Eielson Air Force Base
Air Monitoring Program
Annual Data Report
June 2004 – September 2005

prepared for

U.S. Air Force &
Army Corps of Engineers

prepared by

Hoefler Consulting Group
3401 Minnesota Drive, Suite 300
Anchorage, Alaska 99503
(907) 563-2137

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This USAF annual report for the Eielson Air Force Base ambient monitoring program has been reviewed by the following:

Frances Isrigg
Corps of Engineers Project Manager

Date

Alan M. Trbovich
HCG Permitting Manager

3/2/06
Date

K. Steven Mackey
HCG Project Manager

3/2/2006
Date

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EXECUTIVE SUMMARY

This project was conducted by the U.S Department of the Air Force (USAF) to collect meteorological and air quality data at Eielson Air Force Base near North Pole, Alaska to establish an ambient air quality database. The objective of this monitoring program was to collect meteorological and ambient air quality data that could be used in the event that a Prevention of Significant Deterioration (PSD) air permit might be required for future construction or expansion activities. The data collection was consistent with the requirements of the U.S Environmental Protection Agency (EPA).

The monitoring program began in May 2004. For the purposes of this report, the official *meteorological* monitoring period is from July 1, 2004 through June 30, 2005. The official *gas analyzer* monitoring period runs from August 1, 2004 through July 31, 2005, and the *particulate matter* monitoring period runs from October 1, 2004 through September 30, 2005.

Data capture summary tables are provided as follows for each of the system parameters. Data capture for each of the meteorological monitoring parameters was greater than 90 percent per quarter, and therefore achieved PSD data quality objectives. Data capture percentages for the gas analyzer data and the PM_{10} and $PM_{2.5}$ monitoring periods are included as separate tables. Data that exceeds 80 percent of the AAAQS are highlighted in red.

Table E-1. 1st and 2nd Maximum Concentrations: PM_{10}

Period	Average ($\mu g/m^3$)	1st High Value ($\mu g/m^3$)	2nd High Value ($\mu g/m^3$)	AAAQS
1st Monitoring Quarter	8	24	18	150 $\mu g/m^3$
Percent of AAAQS	5.3%	16.0%	12.0%	
2nd Monitoring Quarter	11	39	20	
Percent of AAAQS	7.3%	26.0%	13.3%	
3rd Monitoring Quarter	19	79	54	
Percent of AAAQS	12.6%	52.6%	36%	
4th Monitoring Quarter	38	148	52	
Percent of AAAQS	25.1%	98.6%	34.6%	
Annual	19	n/a	n/a	50 $\mu g/m^3$
Percent of AAAQS	38.0%			

Table E-2. 1st and 2nd Maximum Concentrations: $PM_{2.5}$

Period	Average ($\mu g/m^3$)	1st High Value ($\mu g/m^3$)	2nd High Value ($\mu g/m^3$)	AAAQS
1st Monitoring Quarter	4.2	10.3	7.3	65 $\mu g/m^3$
Percent of AAAQS	6.4%	15.8%	11.2%	
2nd Monitoring Quarter	7.6	35.4	12.8	
Percent of AAAQS	11.7%	54.5%	19.7%	
3rd Monitoring Quarter	7.9	40.9	37.5	
Percent of AAAQS	12.2%	62.9%	57.7%	
4th Monitoring Quarter	24.4	31.6	26.3	
Percent of AAAQS	37.5%	48.6%	40.5%	
Annual	11.1	n/a	n/a	15 $\mu g/m^3$
Percent of AAAQS	74.0%			

Table E-3. Meteorological Data Capture: Valid Hours per Month

Period	Meteorological Parameter							
	Temp 2m	Delta T	WS	WD	Wind Sigma	RH	Solar	BP
Jul-04	744	744	744	744	744	744	744	744
Aug-04	744	744	744	744	744	744	744	744
Sep-04	720	720	720	720	720	720	720	720
Oct-04	744	744	744	744	744	744	744	744
Nov-04	720	720	720	720	720	720	720	720
Dec-04	741	741	741	741	744	744	744	744
Jan-05	744	744	744	744	744	744	744	744
Feb-05	672	672	672	672	672	672	672	672
Mar-05	744	744	744	744	744	744	744	744
Apr-05	720	720	720	720	720	720	720	720
May-05	744	744	744	744	744	744	744	744
Jun-05	718	718	710	710	710	718	720	720

Table E-4. Meteorological Data Capture: Quarterly Data Completeness

Period	Meteorological Parameter							
	Temp 2m	Delta T	WS	WD	Wind Sigma	RH	Solar	BP
1st Monitoring Quarter	100.0%	100.0%	98.5%	100.0%	100.0%	100.0%	100.0%	100.0%
2nd Monitoring Quarter	99.9%	99.9%	99.9%	99.9%	99.9%	99.7%	100.0%	100.0%
3rd Monitoring Quarter	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
4th Monitoring Quarter	99.9%	99.9%	99.5%	99.5%	99.5%	99.9%	100.0%	100.0%
Annual	99.9%	99.9%	99.5%	99.5%	99.9%	100.0%	100.0%	100.0%

Table E-5. Gas Analyzer – 1st and 2nd Maximum Concentrations

Period	NO_2 - Annual mean (ppm)		CO 8-hour (ppm)			
	Average	AAAQS	1st High Value	2nd High Value	Average	AAAQS
1st Monitoring Quarter	n/a	0.053 ppm	5.2324	5.2309	0.4510	9 ppm
Percent of AAAQS			58.1%	58.1%	5.0%	
2nd Monitoring Quarter			1.8145	1.7215	0.1386	
Percent of AAAQS			20.2%	19.1%	1.5%	
3rd Monitoring Quarter			1.5027	1.4524	0.2168	
Percent of AAAQS			16.7%	16.1%	2.4%	
4th Monitoring Quarter			0.5502	0.5494	0.1339	
Percent of AAAQS			6.1%	6.1%	1.5%	
Annual	0.0105		5.2324	5.2309	0.2559	
Percent of AAAQS	19.9%		58.1%	58.1%	2.8%	

Table E-5 (continued). Gas Analyzer 1st and 2nd Maximum Concentrations

Period	CO 1-hour (ppm)				SO_2 Annual mean (ppm)			
	1st High Value	2nd High Value	Average	AAAQS	1st High Value	2nd High Value	Average	AAAQS
1st Monitoring Quarter	6.9840	6.2260	0.4497	35 ppm	n/a			0.030 ppm
Percent of AAAQS	20.0%	17.8%	1.3%					
2nd Monitoring Quarter	2.8380	2.5720	0.1395					
Percent of AAAQS	8.1%	7.3%	0.4%					
3rd Monitoring Quarter	3.2950	3.0000	0.2178					
Percent of AAAQS	9.4%	8.6%	0.6%					
4th Monitoring Quarter	1.2492	0.6427	0.1350					
Percent of AAAQS	3.6%	1.8%	0.4%					
Annual	6.9840	6.2260	0.2559		0.0015			
Percent of AAAQS	20.0%	17.8%	0.7%		4.9%			

Period	SO_2 3-hour (ppm)				SO_2 24-hour (ppm)			
	1st High Value	2nd High Value	Average	AAAQS	1st High Value	2nd High Value	Average	AAAQS
1st Monitoring Quarter	0.0217	0.0192	0.0005	0.5 ppm	0.0098	0.0096	0.0005	0.14 ppm
Percent of AAAQS	4.3%	3.8%	0.1%		7.0%	6.9%	0.3%	
2nd Monitoring Quarter	0.0439	0.0246	0.0010		0.0111	0.0073	0.0010	
Percent of AAAQS	8.8%	4.9%	0.2%		7.9%	5.2%	0.7%	
3rd Monitoring Quarter	0.1159	0.0937	0.0024		0.0450	0.0198	0.0024	
Percent of AAAQS	23.2%	18.7%	0.5%		32.2%	14.2%	1.7%	
4th Monitoring Quarter	0.0895	0.0757	0.0039		0.0349	0.0166	0.0038	
Percent of AAAQS	17.9%	15.1%	0.8%		24.9%	11.9%	2.7%	
Annual	0.1159	0.0937	0.0015		0.0450	0.0349	0.0015	
Percent of AAAQS	23.2%	18.7%	0.3%		32.2%	24.9%	1.1%	

Period	O_3 1-hour (ppm)			
	1st High Value	2nd High Value	Average	AAAQS
1st Monitoring Quarter	0.0406	0.0337	0.0144	0.12 ppm
Percent of AAAQS	50.8%	42.1%	18.0%	
2nd Monitoring Quarter	0.0378	0.0341	0.0117	
Percent of AAAQS	47.3%	42.6%	14.6%	
3rd Monitoring Quarter	0.0463	0.0450	0.0210	
Percent of AAAQS	57.9%	56.3%	26.3%	
4th Monitoring Quarter	0.0398	0.0357	0.0161	
Percent of AAAQS	49.7%	44.7%	20.1%	
Annual	0.0463	0.0450	0.0156	
Percent of AAAQS	57.9%	56.3%	19.5%	

Table E-6. Quality Assurance Project Plan (QAPP) Variation Table

Item/Procedure	Variation Summary	Variation Reason
Monitoring period differs	The monitoring periods used for data completeness do not begin as indicated in the QAPP.	Operational delays
Monitoring periods not concurrent	The monitoring periods used to gain complete annual data sets cover different time periods.	Unforeseen project delays
Personnel changes	USAF personnel named as site technicians varied over the course of the monitoring period.	Military rotations and deployment of project personnel
Personnel changes	HCG employee named as quality assurance manager and data managers varied from what was stated in the QAPP.	Employee assignment shifted

1.0 INTRODUCTION

1.1 Project Summary

This document serves as the annual monitoring report for the Eielson Air Force Base (EAFB) Air Monitoring Program. This document covers a different monitoring period for each of the three separate parts of the monitoring program, which began in May 2004. For the purposes of this report, the official meteorological monitoring period is from July 1, 2004 through June 30, 2005. The official gas analyzer monitoring period runs from August 1, 2004 through July 31, 2005. The particulate matter (PM_{10} and $PM_{2.5}$) monitoring period runs from October 1, 2004 through September 30, 2005. As indicated in the *Quality Assurance Project Plan, Version 2*, (Hoefler Consulting Group, August 2005) some parameters of the air monitoring program ran longer than others to achieve one full year of monitoring data. This draft report presents meteorological and particulate matter and gaseous pollutant monitoring data.

This project was proactively conducted by the United States Air Force (USAF) to collect meteorological and air quality data at EAFB near North Pole, Alaska to establish an air quality database. The objective was to collect meteorological and ambient air quality data that could be used in the event that a Prevention of Significant Deterioration (PSD) air permit might be required for future construction or expansion activities at EAFB. Representative data are a necessary component of ambient air quality analysis, and could be used to characterize the local environment in support of an Environmental Assessment (EA) or Environmental Impact Statement (EIS). The data collection was consistent with the requirements of the U.S. Environmental Protection Agency (EPA), the Alaska Department of Environmental Conservation (ADEC) and the Quality Assurance Project Plan (QAPP) for the EAFB Monitoring Project.

The Eielson monitoring site was located on a gravel lot southwest of the power plant at EAFB in interior Alaska, approximately 35 miles east of Fairbanks, Alaska and approximately 9 miles east of North Pole. General and specific location maps are provided in Figures 1-1 and 1-2, respectively. The selected site meets the PSD criteria for surface meteorological data collection and is considered representative of the EAFB air shed. The monitoring system was installed in April and May 2004, and valid data collection began on July 1, 2004.

The Eielson AFB Air Monitoring Program measured for the following parameters:

- Sulfur dioxide (SO_2)
- Nitrogen dioxide (NO_2)
- Carbon monoxide (CO)
- Ozone (O_3)
- Particulate matter less than 10 microns (PM_{10})
- Particulate matter less than 2.5 microns ($PM_{2.5}$)

The PM_{10} and $PM_{2.5}$ monitoring was done according to the 3- and 6-day sampling schedule adopted by EPA for the National Ambient Monitoring Stations (NAMS) network and the State/Local Ambient Monitoring Stations (SLAMS) network. Co-located PM_{10} and $PM_{2.5}$ samples for the determination of method precision were collected on the 6-day sample schedule. These data provide a one year air quality baseline prior to the start of any construction activities, should a PSD review be required. These data also represent conservative ambient background concentrations. Continuous meteorological data has also been collected during the monitoring period for the following parameters:

- Wind speed (WS) (meters per second [m/s])
- Wind direction (WD) (degrees [°])
- Wind direction standard deviation (sigma theta[σ_θ])
- Air temperature (2 meters) (degrees Celsius [°C])
- Air temperature (10 meters) (degrees Celsius [°C])
- Delta temperature (degrees Celsius [°C])
- Relative humidity (RH) (percent [%])
- Solar radiation (watts per square meter [watts/m^2])
- Barometric pressure (BP) (millibars [mb])

Figure 1-1. General Site Location Map

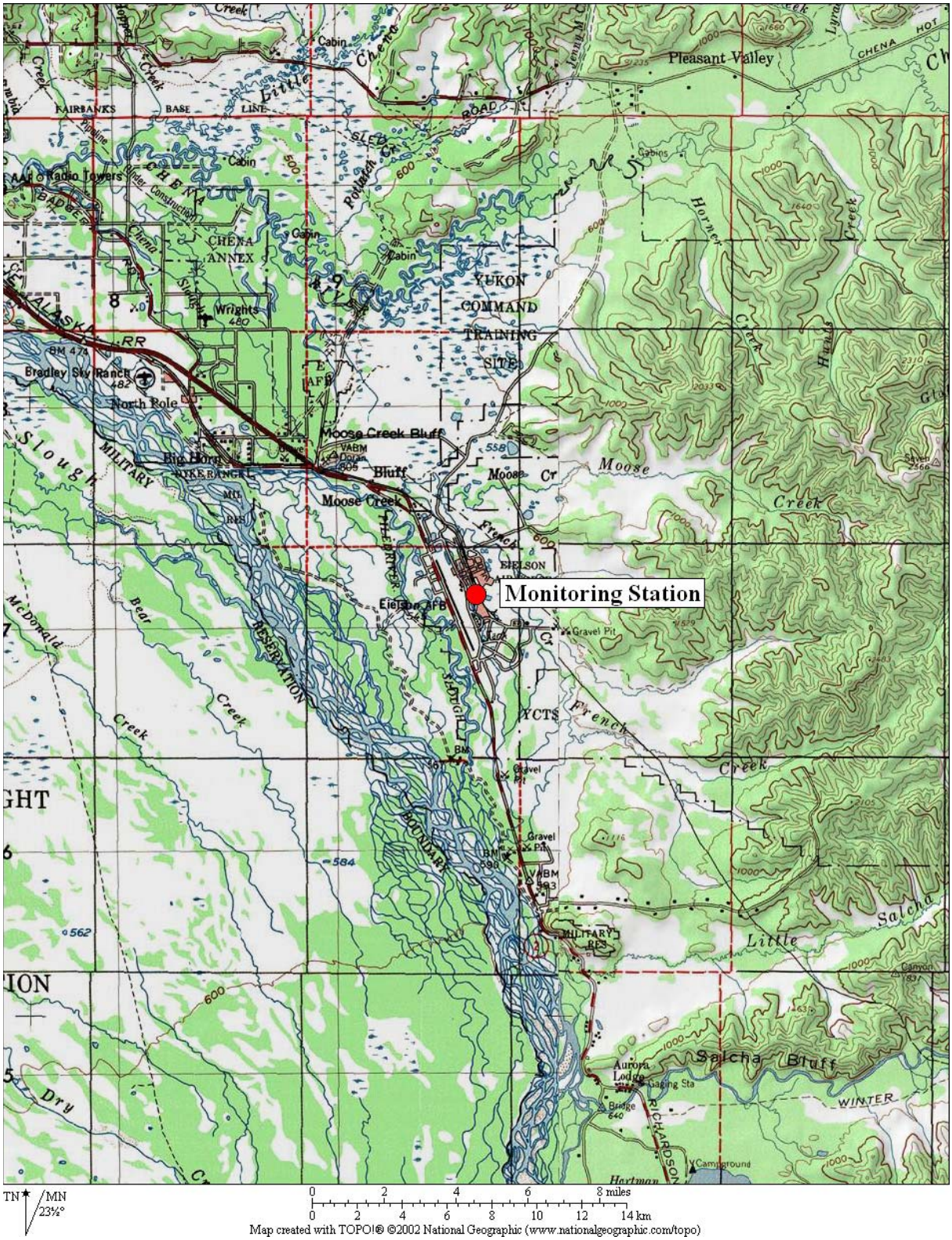


Figure 1-2. Specific Site Location Map

1.2 Measurement Methods

The data collected in this project include 1-hour average concentration data from the continuous SO_2, NO_2, CO, and O_3 gas analyzers and 24-hour average PM_{10} and $PM_{2.5}$ concentrations from filter-based manual samplers. All meteorological parameters were collected as hourly averages, except barometric pressure, which was recorded at the start of each hour.

A detailed listing of all parameters measured and the instrumentation is provided in Table 1-1 and Table 1-2. All instruments meet or exceed EPA PSD requirements for range accuracies, thresholds, response times, resolutions, damping ratios, and other performance measures.

Table 1-1. Air Quality Monitoring Equipment and Measurement Methods

Parameter	Measurement Method	Manufacturer	Manufacturer Model No.	EPA Accuracy Limits	Sample Frequency	Averaging Period	Range	Method Detection Limit/ Resolution
PM_{10}	Selective-size inlet, gravimetric analysis	Rupprecht & Patashnick	Partisol 2000	±10%	24-hour	24-hour	NA	2 µg/m^3
$PM_{2.5}$	Selective-size inlet, gravimetric analysis	Rupprecht & Patashnick	Partisol 2000	±10%	24-hour	24-hour	NA	2 µg/m^3
$NO/NO_X/NO_2$	Chemiluminescent and referential calculation	Horiba	APNA-360CE	±20%	continuous	1-hour	0 - 0.5 ppm	0.01 ppm
CO	Nondispersive cross modulation infrared analysis	Horiba	APMA-360CE	±20%	continuous	1-hour	0 - 50 ppm	1.0 ppm
O_3	Ultraviolet light absorption	Horiba	APOA-360CE	±20%	continuous	1-hour	0 - 0.5 ppm	0.01 ppm
SO_2	Ultraviolet fluorescence	Horiba	APSA-360CE	±20%	continuous	1-hour	0 - 0.5 ppm	0.01 ppm

Table 1-2. Meteorological Monitoring Equipment and Measurement Methods

Parameter	Measurement Method	Manufacturer	Manufacturer Model No.	EPA Accuracy Limits	Sample Frequency	Averaging Period	Range	Method Detection Limit/ Resolution
Wind Speed	3-cup propeller sensor w/ photochopper generating frequency output	Met One Instruments	010C	± (0.2m/s + 5%)	1-second	Hourly	0 – 44.7 m/s	0.1 m/s
Wind Direction	Vane-mounted potentiometer generating a voltage output	Met One Instruments	020C	± 5º	1-second	Hourly	0 - 360º	1°
Wind Sigma	15-minute root mean square values averaged to 1-hour values.	calculated	Yamartino Method	--	15-minute	Hourly	--	1°C
Temperature	Aspirated multi-stage solid-state thermistor	Met One Instruments	062A	± 0.5ºC	1-second	Hourly	-50ºC to +50ºC	0.02°C/m
Delta T	Dual thermistors located at two meters and at 10 meters	Met One Instruments	062A	±0.1 °C	1-second	Hourly	--	0.1 m/s
Relative Humidity	Capacitive polymer H chip in a motor-aspirated shield	Vaisala	HMP45AC	± 2 % RH	1-second	Hourly	0% - 100%	1 %RH
Solar Radiation	Silicon photovoltaic detector	Met One Instruments	096-1	±5%	1-second	Hourly	0-200 W/m^2	10 W/m^2
Barometric Pressure	Solid state pressure transducer	Met One Instruments	090D	± 3 mbar	1-hour	--	880 – 1084 mbar	0.5 mb

1.3 Variations from the Quality Assurance Project Plan (QAPP)

In the EAFB Air Monitoring Program QAPP, Version 2, the official monitoring period was expected to begin in May 2004. Due to start up problems, the actual monitoring period for meteorological data did not begin until July 1, 2004. Ambient air monitoring for SO_2, NO_2, CO, and O_3 is considered to have begun on August 1, 2004 due to NO_2 analyzer failure in July 2004. The monitoring period for PM_{10} and $PM_{2.5}$ began on October 1, 2004 due to sampling problems in August and September 2004.

The monitoring periods were selected to obtain the first 12 continuous calendar months of monitoring data. Because the three selected monitoring periods do not follow a calendar year, data are reported using monitoring quarters rather than calendar quarters.

Based on the selected monitoring periods, the initial station performance and systems audit occurred prior to when the monitoring periods actually begin. However, the initial systems and performance audit was conducted within 30 days of the initial operation date and all other systems and performance audits were performed in a timely manner. The final audits of all samplers and or sensors were conducted within 30 days of the ending date for that respective part of the monitoring program. ADEC approval of the QAPP is pending.

The site technicians provided by the USAF and named in the QAPP changed throughout the monitoring period due to military operational rotations and deployments. The HCG personnel involved it the project also varied from the original Project/Task Organization provided in the QAPP. Katie Baltus took on the duties of the Quality Assurance manager. Jared Cockman and Kathryn Kaufman shared responsibilities as Data Managers.

There were no other variations from the QAPP.

2.0 STATION PERFORMANCE SUMMARY

This section provides a summary of events significant to monitoring station performance and as well as those contributing to or detracting from data completeness, precision, and accuracy.

2.1 Significant Project Events

Significant project events for each parameter are summarized in Table 2-1.

2.2 Missing, Invalid and Adjusted Data

The data sets were carefully reviewed during the quality assurance process. Some data were removed as a result of activity (audit and calibration) at the monitoring site. Some data were flagged, but not removed. Flagged data are carefully examined, but are generally not removed unless the values are outside the normal range of variation, the values become almost constant for an unidentified reason, maintenance activity has occurred at the site, instruments have been damaged, or if the flags continue uninterrupted for an extended period without explanation.

2.3 Network Data Completeness

The data quality objective (DQO) for meteorological data completeness is 90 percent data capture per quarter for every parameter. Data completeness for the meteorological sensors is calculated by dividing the number of valid hours of data by the total number of hours during each monitoring quarter. The 90 percent data capture goal was met each quarter for all parameters. Data capture percentages are provided in Table 2-2.

The PSD goal for annual valid data recovery is 80 percent for all air quality parameters (PM_{10}, $PM_{2.5}$, and gas analyzers). Additionally, four consecutive quarters, each with at least 80 percent valid data recovery, should be obtained for a complete one-year database.

Quarterly data completeness for particulate monitoring and air quality analyzers are provided in Tables 2-3, 2-4, and 2-5 respectively. Calculations for determining data completeness are provided in Appendix A.

Table 2-1. Chronology of Significant Events

Date	Event or Comment
June 23-25, 2004	Initial systems and performance audit. Data communications established.
August 24-25, 2004	3rd quarter 2004 gas analyzer and particulate matter audits were completed.
October 8 -13, 2004	NO/NO_X calibration gas was accidentally shut off. The October 8th-12th calibrations for NO and NO_X were unsuccessful and invalid because no NO/NO_X calibration gas was available on those dates. Calibrations for the other analyzers were not affected
October 29-November 5, 2004	-NO/NOX calibration gas emptied due to a faulty fitting, so the October 29th-30th calibrations for NO/NO_X were unsuccessful and invalid. - NO/NOX replacement calibration cylinder installed, but the Environics calibrator was left out of remote mode. No calibrations for any analyzers occurred on November 1st or 2nd. On November 5th, 2004, the NO_X monitoring system problems were resolved and a multi-point calibration of the gas analyzer was conducted.
December 29-30, 2004	4th quarter 2004 air quality audits and semiannual meteorological audits conducted. Gas analyzer calibration, gas cylinders swapped out, and manual gas analyzer precision checks completed.
March 8-10, 2005	1st quarter 2005 gas analyzer and particulate matter audits completed.
April 26 – June 14, 2005	During this period the sample manifold was left disconnected. All gas analyzer data for this period is considered to be invalid or suspect.
June 13-14, 2005	2nd quarter 2005 gas analyzer and particulate matter audits as well as the semiannual meteorological audit were conducted. The gas analyzers were calibrated and underwent manual precision checks.
August 16, 2005	3rd quarter 2005 particulate matter audits completed and meteorological data were downloaded.

Table 2-2. Quarterly Data Completeness - Meteorological Monitoring

Period	Meteorological							
	Temp 2m	Temp 10m	WS	WD	Sigma	RH	Solar	BP
Jul-04	100.0%	100.0%	98.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Aug-04	100.0%	100.0%	98.5%	100.0%	100.0%	100.0%	100.0%	100.0%
Sep-04	100.0%	100.0%	99.0%	100.0%	100.0%	100.0%	100.0%	100.0%
1st Monitoring Quarter	**100.0%**	**100.0%**	**98.5%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Oct-04	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Nov-04	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Dec-04	99.6%	99.6%	99.6%	99.6%	99.6%	99.7%	100.0%	100.0%
2nd Monitoring Quarter	**99.9%**	**99.9%**	**99.9%**	**99.9%**	**99.9%**	**99.7%**	**100.0%**	**100.0%**
Jan-05	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Feb-05	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Mar-05	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
3rd Monitoring Quarter	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Apr-05	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
May-05	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Jun-05	99.7%	99.7%	98.6%	98.6%	98.6%	99.7%	100.0%	100.0%
4th Monitoring Quarter	**99.9%**	**99.9%**	**99.5%**	**99.5%**	**99.5%**	**99.9%**	**100.0%**	**100.0%**
Annual	**99.9%**	**99.9%**	**99.5%**	**99.5%**	**99.9%**	**100.0%**	**100.0%**	**100.0%**

Table 2-3. Quarterly Data Completeness – PM_{10}

Period	Main	Co-located	Combined
Oct-04	90.9%	83.3%	90.9%
Nov-04	77.8%	60.0%	77.8%
Dec-04	81.8%	60.0%	81.8%
1st Monitoring Quarter	**83.9%**	**68.8%**	**83.9%**
Jan-05	100.0%	100.0%	100.0%
Feb-05	100.0%	100.0%	100.0%
Mar-05	100.0%	80.0%	100.0%
2nd Monitoring Quarter	**100.0%**	**93.3%**	**100.0%**
Apr-05	100.0%	100.0%	100.0%
May-05	100.0%	100.0%	100.0%
Jun-05	90.0%	100.0%	90.0%
3rd Monitoring Quarter	**96.8%**	**100.0%**	**96.8%**
Jul-05	100.0%	100.0%	100.0%
Aug-05	100.0%	100.0%	100.0%
Sep-05	90.0%	100.0%	100.0%
4th Monitoring Quarter	**96.8%**	**100.0%**	**100.0%**
Annual	**94.3%**	**90.2%**	**95.1%**

Table 2-4. Quarterly Data Completeness – $PM_{2.5}$

Period	Main	Co-located	Combined
Oct-04	90.0%	100.0%	90.0%
Nov-04	100.0%	100.0%	100.0%
Dec-04	100.0%	60.0%	100.0%
1st Monitoring Quarter	**96.8%**	**86.7%**	**96.8%**
Jan-05	100.0%	100.0%	100.0%
Feb-05	100.0%	100.0%	100.0%
Mar-05	80.0%	100.0%	90.0%
2nd Monitoring Quarter	**93.3%**	**100.0%**	**96.8%**
Apr-05	100.0%	100.0%	100.0%
May-05	100.0%	100.0%	100.0%
Jun-05	90.0%	100.0%	90.0%
3rd Monitoring Quarter	**96.8%**	**100.0%**	**96.8%**
Jul-05	100.0%	80.0%	100.0%
Aug-05	100.0%	100.0%	100.0%
Sep-05	100.0%	100.0%	100.0%
4th Monitoring Quarter	**100.0%**	**93.3%**	**100.0%**
Annual	**96.7%**	**95.0%**	**97.5%**

Table 2-5. Quarterly Data Completeness - Gas Analyzers

Data Recovery						
Period	**NO**	**NO_2**	**NO_X**	**CO**	**SO_2**	**O_3**
Aug-04	93.8%	93.8%	93.8%	94.6%	94.8%	83.3%
Sep-04	94.9%	94.9%	94.9%	95.6%	95.3%	95.6%
Oct-04	95.6%	95.6%	95.6%	95.7%	95.6%	95.8%
1st Monitoring Quarter	**94.7%**	**94.7%**	**94.7%**	**95.3%**	**95.2%**	**91.5%**
Nov-04	81.8%	81.8%	81.8%	88.9%	88.8%	89.0%
Dec-04	94.0%	94.0%	94.0%	94.4%	94.1%	94.9%
Jan-05	95.2%	95.2%	95.2%	95.6%	95.6%	94.5%
2nd Monitoring Quarter	**90.4%**	**90.4%**	**90.4%**	**93.0%**	**92.8%**	**92.8%**
Feb-05	95.4%	95.4%	95.4%	95.8%	95.8%	95.8%
Mar-05	92.5%	92.5%	92.5%	93.1%	93.1%	92.9%
Apr-05	81.5%	81.5%	81.5%	81.7%	81.7%	81.8%
3rd Monitoring Quarter	**89.7%**	**89.7%**	**89.7%**	**90.1%**	**90.1%**	**90.1%**
May-05	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Jun-05	24.4%	24.4%	24.4%	24.6%	24.6%	24.0%
Jul-05	70.2%	70.7%	70.2%	82.7%	70.4%	75.7%
4th Monitoring Quarter	**31.6%**	**31.8%**	**31.6%**	**35.9%**	**31.7%**	**33.3%**
Annual	**76.5%**	**76.6%**	**76.5%**	**78.5%**	**77.4%**	**76.8%**

2.4 Precision Statistics

2.4.1 Monitoring Network Precision Statistics

Individual precision statistics for particulate monitoring are provided in Table 2-6 and 2-7. Precision statistics were determined using the methods in 40 Code of Federal Regulation (CFR) Part 58, Appendix B.

Gas analyzer precision statistics are provided in Table 2-8. Early in the monitoring program, four of the individual precision check results for CO had results between -15 percent and -20 percent. All of the quarterly average CO analyzer precision checks were less than 15 percent as required. However, these seemingly poor individual CO precision checks were caused by the station's automatic precision check feature not running the CO calibration gas long enough to provide more representative results.

Each of the *manual* CO precision checks during this timeframe of August 2004 through November 2004 gave much lower precision checks (approximately 7 percent low) than the *automatic* precision check results (which varied from 6 percent low to 19 percent low). The different automatic precision check results (versus the manual precision check results) were due to the fixed amount of time the CO calibration gas was allowed to flow during an automatic precision check. During each manual precision check, the CO calibration gas was allowed to flow as much time as was needed to produce a stable reading. This problem of insufficient time settings for the CO calibration gas was permanently corrected on December 29, 2004, when a multiple component gas cylinder and new precision check timing sequences were incorporated into the Eielson monitoring system.

Table 2-6. PM_{10} Monitoring Network Precision Statistics

Period	Main ($\mu g/m^3$)	Co-located ($\mu g/m^3$)	Percent Difference	Average Percent Difference	Standard Deviation	Upper 95% Limit	Lower 95% Limit
1st Monitoring Quarter							
10/1/04	6	5	-18	-7.33	31.4	36.1	-50.8
10/6/04	24	9	-91				
10/12/04	18	20	11				
10/18/04	7	8	13				
10/24/04	11	10	-10				
10/30/04	6	5	-18				
11/5/04	7	7	0				
11/11/04	4	3	-29				
11/17/04	7	Invalid	-				
11/23/04	1	Invalid	-				
11/29/04	13	14	7				
12/5/04	6	7	15				
12/11/04	5	Invalid	-				
12/17/04	13	18	32				
12/23/04	7	7	0				
12/29/04	11	Invalid	-				
2nd Monitoring Quarter							
1/4/05	9	9	0	11.1	38.9	64.9	-42.8
1/10/05	2	8	120				
1/16/05	7	4	-55				
1/22/05	8	14	-55				
1/28/04	11	11	0				
2/3/05	14	14	0				
2/9/05	11	11	0				
2/15/05	12	12	0				
2/21/05	9	9	0				
2/27/05	8	10	22				
3/5/05	5	Invalid	-				
3/11/05	7	7	0				
3/17/05	10	9	-11				
3/23/05	20	23	15				
3/29/05	10	11	10				

Table 2-6 (continued). PM_{10} Monitoring Network Precision Statistics

Period	Main ($\mu g/m^3$)	Co-located ($\mu g/m^3$)	Percent Difference	Average Percent Difference	Standard Deviation	Upper 95% Limit	Lower 95% Limit
3rd Monitoring Quarter							
4/4/05	8	9	12	1.0	18.3	25.9	-24.7
4/10/05	8	7	-13				
4/16/05	13	13	0				
4/22/05	19	23	19				
4/28/05	20	20	0				
5/4/05	16	16	0				
5/10/05	23	20	-14				
5/16/05	9	8	-12				
5/22/05	7	5	-33				
5/28/05	6	10	50				
6/3/05	6	6	0				
6/9/05	40	40	0				
6/15/05	14	15	7				
6/21/05	22	21	-5				
6/27/05	54	53	-2				
4th Monitoring Quarter							
7/3/05	6	7	15	-6.3	39.6	48.6	-61.1
7/9/05	10	11	10				
7/15/05	26	26	0				
7/21/05	13	14	7				
7/27/05	51	51	0				
8/02/05	29	18	-47				
8/08/05	33	32	-3				
8/14/05	148	148	0				
8/20/05	188	182	-3				
8/26/05	10	7	-35				
9/1/05	17	6	-96				
9/7/05	2	5	86				
9/13/05	10	8	-22				
9/19/05	4	4	0				
9/25/05	Invalid	4	-				

Table 2-7. $PM_{2.5}$ Monitoring Network Precision Statistics

Period	Main ($\mu g/m^3$)	Co-located ($\mu g/m^3$)	Percent Difference	Average Percent Difference	Coefficient of Variation	Upper 95% Limit	Lower 95% Limit
1st Monitoring Quarter							
10/6/04	4.5	2.1	-73	5.3	3.8	5.7	2.9
10/12/04	2.8	2.8	0				
10/18/04	3.8	3.8	0				
10/24/04	3.2	3.1	-3				
10/30/04	3.3	3.4	3				
11/5/04	2.7	2.8	4				
11/11/04	3.0	2.6	-14				
11/17/04	5.0	4.9	-2				
11/23/04	3.0	13.1	125				
11/29/04	4.8	5.9	21				
12/5/04	3.7	Invalid	-				
12/11/04	4.1	Invalid	-				
12/17/04	4.7	7.8	50				
12/23/04	2.9	1.8	-47				
12/29/04	Invalid	7.4	-				
2nd Monitoring Quarter							
1/4/05	5.8	5.7	-2	6.4	4.5	6.6	3.5
1/10/05	6.9	9.5	32				
1/16/05	5.0	7.9	45				
1/22/05	6.1	6.6	8				
1/28/05	8.8	8.8	0				
2/3/05	11.3	11.1	-2				
2/9/05	7.9	7.8	-1				
2/15/05	4.6	5	2				
2/21/05	6.9	6.7	-3				
2/27/05	3.7	3.3	-11				
3/5/05	3.7	5.4	37				
3/11/05	2.0	2.5	22				
3/17/05	invalid	3.9	-				
3/23/05	7.9	5	-45				
3/29/05	4.0	4.3	7				

Table 2-7 (continued). $PM_{2.5}$ Monitoring Network Precision Statistics

Period	Main ($\mu g/m^3$)	Co-located ($\mu g/m^3$)	Percent Difference	Average Percent Difference	Coefficient of Variation	Upper 95% Limit	Lower 95% Limit
3rd Monitoring Quarter							
4/4/05	4.1	4.5	9	4.0	3.8	5.4	2.9
4/10/05	2.0	3.2	46				
4/16/05	3.1	2.8	-10				
4/22/05	4.1	5.0	20				
4/28/05	6.0	5.8	-3				
5/4/05	4.0	4.2	5				
5/10/05	17.7	4.5	-119				
5/16/05	2.3	3.0	26				
5/22/05	3.5	4.5	25				
5/28/05	2.0	3.2	46				
6/3/05	2.4	2.6	8				
6/9/05	8.4	8.4	0				
6/15/05	11.7	14.5	21				
6/21/05	18.7	15.7	-17				
6/27/05	40.9	40.5	-1				
4th Monitoring Quarter							
7/3/05	4.5	6.0	29	0.5	0.5	0.7	0.4
7/9/05	6.9	6.8	-1				
7/15/05	7.6	7.3	-4				
7/21/05	3.8	2.7	-34				
7/27/05	26.3	Invalid	-				
8/2/05	19.2	27.8	37				
8/8/05	17.5	18	3				
8/14/05	127.0	124.6	-2				
8/20/05	171.8	170.4	-1				
8/26/05	4.4	2.7	-48				
9/1/05	12.9	2.6	-133				
9/7/05	1.4	1.3	-7				
9/13/05	2.5	2.5	0				
9/19/05	0.5	1.3	89				
9/25/05	0.6	1.4	80				

Table 2-8. Gas Analyzer Monitoring Network Precision Statistics

Period	Type of Precision Check	NO							NO_2							NO_X						
		Analyzer Response (ppm)	Precision Gas Concentration (ppm)	Percent Difference	Average Percent Difference	Standard Deviation	Upper 95% Limit	Lower 95% Limit	Analyzer Response (ppm)	Precision Gas Concentration (ppm)	Percent Difference	Average Percent Difference	Standard Deviation	Upper 95% Limit	Lower 95% Limit	Analyzer Response (ppm)	Precision Gas Concentration (ppm)	Percent Difference	Average Percent Difference	Standard Deviation	Upper 95% Limit	Lower 95% Limit
1st Monitoring Quarter																						
8/9/2004	auto																					
8/12/2004	manual								0.0866	0.0897	-3.46											
8/23/2004	auto																					
8/24/2004	manual	0.0926	0.10	-7.40					0.0884	0.0885	-0.11					0.0959	0.10	-4.10				
9/6/2004	auto	0.094	0.10	-6.00												0.092	0.10	-8.00				
9/7/2004	manual								0.0839	0.0867	-3.23											
9/20/2004	auto	0.095	0.10	-5.00	-5.88	-0.99	-7.25	-4.51				-2.96	1.44	-0.96	-4.96	0.093	0.10	-7.00	-6.42	1.48	-4.37	-8.47
9/20/2004	manual								0.0843	0.0875	-3.66											
10/4/2004	auto	0.094	0.10	-6.00												0.093	0.10	-7.00				
10/7/2004	manual								0.083	0.0857	-3.15											
10/18/2004	auto	0.095	0.10	-5.00												0.094	0.10	-6.00				
10/20/2004	manual								0.0854	0.0891	-4.15											
2nd Monitoring Quarter																						
11/3/2004	manual																					
11/5/2004	manual	0.0963	0.10	-3.70					0.0889	0.0890	-0.11					0.0969	0.10	-3.10				
11/15/2004	auto																					
11/15/2004	neither	--	0.10													--	0.10					
11/16/2004	manual								0.0889	0.0897	-0.89											
11/29/2004	auto																					
12/1/2004	auto	0.0928	0.10	-7.20												0.0947	0.10	-5.30				
11/29/2004	manual								0.0872	0.0889	-1.91											
12/13/2004	auto	--	0.10													--	0.10					
12/16/2004	manual				-7.24	3.01	-3.07	-11.41	0.0898	0.0856	4.91	3.43	4.30	9.39	-2.54				-5.26	1.43	-3.28	-7.24
12/27/2004	auto																					
12/30/2004	manual	0.0937	0.10	-6.30												0.0941	0.10	-5.90				
12/28/2004	manual								0.0888	0.0839	5.84											
1/14/2005	auto	0.093	0.10	-7.00												0.095	0.10	-5.00				
1/18/2005	manual								0.0876	0.0812	7.88											
1/24/2005	auto	0.088	0.10	-12.00												0.093	0.10	-7.00				
1/28/2005	manual								0.089	0.0822	8.27											
1/24/2005	auto																					
3rd Monitoring Quarter																						
2/7/2005	auto	0.088	0.10	-12.00												0.095	0.10	-5.00				
2/3/2005	manual								0.089	0.0820	8.54											
2/21/2005	auto	0.088	0.10	-12.00												0.095	0.10	-5.00				
2/21/2005	manual								0.0904	0.0830	8.92											
3/7/2005	auto	0.088	0.10	-12.00												0.095	0.10	-5.00				
3/7/2005	manual								0.0930	0.0821	13.28											
3/21/2005	auto	0.086	0.10	-14.00												0.092	0.10	-8.00				
3/21/2005	manual				-12.43	1.13	-10.86	-14.00	0.0868	0.0829	4.70	6.68	4.07	12.33	1.03				-5.57	1.40	-3.63	-7.51
4/4/2005	auto	0.089	0.10	-11.00												0.096	0.10	-4.00				
4/4/2005	manual								0.0883	0.0825	7.03											
4/18/2005	auto	0.086	0.10	-14.00												0.093	0.10	-7.00				
4/30/2005	manual								0.0854	0.0827	3.26											
5/2/2005	auto	0.088	0.10	-12.00												0.095	0.10	-5.00				
4/30/2005	manual								0.0882	0.0873	1.03											
4th Monitoring Quarter																						
5/16/2005	auto	0.087	0.10	-13.00												0.095	0.10	-5.00				
5/19/2005	manual								0.0903	0.0850	6.24											
5/30/2005	auto	0.087	0.10	-13.00												0.095	0.10	-5.00				
6/1/2005	manual								0.09	0.0818	10.02											
6/15/2005	manual	0.076	0.08	-5.00	-9.72	4.99	16.63	-16.63	0.0969	0.0972	-0.31	3.13	4.62	9.53	-3.27	0.0763	0.08	-4.62	-5.05	1.23	-3.33	-6.76
6/28/2005	manual	0.0964	0.10	-3.60					0.084	0.0857	-1.98					0.0964	0.10	-3.60				
7/11/2005	auto	0.086	0.10	-14.00												0.093	0.10	-7.00				
7/21/2005	manual								0.0874	0.0835	4.67											
7/28/2005	manual								0.0819	0.0818	0.12											

Table 2-8. (continued). Gas Analyzer Monitoring Network Precision Statistics

Period	Type of Precision Check	CO							SO_2							O_3						
		Analyzer Response (ppm)	Precision Gas Concentration (ppm)	Percent Difference	Average Percent Difference	Standard Deviation	Upper 95% Limit	Lower 95% Limit	Analyzer Response (ppm)	Precision Gas Concentration (ppm)	Percent Difference	Average Percent Difference	Standard Deviation	Upper 95% Limit	Lower 95% Limit	Analyzer Response (ppm)	Precision Gas Concentration (ppm)	Percent Difference	Average Percent Difference	Standard Deviation	Upper 95% Limit	Lower 95% Limit
1st Monitoring Quarter																						
8/9/2003	auto	8.065	10.000	-19.35												0.1000	0.10	0.00				
8/12/2004	manual								0.0932	0.10	-6.80											
8/23/2004	auto															0.094	0.10	-6.00				
8/24/2004	manual	9.313	10.000	-6.87					0.0937	0.10	-6.30											
9/6/2004	auto	8.674	10.000	-13.26												0.097	0.10	-3.00				
9/7/2004	manual								0.0939	0.10	-6.10											
9/20/2004	auto	8.359	10.000	-16.41	-13.10	5.59	-5.35	-20.85				-6.20	0.47	-5.54	-6.86	0.094	0.10	-6.00	-3.17	2.48	0.28	-6.61
9/20/2004	manual								0.0934	0.10	-6.60											
10/4/2004	auto	8.312	10.000	-16.88												0.097	0.10	-3.00				
10/7/2004	manual								0.0945	0.10	-5.50											
10/18/2004	auto	9.419	10.000	-5.81												0.099	0.10	-1.00				
10/20/2004	manual								0.0941	0.10	-5.90											
2nd Monitoring Quarter																						
11/3/2004	manual	9.326	10.000	-6.74					0.0925	0.10	-7.50					0.0875	0.10	-12.50				
11/5/2004	manual																					
11/15/2004	auto	8.819	10.000	-11.81												0.101	0.10	1.00				
11/15/2004	neither																					
11/16/2004	manual								0.0965	0.10	-3.50											
11/29/2004	auto	8.199	10.000	-18.01												0.095	0.10	-5.00				
12/1/2004	auto																					
11/29/2004	manual								0.095	0.10	-5.00											
12/13/2004	auto	8.729	10.000	-12.71												0.101	0.10	1.00				
12/16/2004	manual				-9.88	4.57	-3.54	-16.21	0.0952	0.10	-4.80	-5.07	1.66	-2.77	-7.38				-2.36	4.99	4.56	-9.27
12/27/2004	auto															0.101	0.10	1.00				
12/30/2004	manual	9.25	10.000	-7.50																		
12/28/2004	manual								0.097	0.10	-3.00											
1/14/2005	auto	9.535	10.000	-4.65												0.1	0.10	0.00				
1/18/2005	manual								0.0953	0.10	-4.70											
1/24/2005	auto	9.228	10.000	-7.72												0.098	0.10	-2.00				
1/28/2005	manual																					
1/24/2005	auto								0.093	0.10	-7.00											
3rd Monitoring Quarter																						
2/7/2005	auto	9.201	10.000	-7.99					0.093	0.10	-7.00					0.098	0.10	-2.00				
2/3/2005	manual																					
2/21/2005	auto	9.077	10.000	-9.23					0.094	0.10	-6.00					0.098	0.10	-2.00				
2/21/2005	manual																					
3/7/2005	auto	9.021	10.000	-9.79					0.092	0.10	-8.00					0.098	0.10	-2.00				
3/7/2005	manual																					
3/21/2005	auto	8.963	10.000	-10.37	-8.95	1.29	-7.15	-10.74	0.095	0.10	-5.00	-5.71	1.38	-3.80	-7.63	0.096	0.10	-4.00	-2.29	1.25	-0.55	-4.02
3/21/2005	manual																					
4/4/2005	auto	9.289	10.000	-7.11					0.095	0.10	-5.00					0.097	0.10	-3.00				
4/4/2005	manual																					
4/18/2005	auto	8.973	10.000	-10.27					0.095	0.10	-5.00					0.097	0.10	-3.00				
4/30/2005	manual																					
5/2/2005	auto	9.214	10.000	-7.86					0.096	0.10	-4.00					0.1	0.10	0.00				
4/30/2005	manual																					
4th Monitoring Quarter																						
5/16/2005	auto	8.986	10.000	-10.14					0.094	0.10	-6.00					0.099	0.10	-1.00				
5/19/2005	manual																					
5/30/2005	auto	9.132	10.000	-8.68					0.095	0.10	-5.00					0.099	0.10	-1.00				
6/1/2005	manual																					
6/15/2005	manual	9.602	10.000	-3.98	-7.02	3.02	-2.83	-11.20	0.097	0.10	-3.00	-4.22	1.31	-2.40	-6.03	0.1037	0.10	1.27	-0.53	1.00	0.87	-1.92
6/28/2005	manual	9.643	10.000	-3.57					0.0964	0.10	-3.60					0.0991	0.10	-0.90				
7/11/2005	auto	9.129	10.000	-8.71					0.095	0.10	-5.00					0.099	0.10	-1.00				
7/21/2005	manual																					
7/28/2005	manual								0.0973	0.10	-2.70											

2.4.2 Analytical Laboratory Precision Statistics for Gravimetric Analysis

Analytical laboratory precision for gravimetric PM_{10} and $PM_{2.5}$ samplers is assessed and reported in Appendix B. Replicate sample data is presented in Part I of Table 2-9 below. Part II of Table 2-9 provides data on the filter conditioning environment.

Table 2-9. Analytical Laboratory Precision – Part I

Period		PM_{10}		$PM_{2.5}$	
		Replicate Sample Measurements Pre-Exposure	Replicate Sample Measurements Post-Exposure	Replicate Sample Measurements Pre-Exposure	Replicate Sample Measurements Post-Exposure
1st Monitoring Quarter	No. of Precision Checks	6	6	6	7
	Average Difference (mg)	-0.002	-0.006	-0.001	-0.001
	Maximum Difference (mg)	-0.006	-0.015	-0.003	-0.003
2nd Monitoring Quarter	No. of Precision Checks	6	4	7	8
	Average Difference (mg)	-0.005	0.007	-0.002	-0.003
	Maximum Difference (mg)	-0.017	0.011	-0.006	-0.010
3rd Monitoring Quarter	No. of Precision Checks	5	5	6	4
	Average Difference (mg)	-0.009	0.003	-0.002	-0.001
	Maximum Difference (mg)	-0.012	-0.008	-0.006	0.004
4th Monitoring Quarter	No. of Precision Checks	5	5	7	13
	Average Difference (mg)	-0.006	0.009	-0.002	-0.003
	Maximum Difference (mg)	-0.013	0.033	-0.003	-0.013

Table 2-9. Analytical Laboratory Precision – Part II

Period		PM_{10}		$PM_{2.5}$	
		Temperature (˚C)	Relative Humidity (%)	Temperature (˚C)	Relative Humidity (%)
1st Monitoring Quarter	Minimum	19.0	39.1	20.7	34.9
	Maximum	21.0	40.1	21.9	37.0
	Average	20.6	39.5	21.1	35.9
2nd Monitoring Quarter	Minimum	19.1	37.9	20.9	35.4
	Maximum	21.0	40.0	21.7	36.4
	Average	20.7	39.3	21.1	36.0
3rd Monitoring Quarter	Minimum	20.3	38.9	20.7	34.9
	Maximum	23.0	41.2	22.0	38.7
	Average	21.5	39.5	21.2	36.1
4th Monitoring Quarter	Minimum	21.6	38.7	20.8	34.5
	Maximum	23.0	40.9	22.1	38.6
	Average	22.7	39.8	21.8	35.9
Precision Criteria		20±3˚C	40±5%	20±3˚C	40±5%

2.4.3 Analytical Laboratory Precision Statistics for Lead Analysis

Not applicable.

2.5 Accuracy Statistics

These data summarize the results of the EAFB ambient monitoring program quality control and quality assurance checks. Also included are summaries of the performance and systems audits performed on the monitoring station over the course of the monitoring period. The site was installed in April and May 2004, and the initial performance and system audit was conducted at that time. Due to equipment malfunctions and communications issues, ongoing data collection for the purposes of this annual report did not begin until several months later. The ongoing quality assurance and independent audits results outlined below serve to demonstrate that the procedures for collecting ambient gaseous data, meteorological data, and particulate matter measurements at EAFB meet the requirements as set forth by EPA and ADEC.

2.5.1 Instrument Calibration Statistics

Tables 2-10 and 2-11 summarize the monthly quality control checks of the particulate matter samplers. These manual QC checks are conducted by on-site personnel and the data are transmitted to the HCG Anchorage office.

Multi-point calibration data for the gas analyzers is provided in Appendix C-1. Multi-point calibrations were used to establish or verify the linearity of the gas analyzers. Level 1 zero/span calibration data and graphs are also presented in Appendix C-1. Level 1 zero and span calibrations of the continuous gas analyzers were conducted daily during the monitoring period. These two-point analyzer calibrations were used to assess whether the instruments were properly operating and were conducted by challenging the analyzers with a test atmosphere containing zero concentration of the pollutant, and with a test atmosphere containing a concentration of between 70 and 90 percent of the full measurement range in which the analyzer was operating. The challenge gas was sampled through as much of the sample inlet system as practical to mimic actual sampling of ambient air. These Level 1 zero and span checks were programmed to occur automatically.

Table 2-10. PM_{10} QC Check Accuracy

Period	Date	Flow Transfer Standard Value	Sampler Indicated Reading	Percent Difference	Average Percent Difference	Standard Deviation
1st Monitoring Quarter	10/16/04	16.7	16.6	-0.6	-0.4	0.3
	11/13/04	16.7	16.7	0.0		
	12/10/04	16.7	16.6	-0.6		
2nd Monitoring Quarter	1/5/05	16.7	16.9	1.2	-0.2	1.0
	2/1/05	16.7	16.7	0.0		
	2/28/05	16.7	16.5	-1.2		
	3/28/05	16.6	16.5	-0.6		
3rd Monitoring Quarter	4/24/05	16.7	16.8	0.6	0.3	0.4
	5/31/05	16.8	16.8	0.0		
4th Monitoring Quarter	7/2/05	16.5	16.6	0.6	1.0	0.7
	8/3/05	16.4	16.5	0.6		
	9/2/05	16.4	16.7	1.8		

Table 2-11. $PM_{2.5}$ QC Check Accuracy

Period	Date	Flow Transfer Standard Value	Sampler Indicated Reading	Percent Difference	Average Percent Difference	Standard Deviation
1st Monitoring Quarter	10/16/04	16.7	16.5	-1.2	-0.4	0.9
	11/13/04	16.6	16.7	0.6		
	12/10/04	16.7	16.6	-0.6		
2nd Monitoring Quarter	1/5/05	16.7	16.6	-0.6	0.2	0.6
	2/1/05	16.6	16.7	0.6		
	2/28/05	16.6	16.7	0.6		
	3/28/05	16.7	16.7	0.0		
3rd Monitoring Quarter	4/24/05	16.5	16.7	1.2	-0.3	2.1
	5/31/05	16.7	16.4	-1.8		
4th Monitoring Quarter	7/2/05	16.6	16.6	0.0	0.6	0.6
	8/3/05	16.6	16.8	1.2		
	9/2/05	16.8	16.9	0.6		

2.5.2 Independent Quality Assurance Audits

The initial systems audit was conducted for the Eielson Ambient Air and Meteorological Monitoring Program on June 23, 2004. An evaluation of the systems audit revealed that HCG has the necessary organization, practical field experience, work facilities, and data processing procedures in place to accurately collect and report ambient air quality data for the Eielson Ambient Air Monitoring project. HCG's staff is experienced and capable. The workspace and facilities are adequate for the project's current needs. The air monitoring station appears to be sited at the best available location for obtaining the desired air quality data. The pollution instrument inlet probes and meteorological sensors meet EPA siting requirements. HCG has an effective QA/QC program in place that follows recommended guidelines. The complete technical systems audit reports are available in Appendix C-3.

Meteorological Monitoring

The first performance audit was conducted on June 23, 2004. During each performance audit, the value of each meteorological sensor is compared to the output value from the appropriate piece of audit equipment or from calibrated instruments co-located with the sensor. The difference between the station value for each reading and the predicted value is compared with established PSD limits to assess instrument accuracy. The results of this audit are presented in Table 2-12. The audit results for the relative humidity sensor on June 23, 3004 and June 13, 2005 indicate that the relative humidity sensor failed the performance audit specification of + 1.5 C˚ dew point. The relative humidity was found to be within 0.1˚C dew point range during a calibration check on November 5, 2004. The same relative humidity sensor passed the audit on December 29, 2004. Despite this apparent audit failure in June 2005, the relative humidity data appears to be valid and consistent. For this reason, the relative humidity sensor is believed to have functioned properly throughout the one year monitoring program. While no relative humidity data were removed from the data set, it should be noted that this data may be considered suspect. Appendix C-3 contains the complete performance audit.

Table 2-12. Meteorological Performance Audit Summary – June 23, 2004

Parameter	EPA/ Manufacturer Limit	Units	Maximum Reading	Pass/Fail
Wind Direction Alignment	≤ ±5	degree	3.8	Pass
Wind Direction Accuracy	≤ ±5	degree	3.1	Pass
Wind Direction Linearity	≤ ±3	degree	1.9	Pass
Wind Direction Torque	≤ 0.090	oz-in	NC	--
Wind Speed Accuracy	≤ ±0.2 + 5%	m/s	0.06	Pass
Wind Speed Torque	≤ 0.003	oz-in	<0.003	Pass
Air Temperature Accuracy	≤ ±0.5	°C	0.11	Pass
Vertical Air Temperature Difference	≤ ±0.1	°C	0.03	Pass
Relative Humidity (dewpoint)	≤ ±1.5	°C	2.8	Fail
Solar Radiation	≤ ±5	% obs	--	--
Barometric Pressure	≤ ±0.3	kPa	0.03	Pass

Additional performance audits were performed on December 29, 2004 and June 13, 2005. Each sensor was checked with certified audit equipment, and the starting torque for the wind vane and anemometer were tested. The wind direction alignment, linearity, and starting torque were audited after removing the wind vane. The main temperature thermistor was checked against a National Institute of Standards and Technology (NIST) traceable digital thermometer to determine relative accuracy. Relative humidity was audited using a co-located NIST traceable RH sensor. The barometric pressure sensor was audited by comparing the output readings of the field sensor to the output of a NIST-traceable barometric pressure/altimeter sensor. All audit results were compared to the appropriate EPA limits to determine accuracy. The results of the performance audits are presented in Tables 2-13 and 2-14. Appendix C-3 contains the complete performance audits.

Table 2-13. Meteorological Performance Audit Summary – December 29, 2004

Parameter	EPA/ Manufacturer Limit	Units	Maximum Reading	Pass/Fail
Wind Direction Alignment	≤ ±5	degree	3.4	Pass
Wind Direction Accuracy	≤ ±5	degree	3.1	Pass
Wind Direction Linearity	≤ ±3	degree	-2.2	Pass
Wind Direction Torque	≤ 0.090	oz-in	0.06	--
Wind Speed Accuracy	≤ ±0.2 + 5%	m/s	0.53	Pass
Wind Speed Torque	≤ 0.003	oz-in	<0.003	Pass
Air Temperature Accuracy	≤ ±0.5	°C	0.19	Pass
Vertical Air Temperature Difference	≤ ±0.1	°C	-0.07	Pass
Relative Humidity (dewpoint)	≤ ±1.5	°C	0.14	Pass
Solar Radiation	≤ ±5	% obs	--	--
Barometric Pressure	≤ ±0.3	kPa	-0.237	Pass

Table 2-14. Meteorological Performance Audit Summary – June 13, 2005

Parameter	EPA/ Manufacturer Limit	Units	Maximum Reading	Pass/Fail
Wind Direction Alignment	≤ ±5	degree	4.7	Pass
Wind Direction Accuracy	≤ ±5	degree	2.5	Pass
Wind Direction Linearity	≤ ±3	degree	1.2	Pass
Wind Direction Torque	≤ 0.090	oz-in	<0.06	Pass
Wind Speed Accuracy	≤ ±0.2 + 5%	m/s	0.09	Pass
Wind Speed Torque	≤ 0.003	oz-in	<0.003	Pass
Air Temperature Accuracy	≤ ±0.5	°C	0.13	Pass
Vertical Air Temperature Difference	≤ ±0.1	°C	0.10	Pass
Relative Humidity (dewpoint)	≤ ±1.5	°C	3.18	Fail
Solar Radiation	≤ ±5	% obs	--	--
Barometric Pressure	≤ ±0.3	kPa	0.237	Pass

Air Quality Monitoring

The initial systems and performance audit of the ambient air monitoring network at EAFB was conducted on June 23, 2004. PM_{10} and $PM_{2.5}$ sampler flow audits were also conducted once per quarter throughout the monitoring period. The combination of systems and performance audits constitute a comprehensive evaluation of a monitoring system. The auditing methods used in these audits are consistent with guidelines published by the EPA and ADEC.

Each of the particulate matter flow audits passed the applicable criteria specified in the project QAPP. The PM_{10} flow audit criteria specified in the QAPP are: (a) sampler display flow rate ±7 percent of Transfer Standard QC flow rate, and (b) the Transfer Standard QC flow rate ±7 percent of design 16.67 L/min flow rate. Similarly, the $PM_{2.5}$ flow audit criteria specified in the QAPP are: (a) sampler display flow rate ±4 percent of Transfer Standard QC flow rate, and (b) the Transfer Std QC flow rate ±5 percent of design 16.67 L/min flow rate. The results of these performance audits are summarized in Table 2-15. Applicable audit reports are provided in Appendix E.

Table 2-15. Particulate Matter Performance Audit Accuracy

Project Monitoring Quarter		Audit Transfer Standard Flow Rate (l/min)	Sampler Indicated Reading (l/min)	Design Flow Rate (l/min)	Percent Difference (from Audit Flow Rate)	Percent Difference (from Design Flow Rate)	Average Percent Difference	Standard Deviation	Upper 95% Limit	Lower 95% Limit
PM_{10}										
Primary Sampler	1Q	16.84	16.7	16.67	-0.8	1.0	-1.3	2.0	-3.2	0.6
	2Q	17.16	16.6	16.67	-3.3	2.9				
	3Q	16.4	16.6	16.67	1.2	-1.6				
	4Q	17.1	16.7	16.67	-2.3	2.6				
Co-located Sampler	1Q	16.78	16.7	16.67	-0.5	0.7	0.9	2.8	4.8	-3.0
	2Q	17.3	16.7	16.67	-3.5	3.8				
	3Q	17.2	16.7	16.67	-2.9	3.2				
	4Q	17.12	16.7	16.67	-2.5	2.7				
$PM_{2.5}$										
Primary Sampler	1Q	16.79	16.7	16.67	-0.5	0.7	-1.4	0.9	-2.2	-0.5
	2Q	16.9	16.7	16.67	-1.2	1.4				
	3Q	16.9	16.7	16.67	-1.2	1.4				
	4Q	17.14	16.7	16.67	-2.6	2.8				
Co-located Sampler	1Q	16.73	16.7	16.67	-0.2	0.4	-1.2	1.4	-2.5	0.2
	2Q	16.97	16.7	16.67	-1.6	1.8				
	3Q	16.7	16.7	16.67	0.0	0.2				
	4Q	17.2	16.7	16.67	-2.9	3.2				

The $NO/NO_X/NO_2$ continuous gaseous analyzer is audited in three stages. First, the NO and NO_X channels of the gaseous analyzer are audited with known concentrations of NO. Next, the analyzer NO_2 channel is audited by generating three NO_2 concentration ranges specified by EPA. The percent difference between the expected concentration of NO_2 and the concentration displayed by the analyzer is calculated to determine the analyzer accuracy. Finally, for each NO_2 concentration generated during the NO_2 audit, the NO_X channel percent converter efficiency (CE) is tested. The Environics 6103 dynamic dilution system is used to generate CO concentrations in air for auditing the Horiba CO, O_3 and SO_2 continuous gaseous analyzer.

All audit results were compared to the appropriate EPA limits to determine accuracy. Performance audit results are summarized in Tables 2-16 through 2-19. Appendix C-3 contains the complete performance audits.

Table 2-16. Gas Analyzer Performance Audit Summary – August 24, 2004

Analyzer	Point 1	Point 2	Point 3	Average Percent Difference	Standard Deviation	Upper 95% Limit	Lower 95% Limit
NO_x							
Input (ppm)	0.075	0.182	0.395	4.33	4.65	10.78	-2.11
Response (ppm)	0.0771	0.1995	0.3981				
Accuracy (%)	2.6	9.6	0.8				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
NO							
Input (ppm)	0.078	0.186	0.390	-0.9	5.20	6.30	-8.10
Response (ppm)	0.0747	0.1950	0.3783				
Accuracy (%)	-4.8	5.0	-2.9				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
CO							
Input (ppm)	7.854	18.753	37.895	4.93	4.53	11.22	-1.35
Response (ppm)	7.830	20.20	40.69				
Accuracy (%)	-0.3	7.7	7.4				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
O_3							
Input (ppm)	0.077	0.186	0.399	0.53	7.54	10.98	-9.92
Response (ppm)	0.081	0.192	0.367				
Accuracy (%)	6.3	3.3	-8.0				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
SO_2							
Input (ppm)	0.077	0.193	0.388	-0.13	5.82	7.94	-8.21
Response (ppm)	0.072	0.196	0.406				
Accuracy (%)	-6.6	1.5	4.7				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				

Table 2-17. Gas Analyzer Performance Audit Summary – December 29, 2004

Analyzer	Point 1	Point 2	Point 3	Average Percent Difference	Standard Deviation	Upper 95% Limit	Lower 95% Limit
NO_x							
Input (ppm)	0.0713	0.1665	0.3572	0.87	0.81	1.99	-0.25
Response (ppm)	0.0726	0.1672	0.3585				
Accuracy (%)	1.8	0.4	0.4				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
NO							
Input (ppm)	0.0713	0.1665	0.3572	0.33	0.59	1.15	-0.48
Response (ppm)	0.0720	0.1664	0.3574				
Accuracy (%)	1.0	-0.1	0.1				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
CO							
Input (ppm)	7.42	17.35	37.21	0.93	0.15	1.15	0.72
Response (ppm)	7.48	17.54	37.56				
Accuracy (%)	0.8	1.1	0.9				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
O_3							
Input (ppm)	0.0614	0.1740	0.3986	-11.60	0.53	-10.87	-12.33
Response (ppm)	0.0539	0.1542	0.354				
Accuracy (%)	-12.2	-11.4	-11.2				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
SO_2							
Input (ppm)	0.0748	0.1748	0.3750	5.13	0.65	6.04	4.23
Response (ppm)	0.0782	0.1838	0.3966				
Accuracy (%)	4.5	5.1	5.8				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				

Table 2-18. Gas Analyzer Performance Audit Summary – March 8, 2005

Analyzer	Point 1	Point 2	Point 3	Average Percent Difference	Standard Deviation	Upper 95% Limit	Lower 95% Limit
NO_x							
Input (ppm)	0.0799	0.1800	0.4497	-0.10	1.40	1.84	-2.04
Response (ppm)	0.0787	0.1798	0.4556				
Accuracy (%)	-1.5	-0.1	1.3				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
NO							
Input (ppm)	0.0799	0.1800	0.4497	-3.53	1.67	-1.23	-5.84
Response (ppm)	0.0756	0.1746	0.4397				
Accuracy (%)	-5.4	-3.0	-2.2				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
CO							
Input (ppm)	6.98	17.97	39.98	13.77	0.40	14.33	13.21
Response (ppm)	7.92	20.52	45.45				
Accuracy (%)	13.4	14.2	13.7				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
O_3							
Input (ppm)	0.0656	0.1750	0.3787	-7.13	2.87	-3.16	-11.11
Response (ppm)	0.0607	0.1579	0.3631				
Accuracy (%)	-7.5	-9.8	-4.1				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
SO_2							
Input (ppm)	0.07997	0.17973	0.40002	-14.30	2.82	-10.40	-18.20
Response (ppm)	0.0622	0.1503	0.3385				
Accuracy (%)	-11.1	-16.4	-15.4				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				

Table 2-19. Gas Analyzer Performance Audit Summary – June 13, 2005

Analyzer	Point 1	Point 2	Point 3	Average Percent Difference	Standard Deviation	Upper 95% Limit	Lower 95% Limit
NO_x							
Input (ppm)	0.0698	0.1749	0.3999	-1.73	1.03	-0.31	-3.16
Response (ppm)	0.068	0.1715	0.3977				
Accuracy (%)	-2.6	-2.0	-0.6				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
NO							
Input (ppm)	0.0698	0.1749	0.3999	-3.83	0.83	-2.68	-4.99
Response (ppm)	0.0667	0.1677	0.3885				
Accuracy (%)	-4.5	-4.1	-2.9				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
CO							
Input (ppm)	6.9830	17.4760	39.9856	0.87	0.95	2.18	-0.44
Response (ppm)	6.9680	17.6800	40.6300				
Accuracy (%)	-0.2	1.2	1.6				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
O_3							
Input (ppm)	0.0768	0.1747	0.3991	-1.77	5.44	5.78	-9.31
Response (ppm)	0.0802	0.1681	0.3756				
Accuracy (%)	4.4	-3.8	-5.9				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				
SO_2							
Input (ppm)	0.0700	0.1748	0.3999	-6.87	3.02	-2.69	-11.05
Response (ppm)	0.0642	0.1592	0.3863				
Accuracy (%)	-8.3	-8.9	-3.4				
EPA Limit: ±20%	**Pass**	**Pass**	**Pass**				

3.0 MONITORING DATA NETWORK SUMMARY

3.1 Air Quality Data Summary

A summary of the concentration of PM_{10} and $PM_{2.5}$ (micrograms per standard cubic meter [µg/m³]) measured at the monitoring station from October 1, 2004 through September 30, 2005 is provided in Table 3-1 and 3-2.

The annual average PM_{10} concentration for the main sampler was 19.0 µg/m^3. (The annual average PM_{10} concentration for the co-located sampler 18.7 µg/m^3.) These measured annual averages are in compliance with the maximum annual average concentration of 50 µg/m^3 as set forth in 18 Alaska Administrative Code (AAC) 50.010.

The AAAQS 24-hour average of 150 µg/m^3 was exceeded on four days in August 2005 during the fourth monitoring quarter. These measured PM_{10} values are valid but are not representative of normal conditions. Ambient PM_{10} concentrations were elevated above normal levels in August 2005 because of dense regional smoke from numerous and very large lightning-caused wildfires in Interior Alaska. This measured concentration, while greater than the applicable Alaska and National Ambient Air Quality Standards (NAAQS), does not represent a violation of those standards.

Table 3-1. AAAQS Ambient Air Monitoring – PM_{10}

Period	Average (µg/m^3)	1st High Value (µg/m^3)	2nd High Value (µg/m^3)	AAAQS
1st Monitoring Quarter	8	24	18	150 µg/m^3
Percent of AAAQS	5.3%	16.0%	12.0%	
2nd Monitoring Quarter	11	39	20	
Percent of AAAQS	7.3%	26%	13.3%	
3rd Monitoring Quarter	19	79	54	
Percent of AAAQS	12.6%	52.6%	36%	
4th Monitoring Quarter	38	148	52	
Percent of AAAQS	25.1%	98.6%	34.6%	
Annual	19	n/a	n/a	50 µg/m^3
Percent of AAAQS	38.0%			

The annual average $PM_{2.5}$ concentration for the main sampler was 11.1 µg/m^3 and for the co-located sampler 11.5 µg/m^3. These measured annual averages are in compliance with the maximum annual average concentration of 15 µg/m^3 as set forth in 18 AAC 50.010.

The AAAQS 24-hour average of 65 µg/m^3 was exceeded on four days during the fourth monitoring quarter. These measured $PM_{2.5}$ values are valid but are not representative of normal conditions. Ambient $PM_{2.5}$ concentrations were elevated above normal levels in August 2005 because of dense regional smoke from numerous and very large lightning-caused wildfires in Interior Alaska. This measured concentration, while greater than the applicable Alaska and National Ambient Air Quality Standards (NAAQS), does not represent a violation of those standards.

Table 3-2. AAAQS Ambient Air Monitoring – $PM_{2.5}$

Period	Average (µg/m^3)	1st High Value (µg/m^3)	2nd High Value (µg/m^3)	AAAQS
1st Monitoring Quarter	4.2	10.3	7.3	65 µg/m^3
Percent of AAAQS	6.4%	15.8%	11.2%	
2nd Monitoring Quarter	7.6	35.4	12.8	
Percent of AAAQS	11.7%	54.5%	19.7%	
3rd Monitoring Quarter	7.9	40.9	37.5	
Percent of AAAQS	12.2%	62.9%	57.7%	
4th Monitoring Quarter	24.4	31.6	26.3	
Percent of AAAQS	37.5%	48.6%	40.5%	
Annual	11.1	n/a	n/a	15 µg/m^3
Percent of AAAQS	74.0%			

3.2 Meteorological Data Summary

This section presents specific meteorological data for all parameters monitored. The monitoring period was from July 1, 2004 through June 30, 2005.

Wind Speed and Wind Direction Climatology

On an annual basis, winds were predominately from the southeast and east with a strong component from the southwest. During the first quarter, the winds were primarily from the west/southwest, with a smaller component from the southeast. The second quarter winds are dominated by a southeastern component along with a northern component. Winds in the third quarter were generally from the southeast and north. Strong westerly winds were predominant during the fourth quarter with southeast winds. The annual average wind speed was 1.61 meters per second (m/s). Table 3-3 provides a summary of the average wind speeds and the maximum wind speeds for each quarter. Annual and quarterly windroses are presented in Figures 3-1 through 3-5. Wind frequency distribution information is provided in Tables 3-4 through 3-8. The wind data are available in Appendix D.

Table 3.3. Average and Maximum Wind Speeds for Monitoring Period

Monitoring Quarter	Average Hourly Wind Speeds (m/s)	Maximum Hourly Wind Speed (m/s)
First (3rd Quarter 2004)	1.93	9.09
Second (4th Quarter 2004)	1.16	6.03
Third (1st Quarter 2005)	1.30	8.70
Fourth (2nd Quarter 2005)	2.07	8.18

Figure 3-1. Annual Windrose
(July 1, 2004 – June 30, 2005)

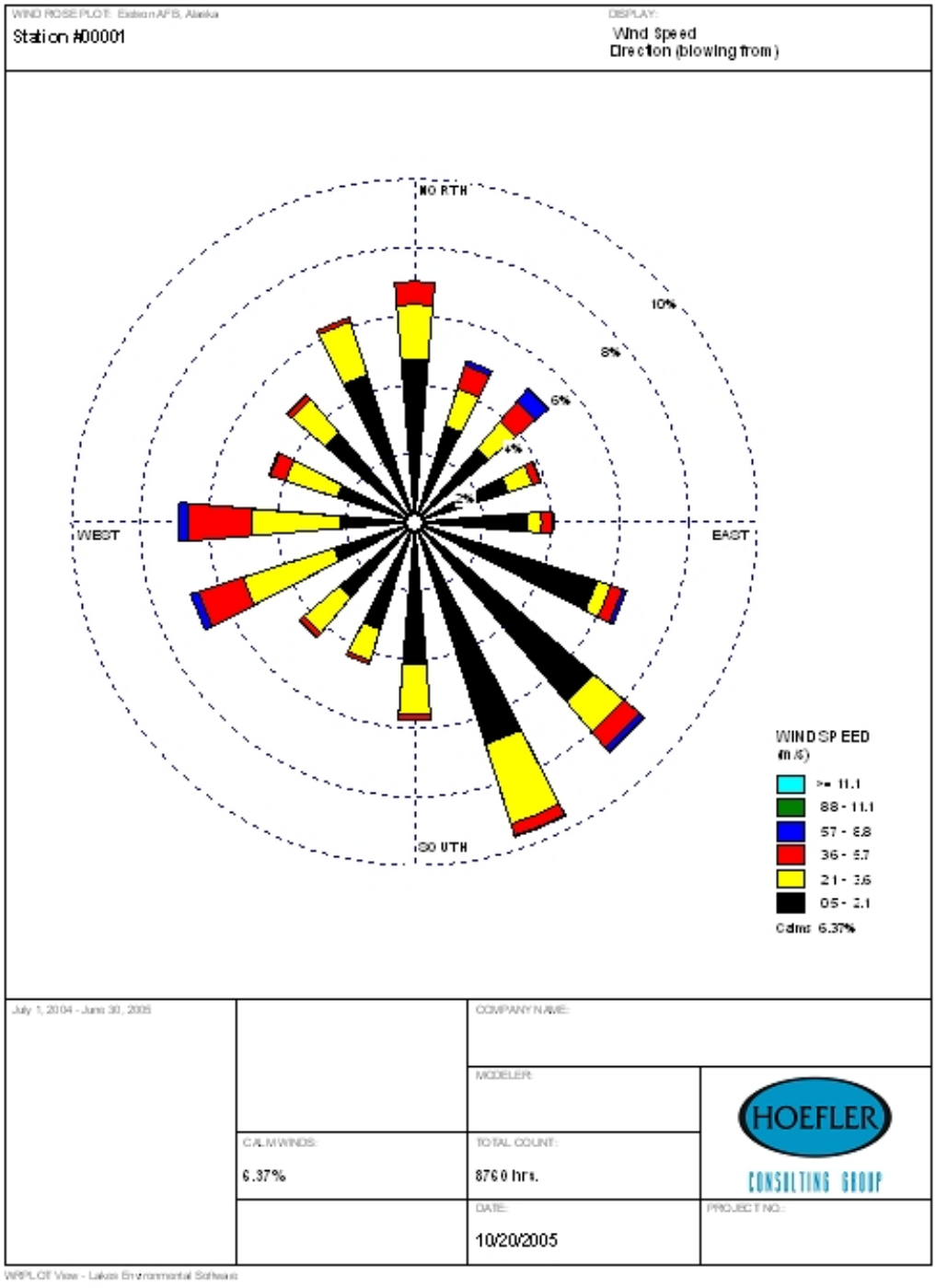


Figure 3-2. First Monitoring Quarter Windrose
(July 1, 2004 – September 30, 2004)

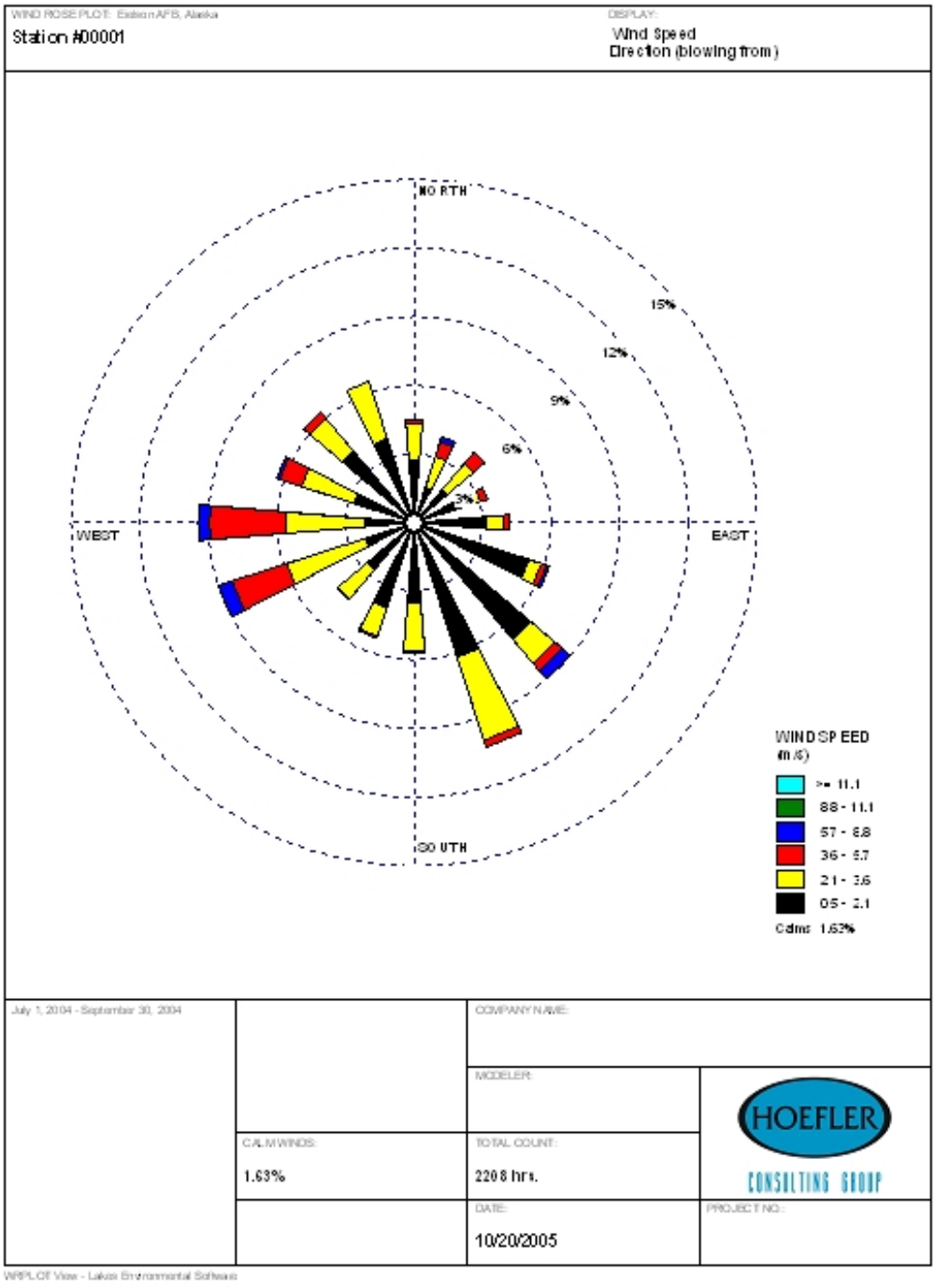


Figure 3-3. Second Monitoring Quarter Windrose
(October 1, 2004 – December 31, 2004)

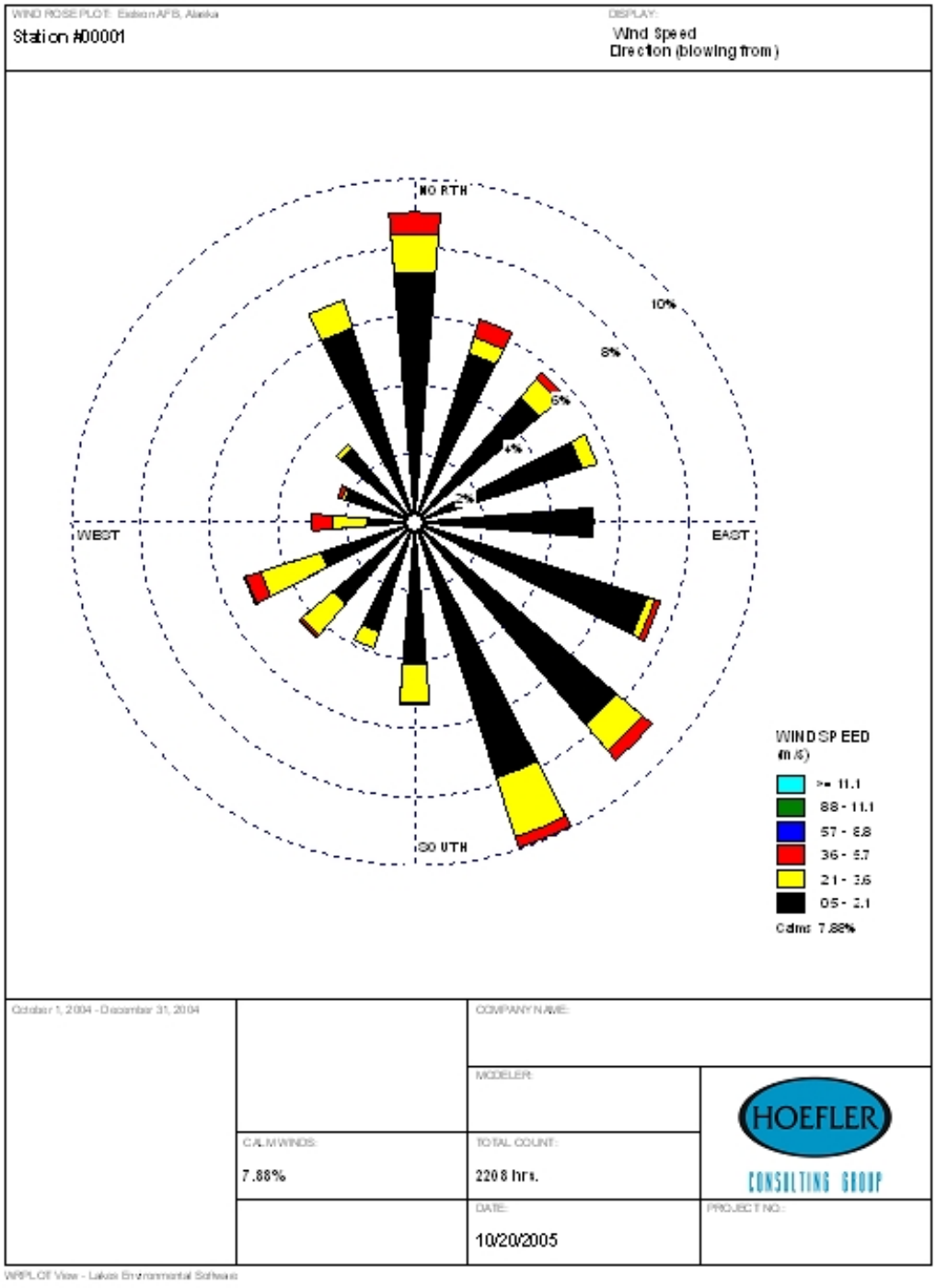


Figure 3-4. Third Monitoring Quarter Windrose
(January 1, 2005 – March 31, 2005)

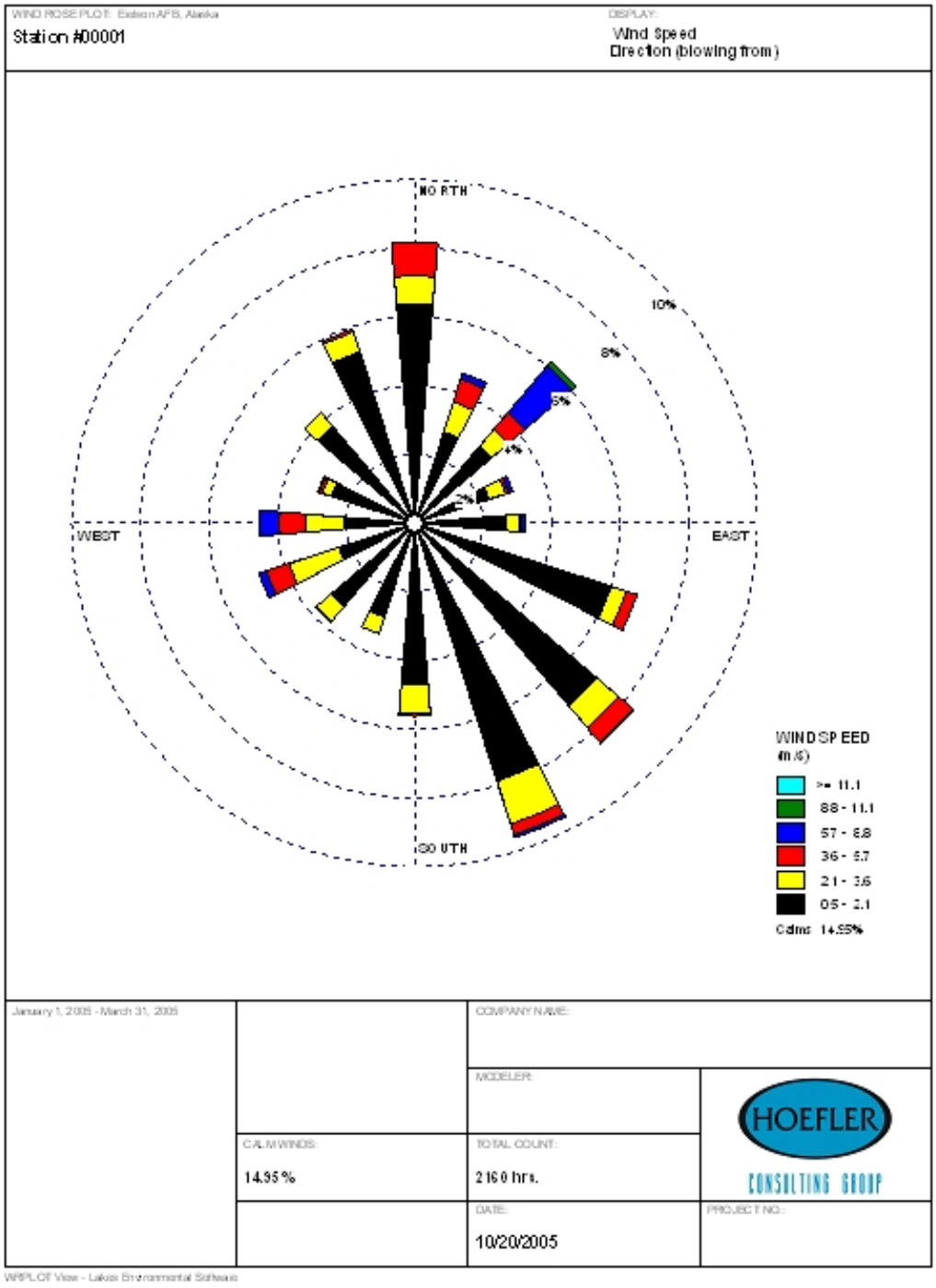


Figure 3-5. Fourth Monitoring Quarter Windrose
(April 1, 2005 – June 30, 2005)

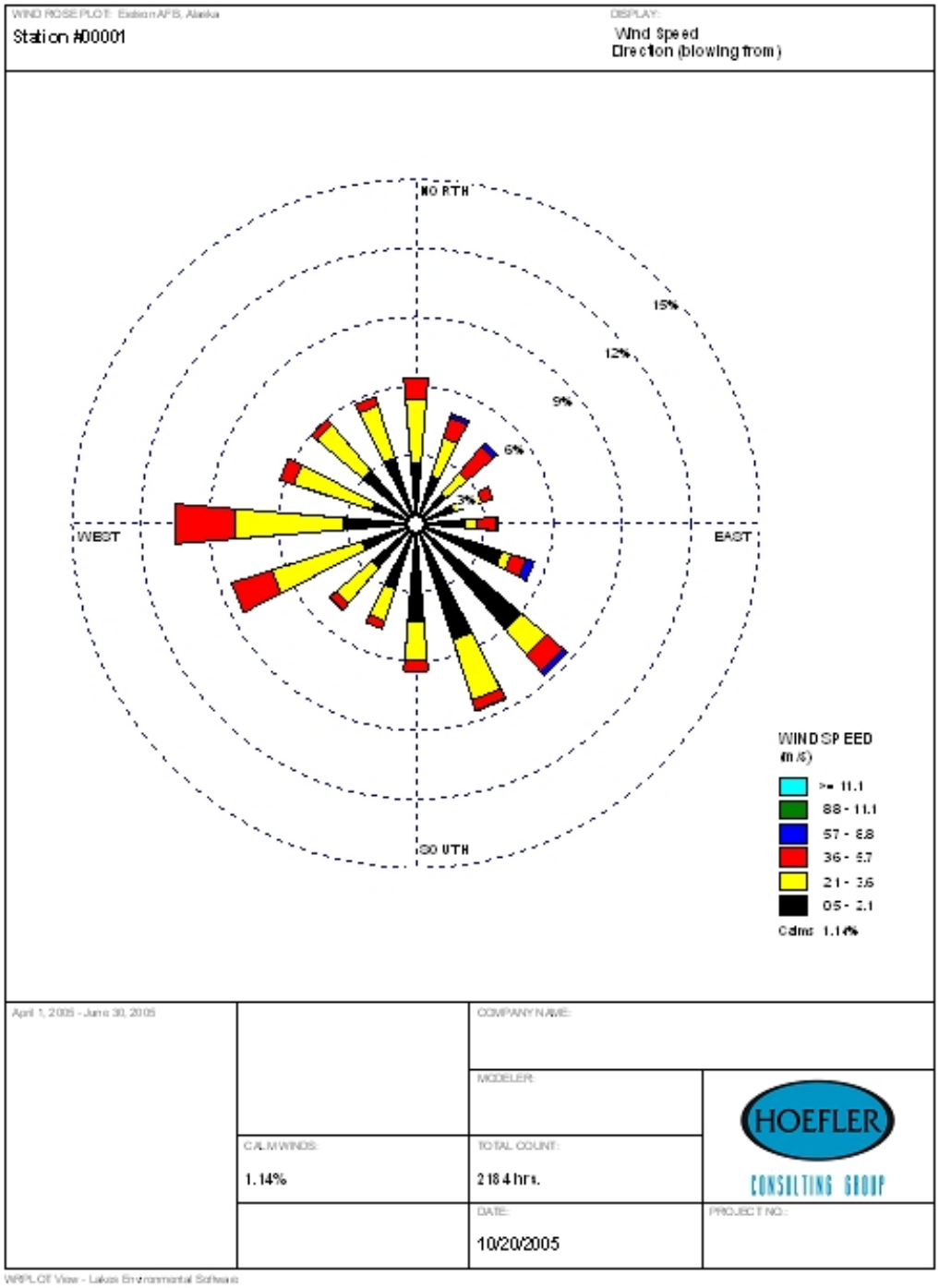


Table 3-4. Annual Windrose Analysis

Station ID:
Eielson AFB

RUN ID: Annual

Start Date: July 1, 2004

End Date: June 30, 2005

Frequency Distribution
(Percent)

Speed (m/s)

	0.51-2.06	2.06-3.60	3.60-5.66	5.66-8.75	8.75-10.80	>10.80	Total
N	0.0473	0.0160	0.0067	0.0000	0.0000	0.0000	0.0700
NNE	0.0295	0.0114	0.0071	0.0015	0.0000	0.0000	0.0494
NE	0.0283	0.0102	0.0074	0.0050	0.0005	0.0000	0.0514
ENE	0.0285	0.0075	0.0023	0.0003	0.0000	0.0000	0.0387
E	0.0328	0.0042	0.0030	0.0005	0.0000	0.0000	0.0404
ESE	0.0558	0.0042	0.0035	0.0013	0.0000	0.0000	0.0648
SE	0.0683	0.0116	0.0058	0.0018	0.0001	0.0000	0.0877
SSE	0.0678	0.0242	0.0035	0.0003	0.0000	0.0000	0.0959
S	0.0413	0.0144	0.0017	0.0000	0.0001	0.0000	0.0575
SSW	0.0328	0.0095	0.0011	0.0000	0.0000	0.0000	0.0434
SW	0.0288	0.0136	0.0015	0.0002	0.0000	0.0000	0.0441
WSW	0.0247	0.0279	0.0137	0.0023	0.0000	0.0000	0.0685
W	0.0217	0.0259	0.0183	0.0027	0.0000	0.0000	0.0686
WNW	0.0236	0.0159	0.0047	0.0005	0.0000	0.0000	0.0446
NW	0.0341	0.0129	0.0016	0.0001	0.0000	0.0000	0.0487
NNW	0.0451	0.0162	0.0013	0.0000	0.0000	0.0000	0.0626
Total	0.6103	0.2256	0.0832	0.0166	0.0007	0.0000	0.9363

Avg. Wind Speed: 1.61 m/s

Table 3-5. First Monitoring Quarter Windrose Analysis

Station ID:
Eielson AFB

RUN ID: 1st Quarter

Start Date: July 1, 2004

End Date: September 30, 2004

Frequency Distribution

(Percent)

Speed (m/s)

	0.51-2.06	2.06-3.60	3.60-5.66	5.66-8.75	8.75-10.80	>10.80	Total
N	0.0272	0.0159	0.0018	0.0000	0.0000	0.0000	0.0448
NNE	0.0163	0.0140	0.0068	0.0023	0.0000	0.0000	0.0394
NE	0.0190	0.0149	0.0063	0.0000	0.0000	0.0000	0.0403
ENE	0.0226	0.0077	0.0032	0.0000	0.0000	0.0000	0.0335
E	0.0313	0.0077	0.0027	0.0000	0.0000	0.0000	0.0417
ESE	0.0525	0.0059	0.0023	0.0014	0.0000	0.0000	0.0620
SE	0.0666	0.0136	0.0045	0.0045	0.0005	0.0000	0.0897
SSE	0.0616	0.0380	0.0032	0.0000	0.0000	0.0000	0.1028
S	0.0349	0.0213	0.0005	0.0000	0.0005	0.0000	0.0571
SSW	0.0389	0.0131	0.0009	0.0000	0.0000	0.0000	0.0530
SW	0.0267	0.0168	0.0009	0.0000	0.0000	0.0000	0.0444
WSW	0.0222	0.0362	0.0249	0.0063	0.0000	0.0000	0.0897
W	0.0213	0.0344	0.0335	0.0050	0.0000	0.0000	0.0942
WNW	0.0276	0.0240	0.0100	0.0014	0.0000	0.0000	0.0630
NW	0.0412	0.0181	0.0036	0.0005	0.0000	0.0000	0.0634
NNW	0.0385	0.0263	0.0000	0.0000	0.0000	0.0000	0.0648
Total	0.5485	0.3080	0.1051	0.0213	0.0009	0.0000	0.9837

Avg. Wind Speed: 1.93 m/s

Table 3-6. Second Monitoring Quarter Windrose Analysis

Station ID:
Eielson AFB

RUN ID: 2nd Quarter

Start Date: October 1, 2004

End Date: December 31, 2004

Frequency Distribution
(Percent)

Speed (m/s)

	0.51-2.06	2.06-3.60	3.60-5.66	5.66-8.75	8.75-10.80	>10.80	Total
N	0.0725	0.0113	0.0063	0.0000	0.0000	0.0000	0.0901
NNE	0.0516	0.0050	0.0054	0.0000	0.0000	0.0000	0.0620
NE	0.0476	0.0072	0.0023	0.0000	0.0000	0.0000	0.0571
ENE	0.0512	0.0045	0.0000	0.0000	0.0000	0.0000	0.0557
E	0.0516	0.0005	0.0000	0.0000	0.0000	0.0000	0.0521
ESE	0.0711	0.0023	0.0018	0.0000	0.0000	0.0000	0.0752
SE	0.0770	0.0100	0.0036	0.0000	0.0000	0.0000	0.0906
SSE	0.0779	0.0181	0.0032	0.0000	0.0000	0.0000	0.0992
S	0.0412	0.0113	0.0005	0.0000	0.0000	0.0000	0.0530
SSW	0.0335	0.0050	0.0000	0.0000	0.0000	0.0000	0.0385
SW	0.0313	0.0118	0.0009	0.0005	0.0000	0.0000	0.0444
WSW	0.0285	0.0186	0.0045	0.0005	0.0000	0.0000	0.0521
W	0.0136	0.0104	0.0059	0.0000	0.0000	0.0000	0.0299
WNW	0.0213	0.0009	0.0014	0.0000	0.0000	0.0000	0.0236
NW	0.0281	0.0018	0.0000	0.0000	0.0000	0.0000	0.0299
NNW	0.0593	0.0086	0.0000	0.0000	0.0000	0.0000	0.0679
Total	0.7572	0.1273	0.0358	0.0009	0.0000	0.0000	0.9212

Avg. Wind Speed: 1.16 m/s

Table 3-7. Third Monitoring Quarter Windrose Analysis

Station ID :
Eielson AFB

RUN ID: 3rd Quarter

Start Date: January 1, 2005

End Date: March 31, 2005

Frequency Distribution
(Percent)

Speed (m/s)

	0.51-2.06	2.06-3.60	3.60-5.66	5.66-8.75	8.75-10.80	>10.80	Total
N	0.0634	0.0083	0.0097	0.0000	0.0000	0.0000	0.0815
NNE	0.0278	0.0093	0.0069	0.0019	0.0000	0.0000	0.0458
NE	0.0292	0.0065	0.0065	0.0176	0.0019	0.0000	0.0616
ENE	0.0227	0.0051	0.0009	0.0014	0.0000	0.0000	0.0301
E	0.0269	0.0037	0.0005	0.0009	0.0000	0.0000	0.0319
ESE	0.0602	0.0046	0.0032	0.0000	0.0000	0.0000	0.0681
SE	0.0694	0.0083	0.0056	0.0005	0.0000	0.0000	0.0838
SSE	0.0787	0.0130	0.0032	0.0009	0.0000	0.0000	0.0958
S	0.0468	0.0083	0.0009	0.0000	0.0000	0.0000	0.0560
SSW	0.0287	0.0051	0.0000	0.0000	0.0000	0.0000	0.0338
SW	0.0319	0.0056	0.0005	0.0000	0.0000	0.0000	0.0380
WSW	0.0231	0.0153	0.0069	0.0023	0.0000	0.0000	0.0477
W	0.0204	0.0116	0.0074	0.0060	0.0000	0.0000	0.0454
WNW	0.0255	0.0028	0.0009	0.0005	0.0000	0.0000	0.0296
NW	0.0370	0.0051	0.0000	0.0000	0.0000	0.0000	0.0421
NNW	0.0523	0.0060	0.0009	0.0000	0.0000	0.0000	0.0593
Total	0.6440	0.1185	0.0542	0.0319	0.0019	0.0000	0.8505

Avg. Wind Speed: 1.30 m/s

Table 3-8. Fourth Monitoring Quarter Windrose Analysis

Station ID : Eielson AFB RUN ID: 4th Quarter

Start Date: April 1, 2005 End Date: June 30, 2005

Frequency Distribution

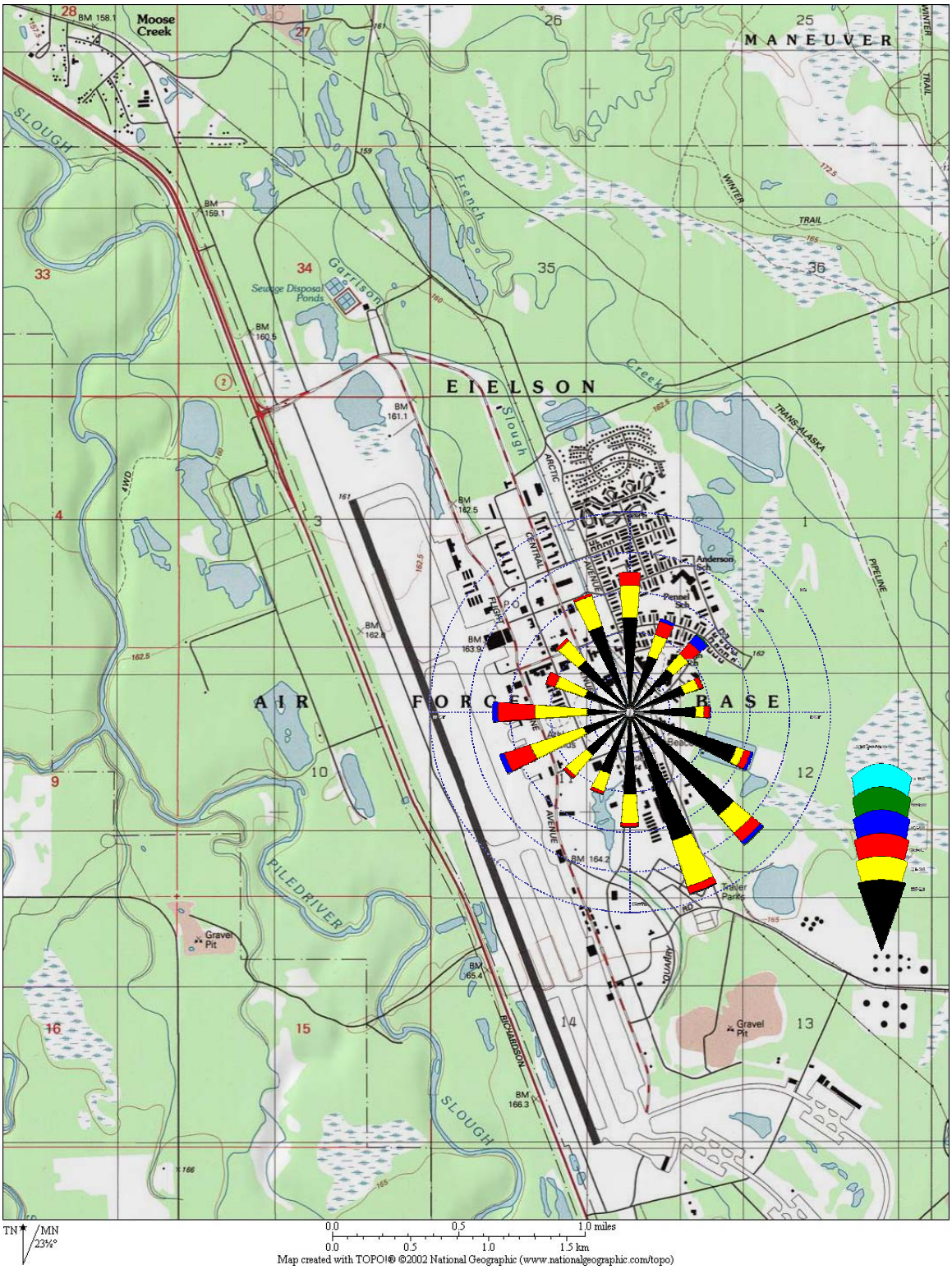
(Percent)

Speed (m/s)

	0.51-2.06	2.06-3.60	3.60-5.66	5.66-8.75	8.75-10.80	>10.80	Total
N	0.0261	0.0284	0.0092	0.0000	0.0000	0.0000	0.0636
NNE	0.0220	0.0174	0.0092	0.0018	0.0000	0.0000	0.0504
NE	0.0174	0.0119	0.0147	0.0027	0.0000	0.0000	0.0467
ENE	0.0174	0.0128	0.0050	0.0000	0.0000	0.0000	0.0353
E	0.0211	0.0050	0.0087	0.0009	0.0000	0.0000	0.0357
ESE	0.0394	0.0041	0.0069	0.0037	0.0000	0.0000	0.0540
SE	0.0600	0.0147	0.0096	0.0023	0.0000	0.0000	0.0865
SSE	0.0531	0.0275	0.0046	0.0005	0.0000	0.0000	0.0856
S	0.0426	0.0165	0.0050	0.0000	0.0000	0.0000	0.0641
SSW	0.0298	0.0147	0.0037	0.0000	0.0000	0.0000	0.0481
SW	0.0252	0.0201	0.0037	0.0005	0.0000	0.0000	0.0495
WSW	0.0247	0.0412	0.0183	0.0000	0.0000	0.0000	0.0842
W	0.0316	0.0472	0.0261	0.0000	0.0000	0.0000	0.1049
WNW	0.0201	0.0357	0.0064	0.0000	0.0000	0.0000	0.0623
NW	0.0302	0.0266	0.0027	0.0000	0.0000	0.0000	0.0595
NNW	0.0302	0.0238	0.0041	0.0000	0.0000	0.0000	0.0582
Total	0.4908	0.3475	0.1378	0.0124	0.0000	0.0000	0.9886

Avg. Wind Speed: 2.07 m/s

Figure 3-6. Windrose Superimposed over Site Map



Temperature Climatology

Daily average temperatures at Eielson AFB ranged from 23.6˚C to -40.5˚C during the monitoring period. On average, the summer months are relatively warm for Alaska, and during the winter, longer periods of extremely low temperatures are common. Extreme high and low temperatures ranged from 29.6˚C to -41.7˚C. Table 3-9 presents a temperature summary for the station. The complete data set is provided in Appendix D. Figure 3-6 illustrates the temperature data for the monitoring period. Figure 3-7 presents the delta between the 2-meter and 10-meter thermistors.

Table 3-9. Two-Meter Temperature Climatology

Period	Max. Daily Average Temperature (˚C)	Min. Daily Average Temperature (˚C)	Monthly Average (˚C)	Maximum Hourly High Temperature (˚C)	Date	Minimum Hourly Low Temperature (˚C)	Date
July	23.6	14.4	18.5	29.6	7/14	9.6	7/1
August	20.2	9.0	16.6	28.2	8/16	3.9	8/30
September	10.0	-2.0	3.3	16.3	9/8	-6.3	9/28
1st Monitoring Quarter	**23.6**	**-2.0**	**12.8**	**29.6**	**7/14**	**-6.3**	**9/28**
October	5.2	-13.2	-1.5	14.0	10/4	-17.2	10/31
November	-5.0	-22.5	-13.6	3.0	11/19	-29.1	11/7
December	-3.0	-31.8	-19.5	4.4	12/23	-39.0	12/25
2nd Monitoring Quarter	**5.2**	**-31.8**	**-11.5**	**14.0**	**10/4**	**-39.0**	**12/25**
January	-1.9	-40.5	-21.9	0.0	1/6	-41.7	1/12
February	-5.2	-37.9	-18.9	3.9	2/14	-41.0	2/3
March	1.1	-16.4	-5.8	7.6	3/10	-21.7	3/5
3rd Monitoring Quarter	**1.1**	**-40.5**	**-15.5**	**7.6**	**3/10**	**-41.7**	**1/12**
April	15.7	-10.1	1.1	21.8	4/30	-15.6	4/2
May	17.0	8.4	13.1	23.6	5/11	0.5	5/5
June	20.5	10.2	16.2	27.3	6/29	6.4	6/6
4th Monitoring Quarter	**20.5**	**-10.1**	**10.1**	**27.3**	**6/29**	**-15.6**	**4/2**
Annual	**23.6**	**-40.5**	**-1.0**	**29.6**	**7/14**	**-41.7**	**1/12**

Figure 3-7
Average Hourly 2-m Temperatures

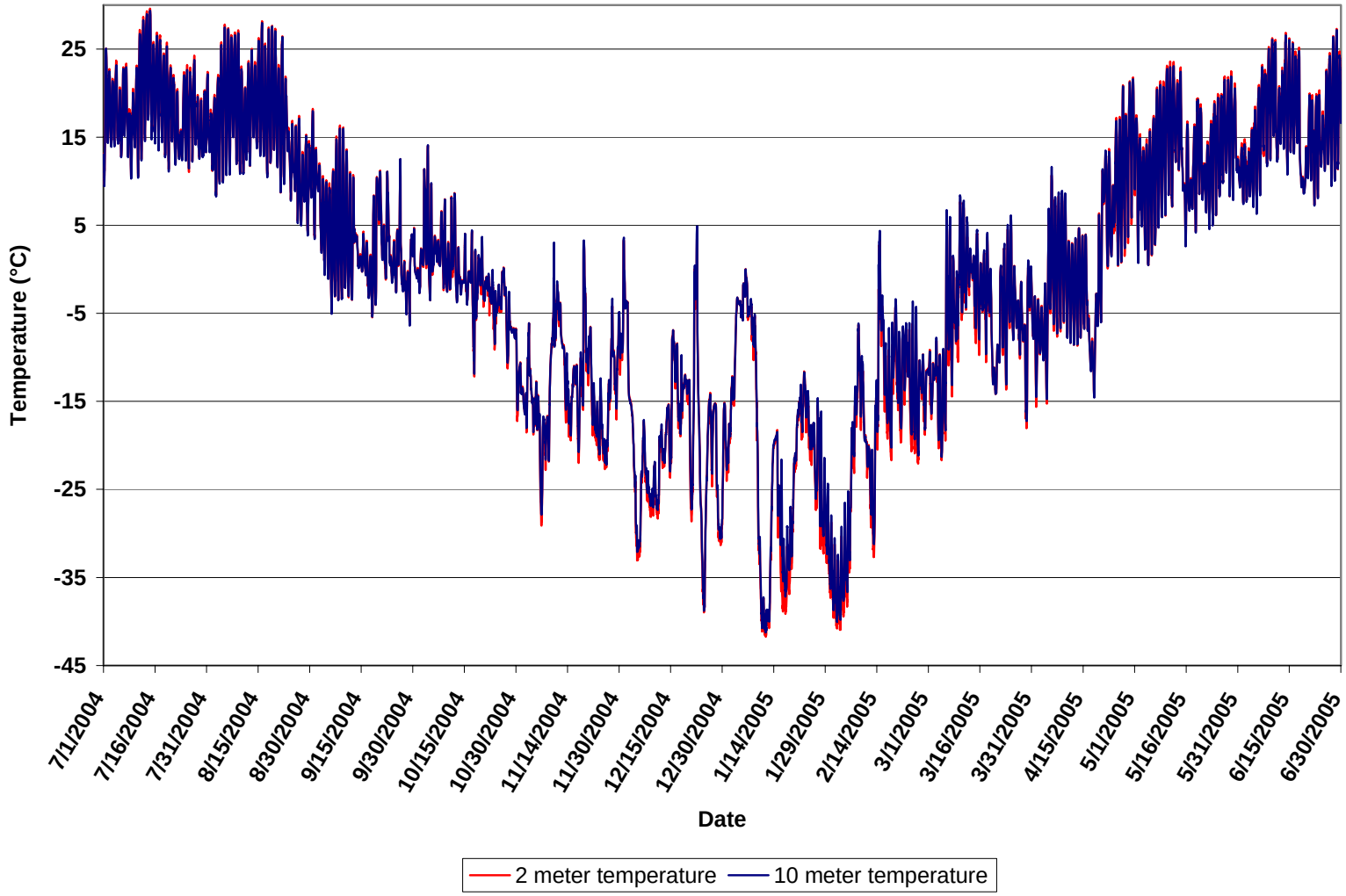
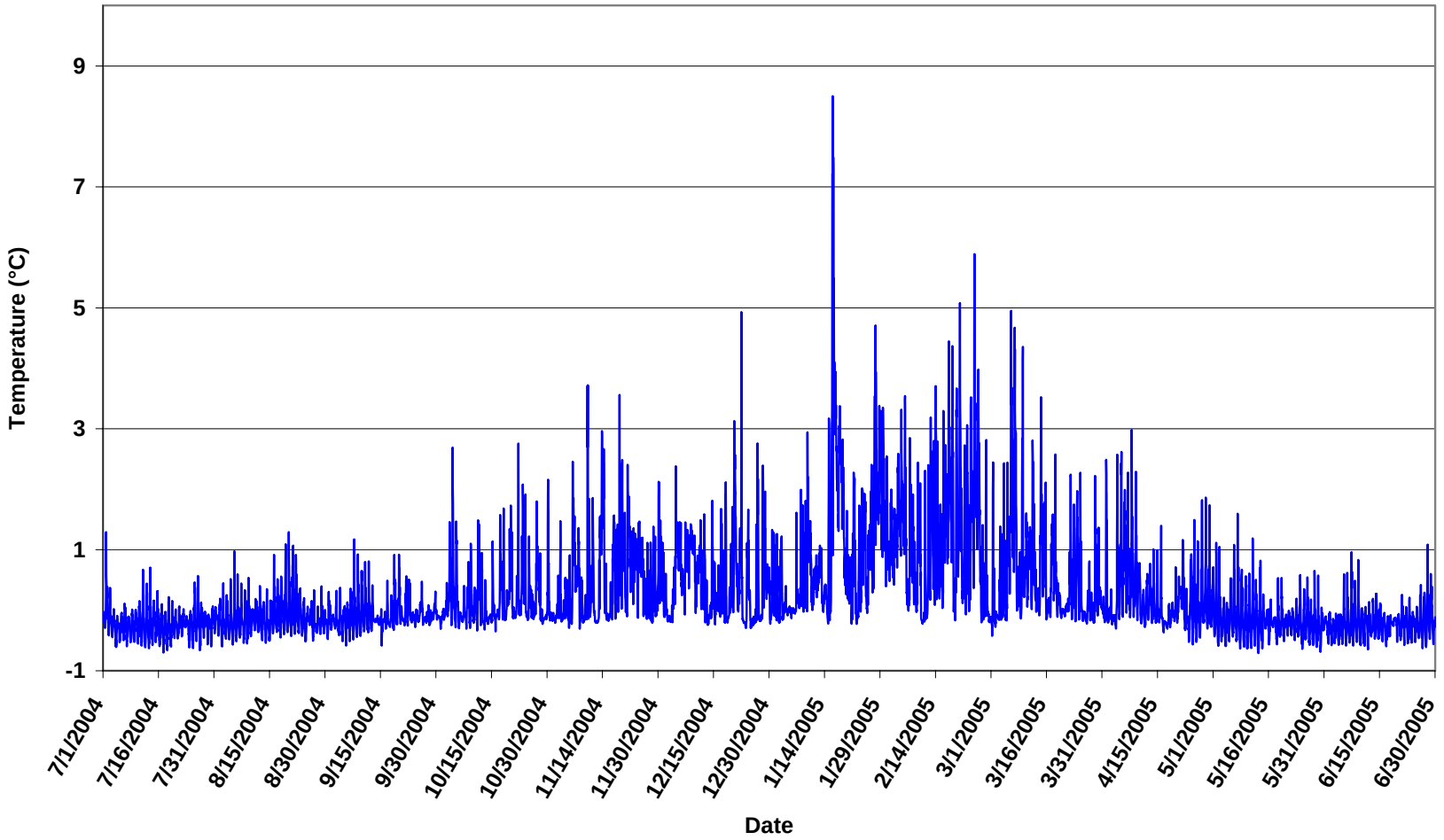


Figure 3-8
Delta Temperature



Other Meteorological Parameters

Average daily relative humidity ranged from 13.4 to 99.2 percent during the monitoring period. A time-series plot of the relative humidity data is presented in Figure 3-9. Daily average barometric pressure ranged from 28.0 to 30.3 inHg, which is similar to the pressure climatology for the surrounding region. An analysis of barometric pressure data is provided in Figure 3-10. Solar radiation climatology information is presented in Figure 3-11. Complete solar radiation data is presented in Appendix D.

Figure 3-9
Average Hourly Relative Humidity

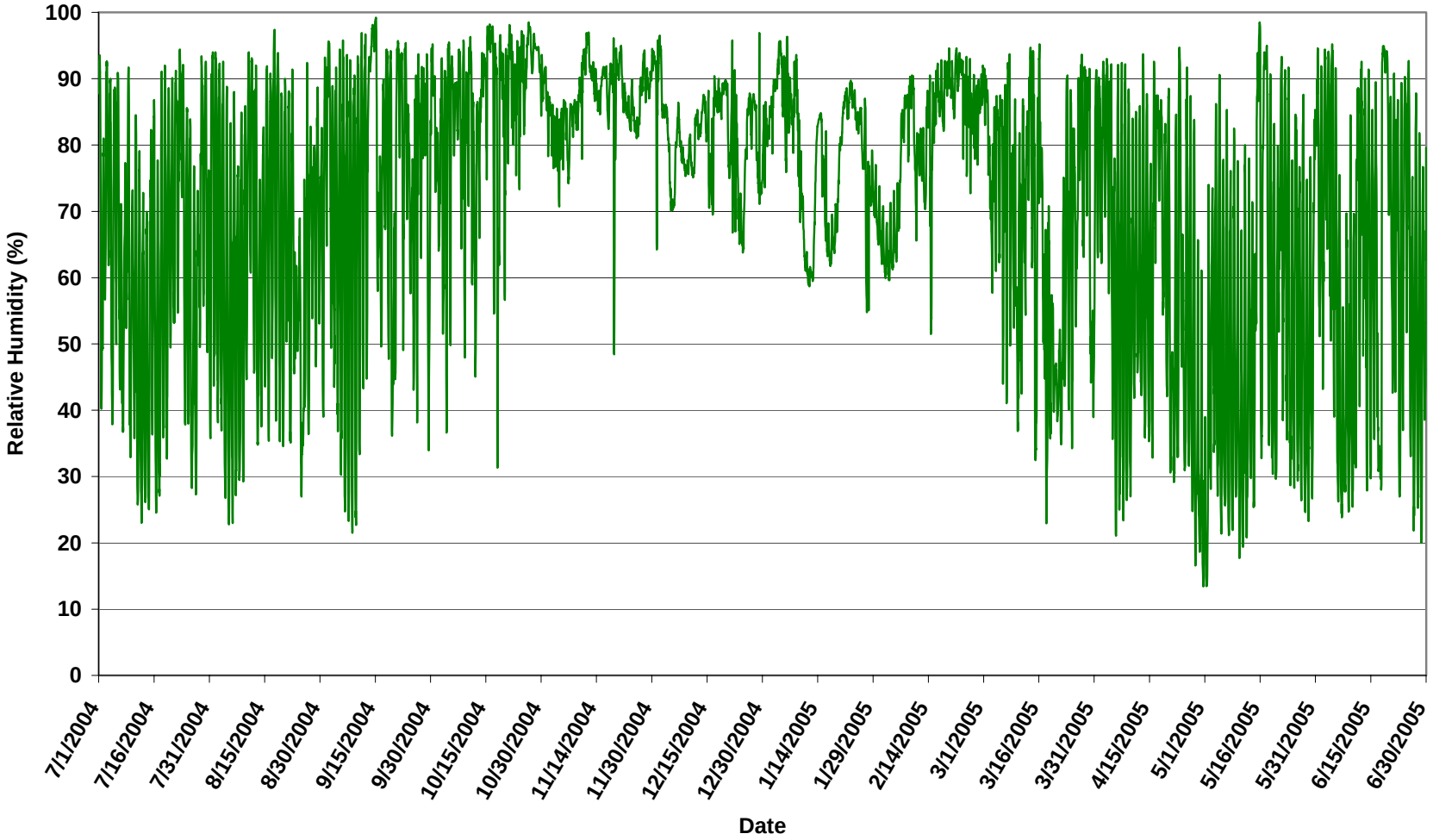


Figure 3-10
Average Hourly Barometic Pressure

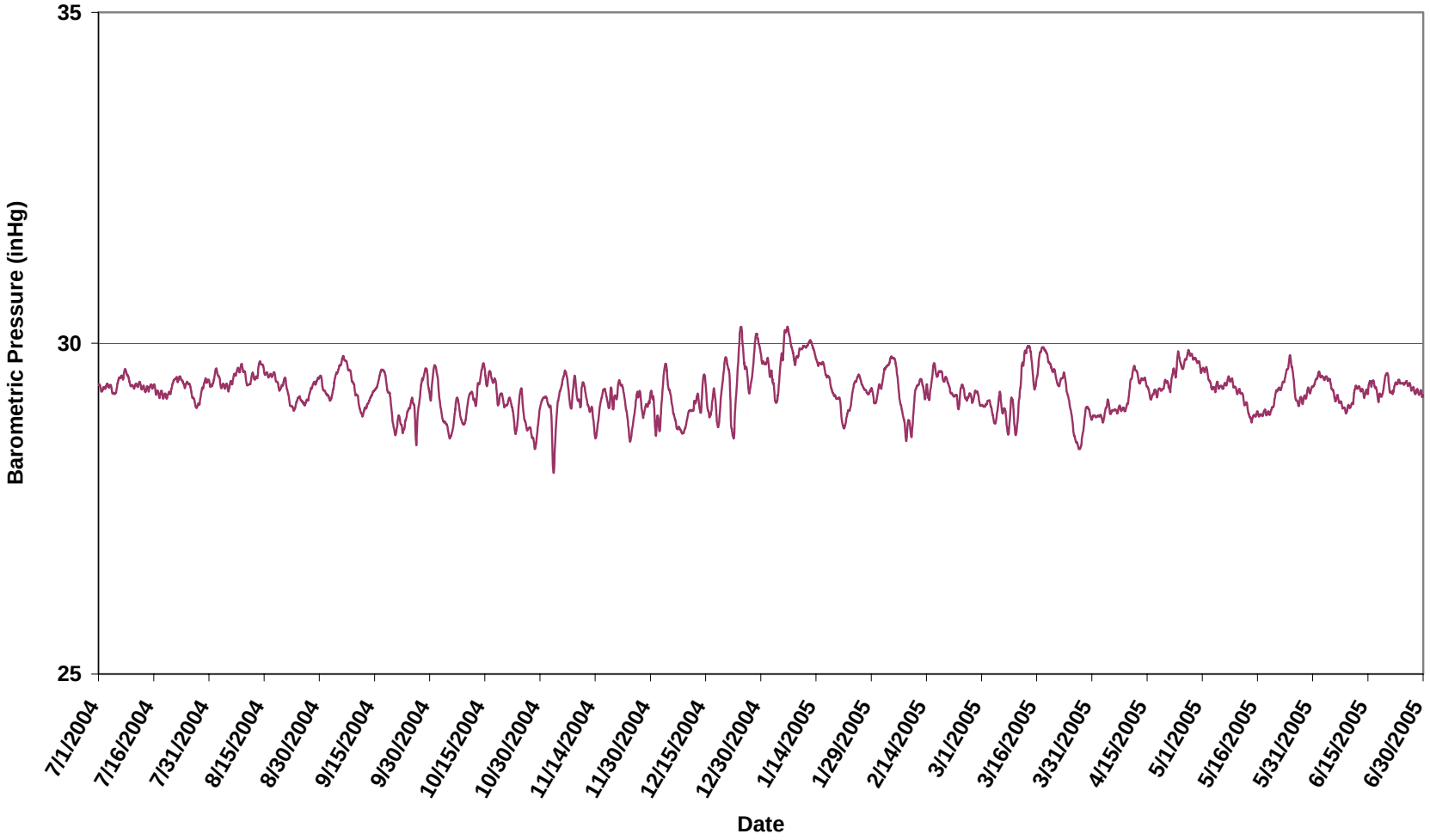
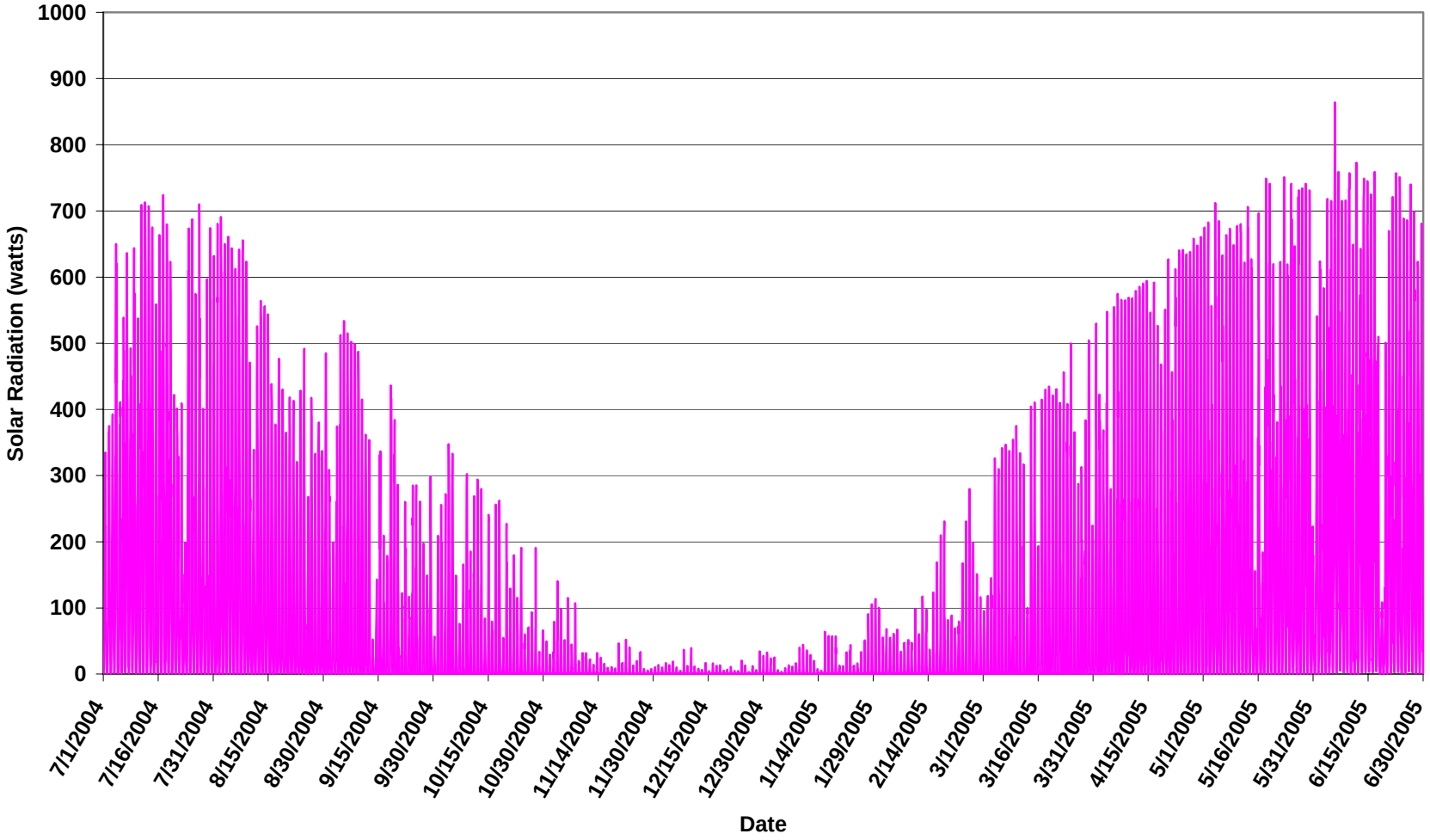


Figure 3-11
Average Hourly Solar Radiation



4.0 REFERENCES

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Title 40, CFR, Part 53, Ambient Air Monitoring Reference and Equivalent Methods, July 1, 2002.

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Quality Assurance Project Plan for Laboratory and Data Management Support of the Determination of Particulate Matter as PM_{10} in the Atmosphere (Low Volume Method), Rev 3, IML Air Science, March 2003.

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