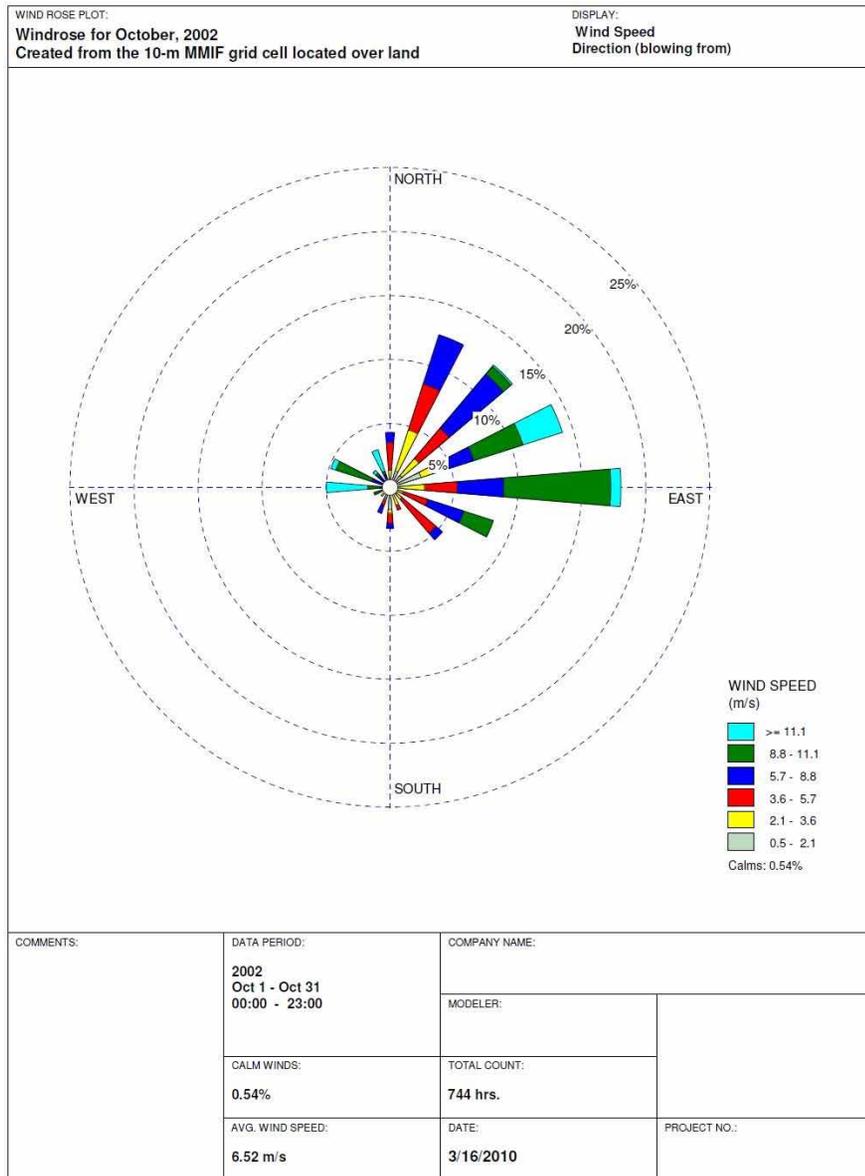


Figure D-4 A Comparison of 2002 MM5 Overland with Wainwright NWS Data Collected Over a 5-year Period During October

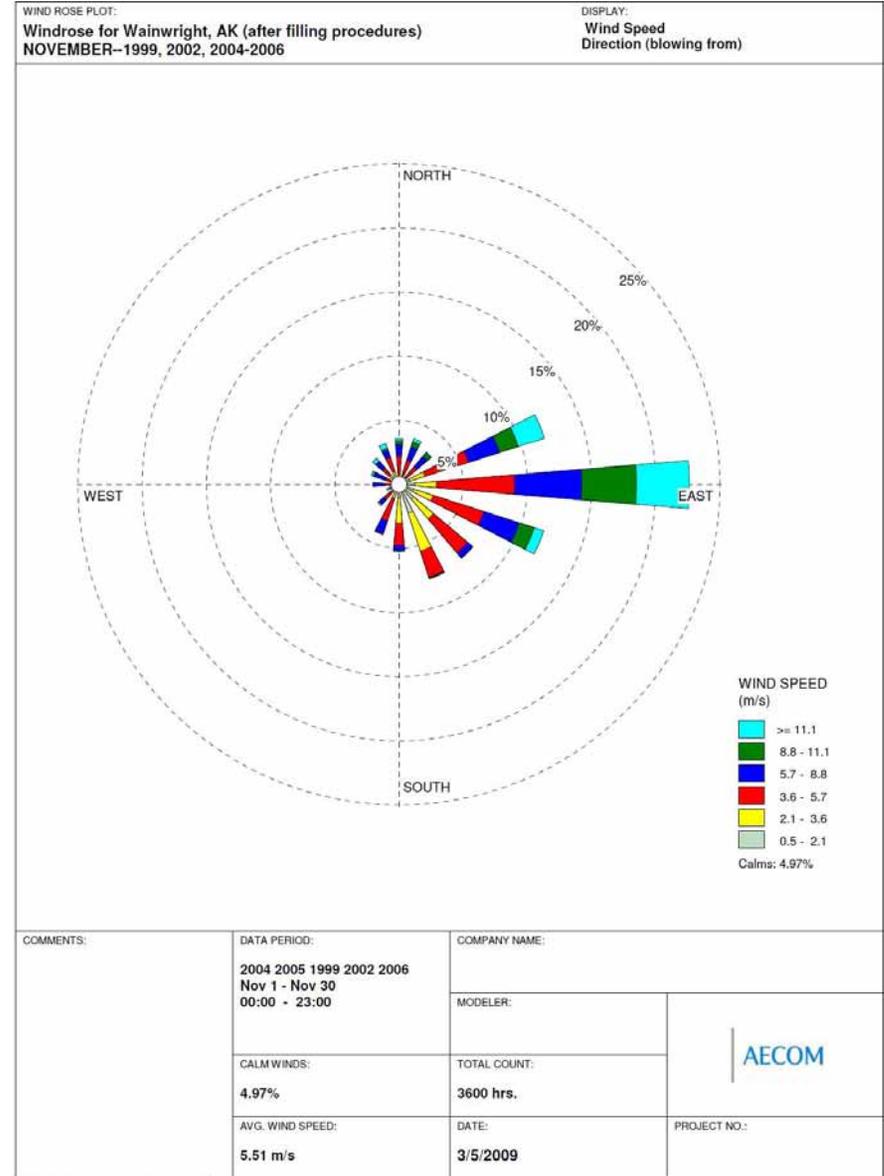
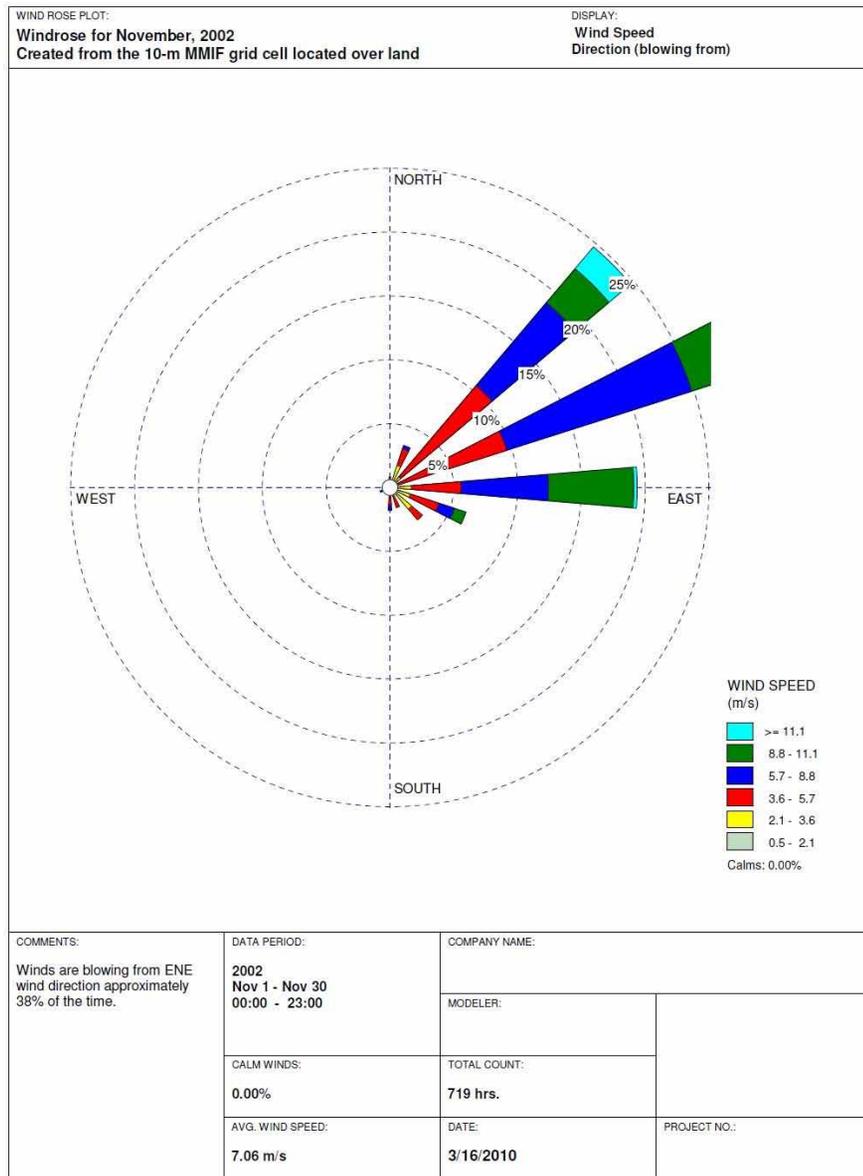


Figure D-5 A Comparison of 2002 MM5 Overland with Wainwright NWS Data Collected Over a 5-year Period During November

Attachment E

A Comparison of Concurrent Barrow Mixing Heights, MM5 PBL Thickness Overwater, and MM5 PBL Thickness Overland

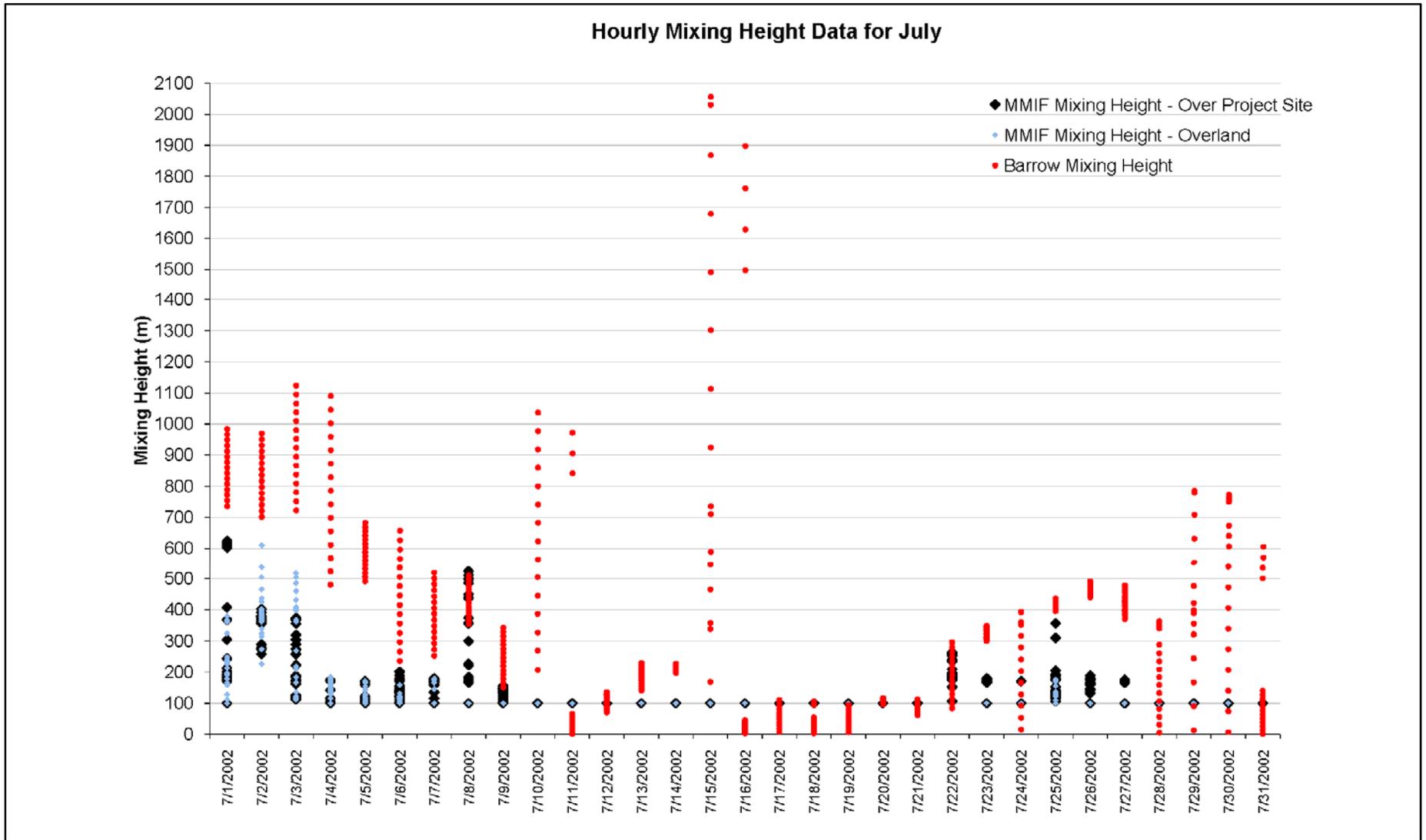


Figure E-1 A Comparison of Concurrent Barrow Mixing Heights, MM5 PBL Thickness Overwater, and MM5 PBL Thickness Overland – July 2002

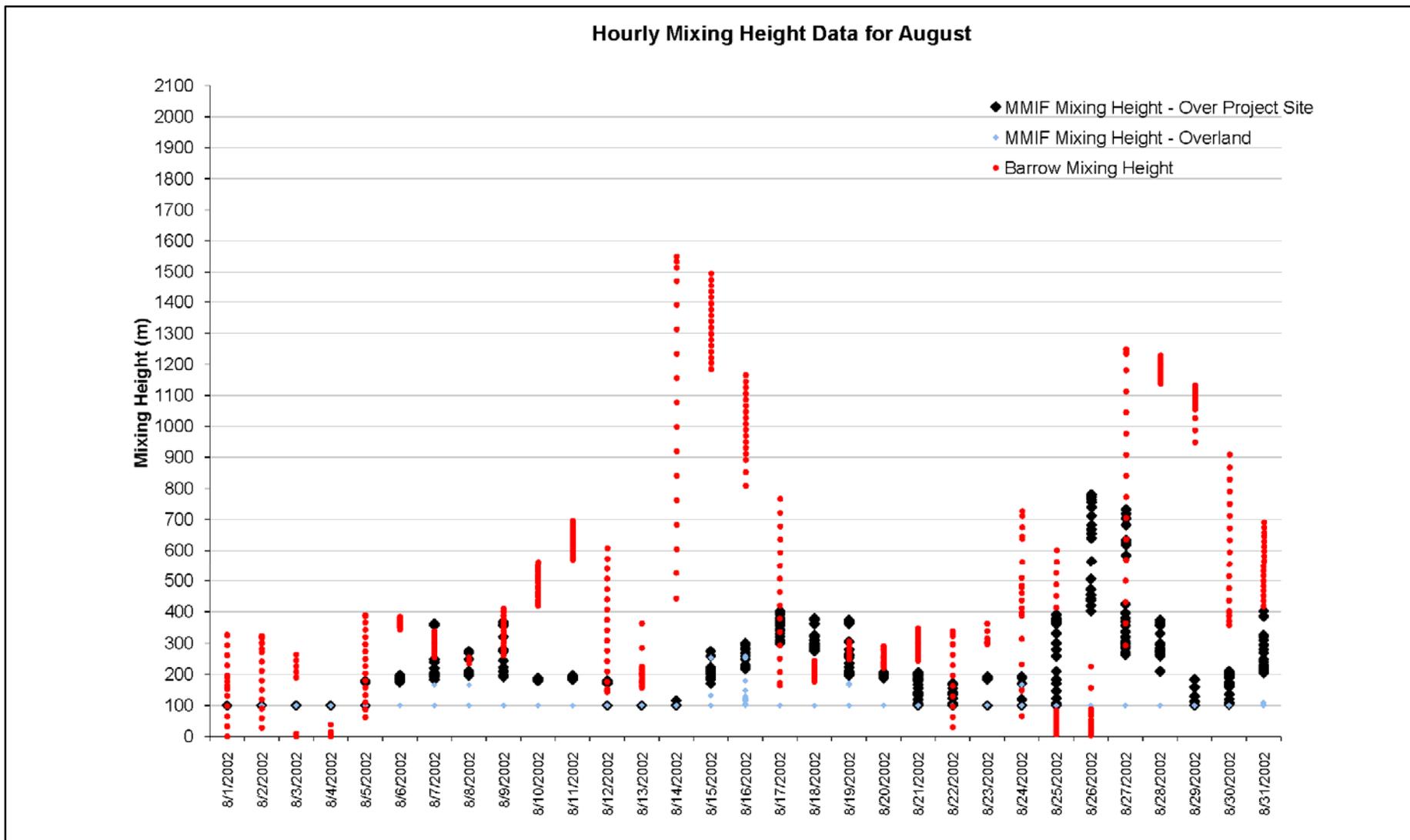


Figure E-2 A Comparison of Concurrent Barrow Mixing Heights, MM5 PBL Thickness Overwater, and MM5 PBL Thickness Overland – August 2002

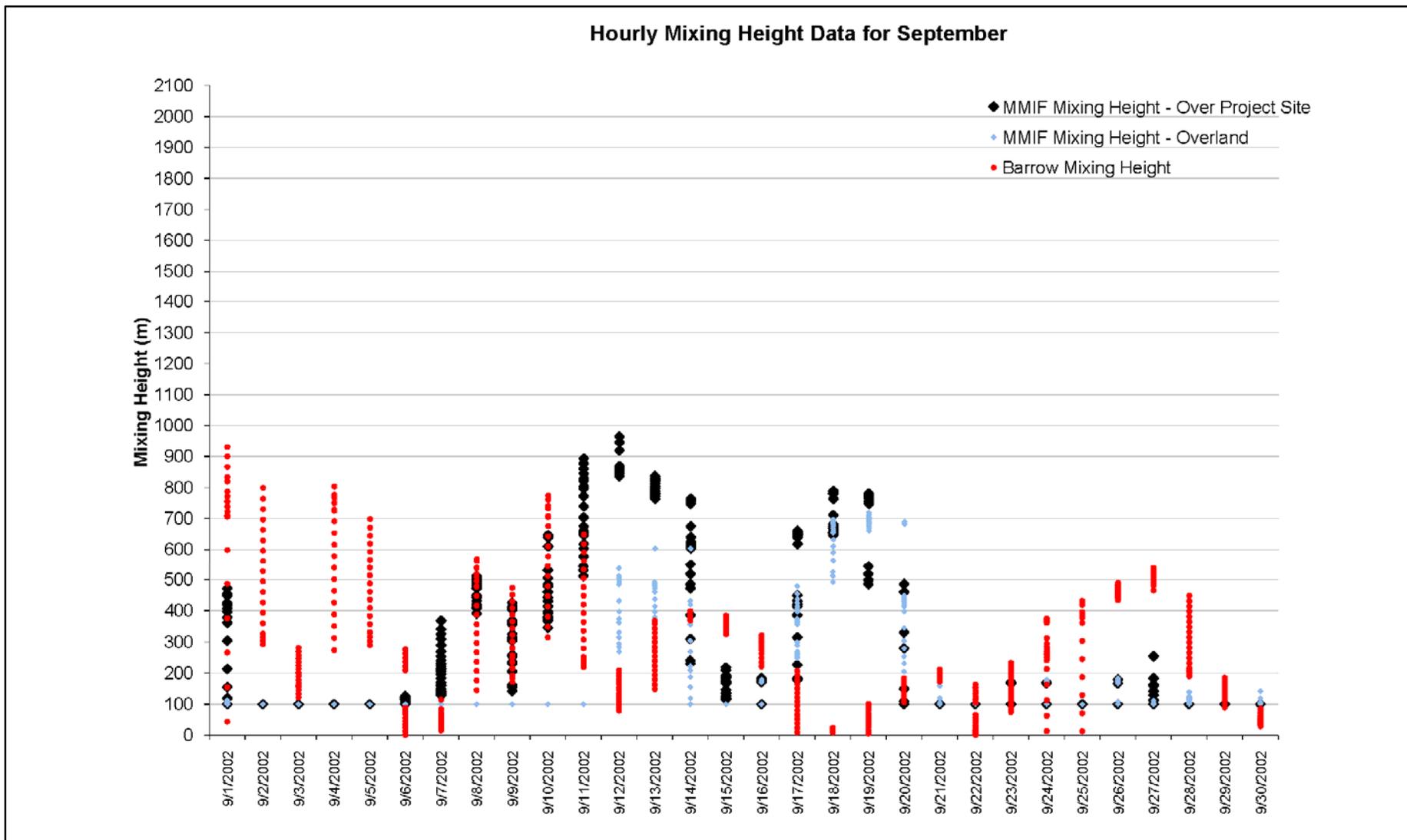


Figure E-3 A Comparison of Concurrent Barrow Mixing Heights, MM5 PBL Thickness Overwater, and MM5 PBL Thickness Overland – September 2002

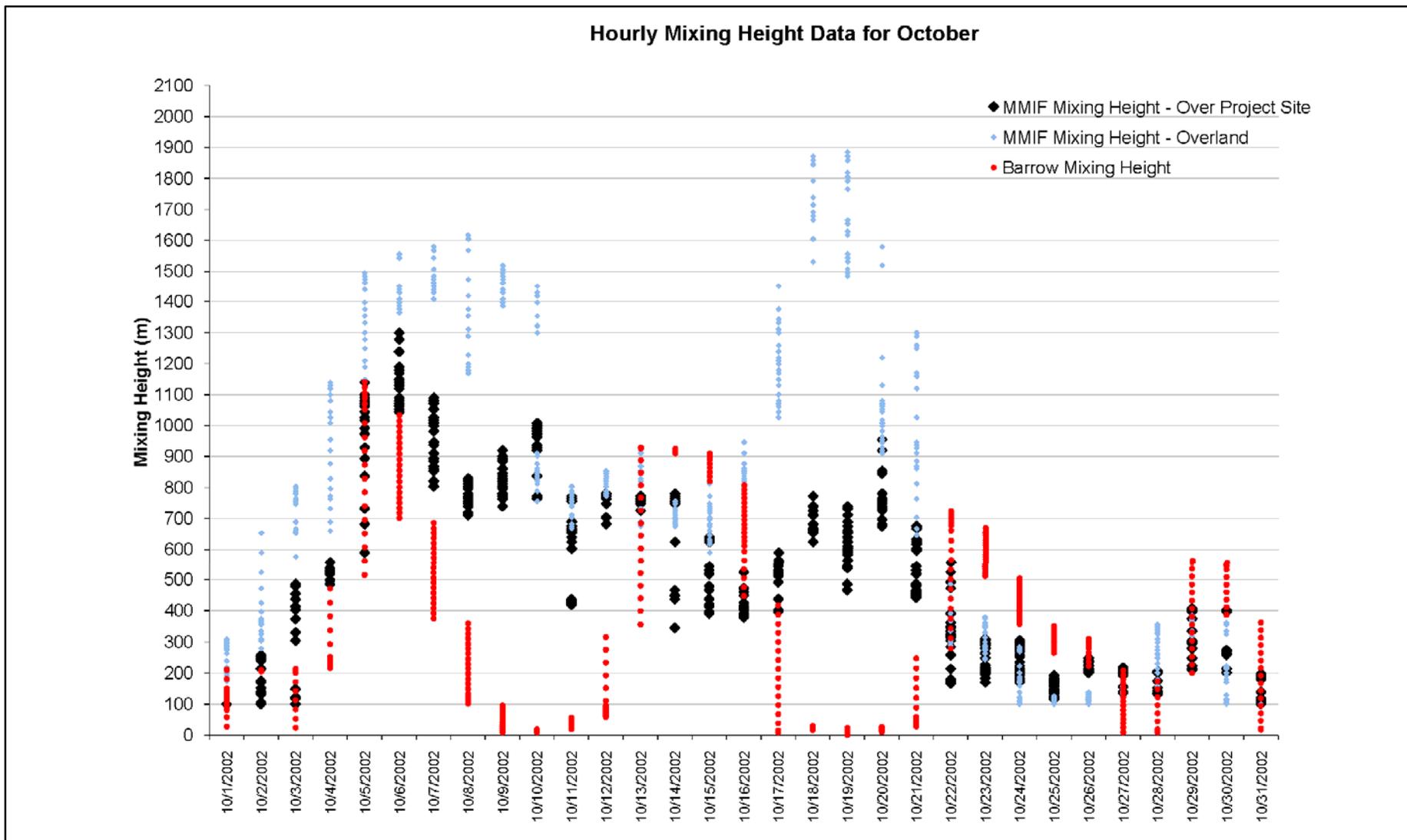


Figure E-4 A Comparison of Concurrent Barrow Mixing Heights, MM5 PBL Thickness Overwater, and MM5 PBL Thickness Overland – October 2002

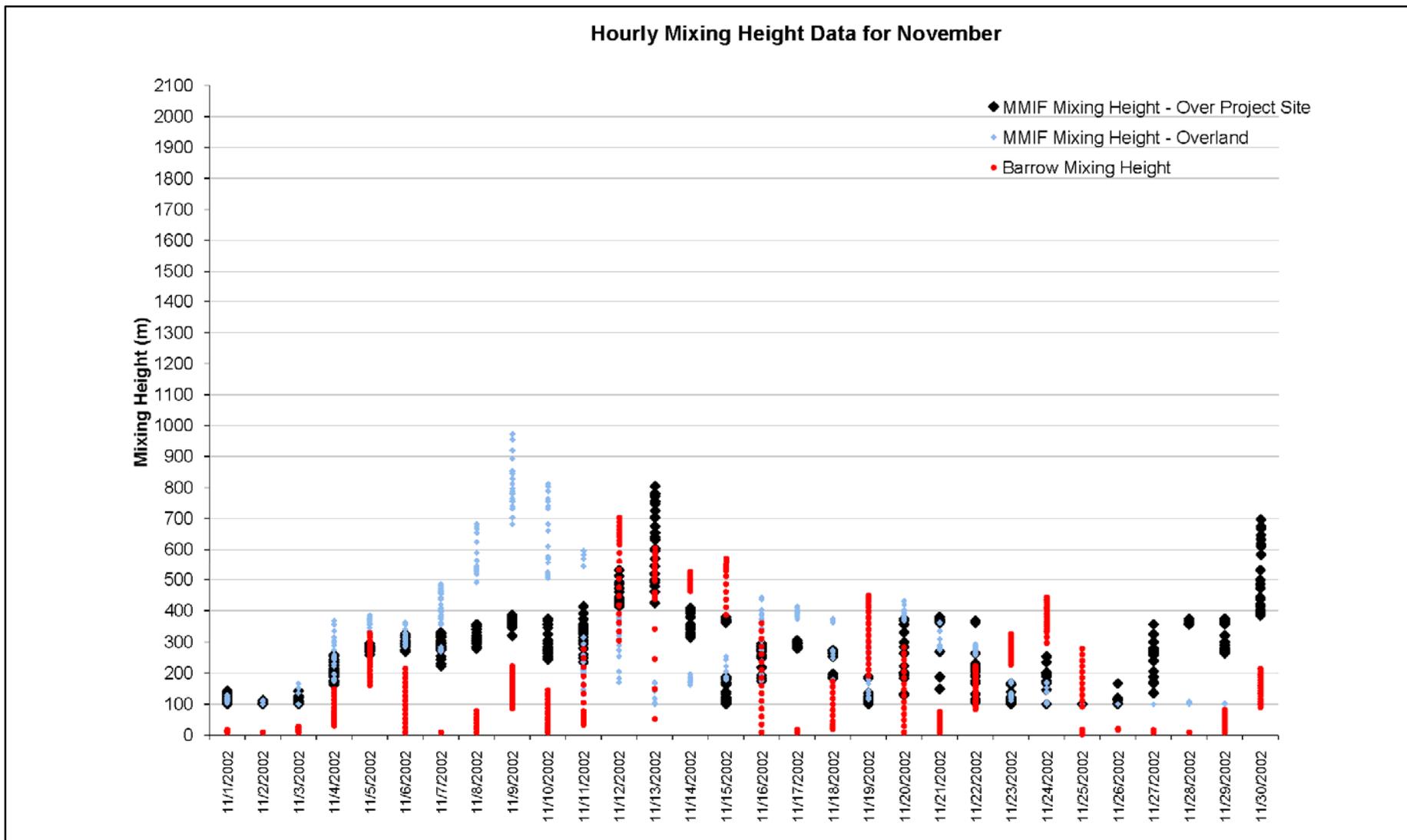


Figure E-5 A Comparison of Concurrent Barrow Mixing Heights, MM5 PBL Thickness Overwater, and MM5 PBL Thickness Overland – November 2002