

RICHARD E. BLUBAUGH
Vice President – Environmental
Health & Safety Resources

POWERTECH (USA) Inc.

June 13, 2012

Mr. Ronald A. Burrows, Project Manager
Office of Federal and State Materials and
Environmental Management Programs
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: Additional Regional Meteorological Data; Powertech (USA) Inc.'s Proposed Dewey-Burdock
Project; Docket No. 40-9075

Dear Mr. Burrows:

Following our May 23, 2012 teleconference, Powertech (USA) Inc. has prepared the enclosed submittal of additional regional meteorological data for the Dewey-Burdock Project. The information is provided as addenda to the Technical Report request for additional information (TR RAI) responses that were submitted in June 2011. Please find enclosed addenda to the response to TR RAI 2.5-1(c), Appendix 2.5-D and Appendix 2.5-E. These revisions provide the following:

1. Documentation of analysis of variance and the resulting p-values for all linear regression analyses of short and long-term wind speed and direction distributions. The purpose of this addition is to provide a confidence level for each coefficient of determination (R^2).
2. Documentation of semi-annual meteorological instrument audits over the past decade, for industry weather stations cited in the RAI response.
3. Standard operating procedures for meteorological instrument and data quality assurance.
4. Adjustment of the Powder River Basin wind speed and direction study to use the Dewey-Burdock baseline monitoring year instead of the most recent monitoring year as the source for short-term wind data.

These changes also will be incorporated into the final Technical Report.

Respectfully submitted,

Richard Blubaugh
Vice President - Environmental Health & Safety Resources

cc: R.F. Clement
M. Hollenbeck

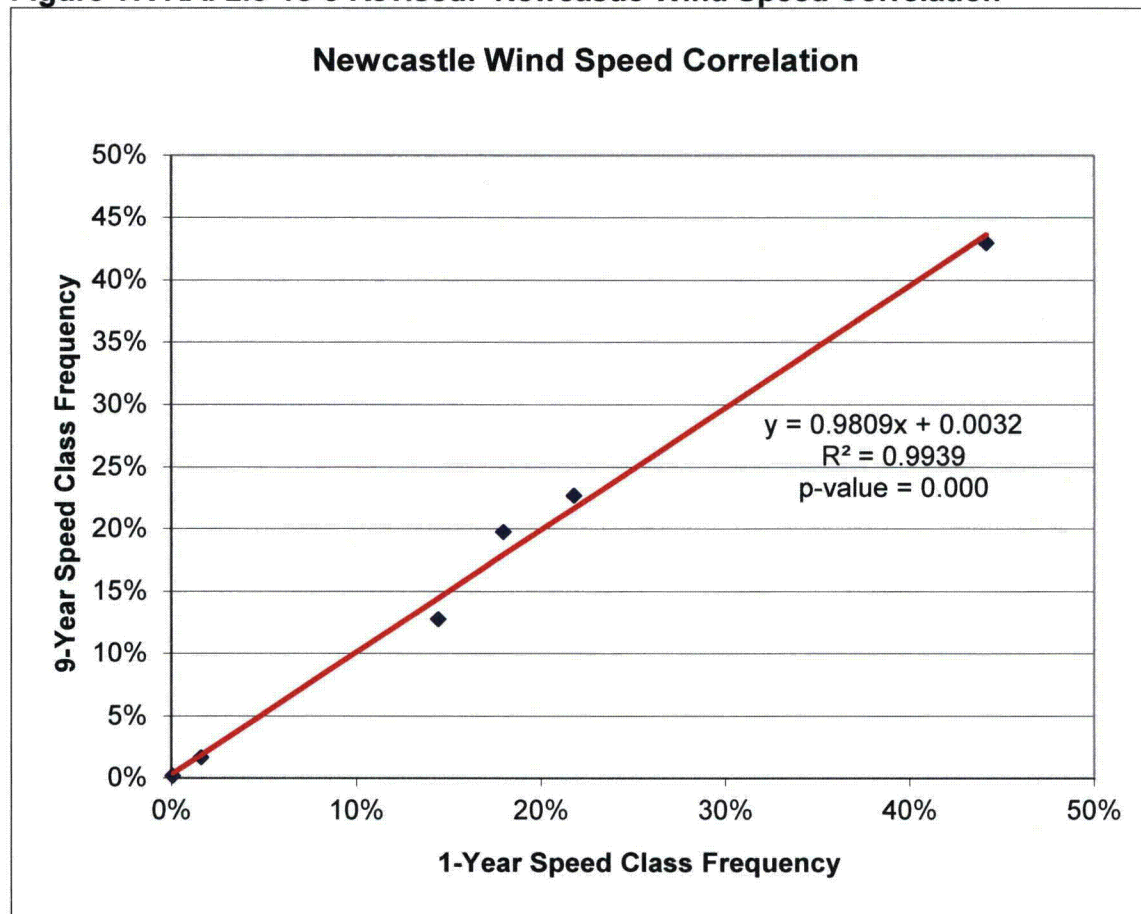
**Addendum to
TR RAI Response 2.5-1(c)**

Addendum to TR RAI Response 2.5-1(c)

Figures TR RAI 2.5-1c-3 and TR RAI 2.5-1c-4 have been enhanced to show the p-value associated with each regression analysis. The R^2 value, or coefficient of determination, provides a measure of how well the baseline-year wind speed and direction distributions match (and therefore predict) the long-term wind speed and direction distributions. An R^2 value of 1 would indicate a perfect match between the two time periods. In this case, the short and long-term wind data distributions would be identical and therefore interchangeable. An R^2 value of 0.90 or higher indicates a very strong correlation between the short and long-term distributions.

The p-value provides a measure of the probability that no linear relationship exists between the short and long-term wind data distributions. A p-value of 0 reflects the highest confidence possible that a linear relationship exists. The regression analyses of wind speed distributions and wind direction distributions both show p-values of 0.000. This result justifies a high degree of confidence that the R^2 values are real and that the use of baseline-year wind data to predict long-term wind behavior is legitimate.

Figure TR RAI 2.5-1c-3 Revised: Newcastle Wind Speed Correlation



The wind speed correlation graph in Figure TR RAI 2.5-1c-3 Revised was generated in Microsoft Excel. The following output from MiniTab, a statistical software package, corroborates the R^2 value obtained in Excel and displays the p-value of 0.000.

Newcastle 9-Year Speeds versus Baseline-Year Speeds

The regression equation is:

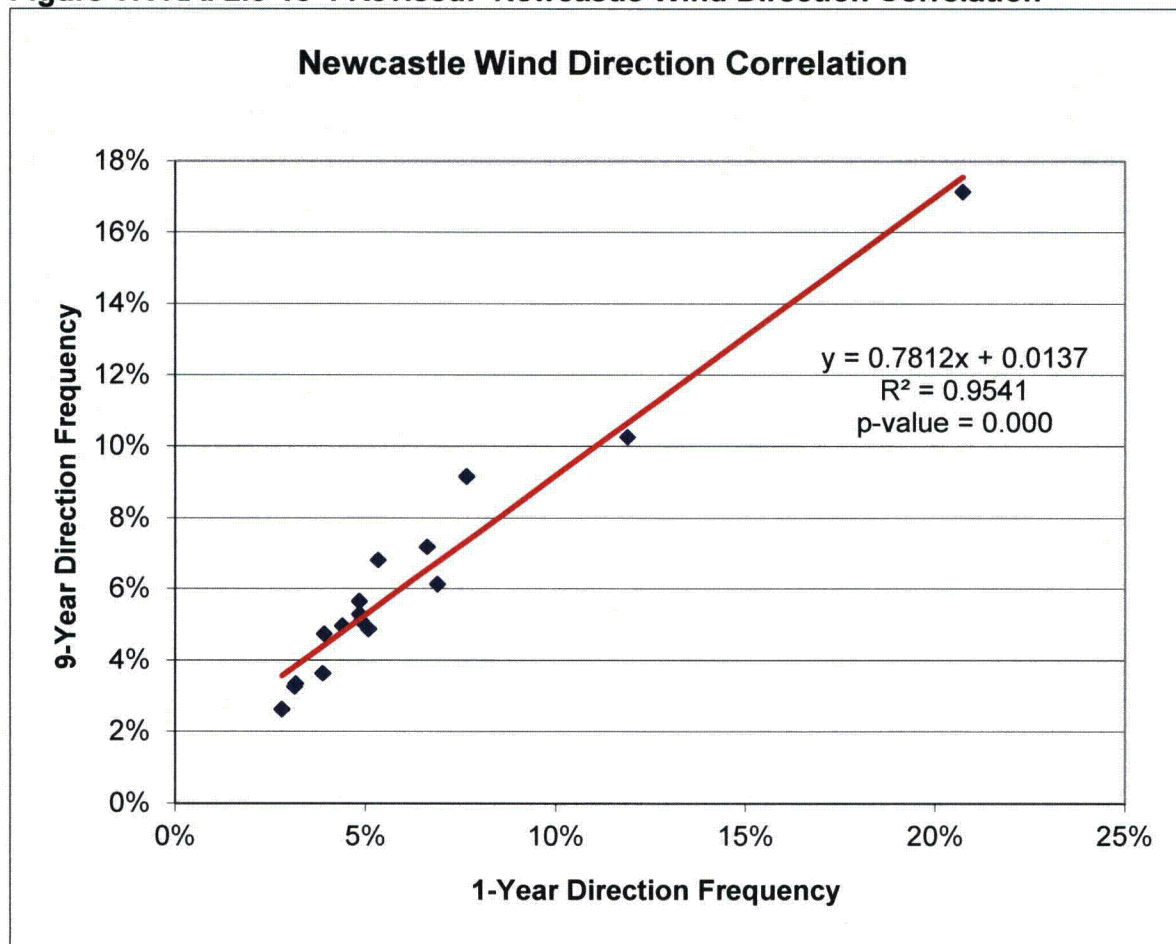
$$9\text{-Year Speeds} = 0.003191 + 0.9809 * \text{Baseline-Year Speeds}$$

$$S = 0.0138529 \quad R^2 = 99.4\% \quad R^2 (\text{adj.}) = 99.2\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.124179	0.124179	647.09	0.000
Error	4	0.000768	0.000192		
Total	5	0.124947			

Figure TR RAI 2.5-1c-4 Revised: Newcastle Wind Direction Correlation





The wind direction correlation graph in Figure TR RAI 2.5-1c-4 Revised was generated in Microsoft Excel. The following output from MiniTab, a statistical software package, corroborates the R^2 value obtained in Excel and displays the p-value of 0.000.

Newcastle 9-Year versus Baseline-Year Directions

The regression equation is:

$$9\text{-Year} = 0.01368 + 0.7812 * \text{Baseline-Year}$$

$$S = 0.00789827 \quad R^2 = 95.4\% \quad R^2 (\text{adj.}) = 95.1\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.0181649	0.0181649	291.18	0.000
Error	14	0.0008734	0.0000624		
Total	15	0.0190383			

Addendum to

APPENDIX 2.5-D

Newcastle Meteorological Station Audit Reports

Addendum to TR RAI Appendix 2.5-D Newcastle Meteorological Station Audit Reports

Appendix 2.5-D in the TR RAI responses provided select audit records for the Wyoming Refining meteorological station in Newcastle. This addendum fills out the Newcastle audit records to span the entire monitoring period. It also provides audit records for the Antelope Mine, Buckskin Mine and Dry Fork Mine meteorological stations. In all cases, meteorological audits were performed semi-annually in accordance with EPA's Onsite Meteorological Program Guidance for Regulatory Modeling Applications. Semi-annual audits are also required by the Wyoming Department of Environmental Quality (DEQ) in conjunction with air quality monitoring. All meteorological audits were documented and reported to DEQ for each of the four sites since monitoring began. IML was unable to obtain copies of older reports (more than 10 to 15 years old), but the approval of such reports by DEQ provides de facto evidence that regular audits were performed and that meteorological instruments were kept within specification.

Also included in this addendum are standard operating procedures (SOPs) used by IML personnel to assure quality meteorological data. The SOPs prescribe instrument calibration, audit and inspection procedures, as well as data processing and reporting methods.



POWERTECH (USA) INC.

Newcastle Meteorological Station Audit Reports

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining, Newcastle
 Audit Date: 3-Jan-02
 Audit Performed by: K. Fox, T. Mendenhall - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	digital thermistor
Data acquisition system (DAS):	Campbell Scientific CR510	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0	(3)
WD (degrees)		0	1	1	5	(1)
		90	89	1	5	(1)
		180	181	1	5	(1)
		270	269	1	5	(1)
Temperature (°F)	ice	32.0	31.9	0.1	1.8	(1)
	ambient	47.5	46.8	0.7	1.8	(1)
	warm	98.2	98.1	0.1	1.8	(1)

BOLD difference values exceed performance specifications

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1996
 (3)= Manufacturer's Specifications

Notes, Recommendations

Initial Install Audit
 System on-line @ 1535, 1/3/02

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining, Newcastle

Audit Date: 8-Aug-02

Audit Performed by: K. Fox - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	digital thermistor
Data acquisition system (DAS):	Campbell Scientific CR510	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0	(3)
WD (degrees)		0	2	2	5	(1)
		90	90	0	5	(1)
		180	180	0	5	(1)
		270	271	1	5	(1)
Temperature (°F)	ice	32.7	32.3	0.4	1.8	(1)
	ambient	83.2	84.3	1.1	1.8	(1)
	warm	108.8	108.8	0.0	1.8	(1)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1996
 (3)= Manufacturer's Specifications

Notes, Recommendations

System off-line @ 1135
 System on-line @ 1200

Installation:
 System on-line @ 1535, 1/3/02

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining, Newcastle

Audit Date: 21-Jan-03

Audit Performed by: S. Heil, T. Shaw - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	digital thermistor
Data acquisition system (DAS):	Campbell Scientific CR510	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.43	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0	(3)
WD (degrees)		0	0	0	5	(1)
		90	91	1	5	(1)
		180	180	0	5	(1)
		270	270	0	5	(1)
Temperature (°F)	ice	26.6	26.8	0.2	1.8	(1)
	ambient	31.9	31.9	0.0	1.8	(1)
	warm	116.7	116.9	0.2	1.8	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1996
 (3)= Manufacturer's Specifications

Notes, Recommendations

System off-line @ 1031
 System on-line @ 1100

Installation:
 System on-line @ 1535, 1/3/02

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining, Newcastle

Audit Date: 16-Sep-03

Audit Performed by: K. Fox, K. Jahnke - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	digital thermistor
Data acquisition system (DAS):	Campbell Scientific CR510	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0	(3)
WD (degrees)		0	0	0	5	(1)
		90	92	2	5	(1)
		180	181	1	5	(1)
		270	271	1	5	(1)
Temperature (°F)	ice	33.0	32.8	0.2	1.8	(1)
	ambient	71.2	70.5	0.7	1.8	(1)
	warm	113.3	113.4	0.1	1.8	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1996
 (3)= Manufacturer's Specifications

Notes, Recommendations

System off-line @ 1103
System on-line @ 1129
Clock is on actual time, not Standard time. Will correct from Sheridan
Installation:
System on-line @ 1535, 1/3/02

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining, Newcastle

Audit Date: 10-Mar-04

Audit Performed by: J. Rogers, K. Jahnke - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	digital thermistor
Data acquisition system (DAS):	Campbell Scientific CR510	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.44	0.00	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.35	0.00	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0 (3)
WD (degrees)		0	1	1	5 (1)
		90	90	0	5 (1)
		180	180	0	5 (1)
		270	271	1	5 (1)
Temperature (°F)	ice	31.8	31.8	0.0	1.8 (1)
	ambient	29.4	29.3	0.1	1.8 (1)
	warm	128.1	127.1	1.0	1.8 (1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 199

(3)= Manufacturer's Specifications

Notes, Recommendations

System off-line @ 1049

System on-line @ 1105

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining, Newcastle

Audit Date: 2-Sep-04

Audit Performed by: T. Shaw, K. Jahnke - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	digital thermistor
Data acquisition system (DAS):	Campbell Scientific CR510	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.37	0.23	4.58	(1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0	(3)
WD (degrees)		0	1	1	5	(1)
		90	90	0	5	(1)
		180	180	0	5	(1)
		270	270	0	5	(1)
Temperature (°F)	ambient	84.9	84.0	0.9	1.8	(1)
	ice water bath	38.1	38.4	0.3	1.8	(1)
	warm water bath	94.1	93.7	0.4	1.8	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1996

(3)= Manufacturer's Specifications

Notes, Recommendations

System off-line @ 1344

System on-line @ 1409

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining, Newcastle

Audit Date: 23-Mar-05

Audit Performed by: W. Adler, D. Tarver - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	digital thermistor
Data acquisition system (DAS):	Campbell Scientific CR510	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.23	0.23	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0	(3)
WD (degrees)		0	1	1	5	(1)
		90	91	1	5	(1)
		180	180	0	5	(1)
		270	270	0	5	(1)
Temperature (°F)	ambient	45.3	44.3	1.0	1.8	(1)
	ice water bath	32.7	32.6	0.1	1.8	(1)
	warm water bath	137.0	135.4	1.6	1.8	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1996

(3)= Manufacturer's Specifications

Notes, Recommendations

System off-line @ 0937

System on-line @ 0958

Direction alignment was off by 12 degrees (pointed at magnetic South).

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining, Newcastle

Audit Date: 27-Sep-05

Audit Performed by: B. Hanewald, K. Fox - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	digital thermistor
Data acquisition system (DAS):	Campbell Scientific CR510	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.23	0.23	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0	(3)
WD (degrees)	0	1.1	1	5	(1)
	90	89.6	0	5	(1)
	180	179.5	1	5	(1)
	270	271.7	2	5	(1)
Temperature (°F)	ambient	75.8	76.0	0.2	1.8 (1)
	ice water bath	32.5	32.1	0.4	1.8 (1)
	warm water bath	127.1	126.7	0.4	1.8 (1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1996

(3)= Manufacturer's Specifications

Notes, Recommendations

System off-line @ 1645

System on-line @ 1719

Tail is a little chewed up.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining, Newcastle

Audit Date: 30-Mar-06

Audit Performed by: K. Fox - IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	digital thermistor
Data acquisition system (DAS):	Campbell Scientific CR510	N/A

Audit Results

	Reference	DAS Value	Difference	Specification		
WS (mph)	0.00	0.23	0.23	0.56	(1)	
	3.44	3.44	0.00	0.56	(1)	
	9.16	9.16	0.00	0.56	(1)	
	34.35	34.35	0.00	1.72	(1)	
	91.60	91.60	0.00	4.58	(1)	
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0	(3)	
WD (degrees)	0	4.0	4	5	(1)	
	90	86.0	4	5	(1)	
	180	179.0	1	5	(1)	
	270	271.0	1	5	(1)	
Temperature (°F)	77.0	76.8	0.2	1.8	(1)	
	ice water bath	32.3	32.3	0.0	1.8	(1)
	warm water bath	120.0	119.7	0.3	1.8	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1996

(3)= Manufacturer's Specifications

Notes, Recommendations

System off-line @ 1230

System on-line @ 1308

Tail is a little chewed up.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining, Newcastle

Audit Date: 20-Jul-06

Audit Performed by: B. Kelly, K. Fox - IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	digital thermistor
Data acquisition system (DAS):	Campbell Scientific CR510	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.23	0.23	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	≤0.2	N/A	N/A	1.0	(3)
WD (degrees)	0	1.5	2	5	(1)
	90	88.0	2	5	(1)
	180	179.0	1	5	(1)
	270	274.0	4	5	(1)
Temperature (°F)	72.9	72.9	0.0	1.8	(1)
	ice water bath	35.8	35.6	0.2	1.8 (1)
	warm water bath	128.2	127.2	1.0	1.8 (1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1996
 (3)= Manufacturer's Specifications

Notes, Recommendations

System off-line @ 1433
System on-line @ 1503
Tail is a little chewed up.
Needs rebuilt sensor next trip - WD pot worn

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining, Newcastle

Audit Date: 15-Mar-07

Audit Performed by: B. Kelly, C. Medill - IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	digital thermistor
Data acquisition system (DAS):	Campbell Scientific CR510	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0	(3)
WD (degrees)	0	1.5	1	5	(1)
	90	89.9	0	5	(1)
	180	179.2	1	5	(1)
	270	268.7	1	5	(1)
Temperature (°F)	71.6	71.6	0.0	1.8	(1)
	ice water bath	32.3	0.2	1.8	(1)
	warm water bath	130.7	1.4	1.8	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1996

(3)= Manufacturer's Specifications

Notes, Recommendations

System off-line @ 0905
 System on-line @ 1015
 Replaced anemometer with new Wind Monitor AQ

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining, Newcastle

Audit Date: 13-Sep-07

Audit Performed by: B. Kelly, C. Medill - IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	digital thermistor
Data acquisition system (DAS):	Campbell Scientific CR510	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0	(3)
WD (degrees)	0	0.1	0	5	(1)
	90	89.9	0	5	(1)
	180	180.8	1	5	(1)
	270	268.1	2	5	(1)
Temperature (°F)	84.6	84.5	0.0	0.9	(1)
	ice water bath	32.2	32.0	0.1	(1)
	warm water bath	127.9	126.8	1.1	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1996

(3)= Manufacturer's Specifications

Notes, Recommendations

System off-line @ 0834

System on-line @ 0850

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining
Audit Performed By: S. Hansen, C. Medill, IML-Air Science

Audit Date: 3-Mar-08

Sensor	Mfr./Model	Serial Number	Reference Device	Serial/ID Number
Vert. Wind Speed 10m:	RM Young Wind Monitor AQ	NA	quartz referenced drive motor	CA02423
Wind Speed (WS):	RM Young Wind Monitor AQ	WM75308	quartz referenced drive motor	IML0853 & IML0858
Wind Direction (WD):	RM Young Wind Monitor AQ	WM75308	transit, compass	Brunton 5080393535
Temperature @ 2 Meters:	Fenwall 107	NA	digital thermistor	IML0987
Relative Humidity:	Vaisala HMP50	C4240028	digital psychrometer	Thermo-Hygro 22087796
Barometric Pressure:	Vaisala PTB101B	C4240018	digital barometer	IML0968
Solar Radiation:	LI-COR LI200X	PY57681	Li-Cor	PY54289
Data acquisition system:	CSI CR1000 datalogger	13147	N/A	N/A

Audit Results

	RPM	MPH	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	below threshold	
	300	3.44	3.44	0.00	0.56	(2)
	800	9.16	9.16	0.00	0.56	(2)
	3000	34.35	34.35	0.00	1.72	(2)
	8000	91.60	91.60	0.00	4.58	(2)
WS start torque (gm-cm)	Reference		DAS Value	Difference	Specification	
	<.1		N/A	N/A	1.0	(3)
WD (degrees)		0.0	0.7	0.7	5.0	(2)
		90.0	89.8	0.2	5.0	(2)
		180.0	179.8	0.2	5.0	(2)
		270.0	269.9	0.1	5.0	(2)
Temp. (°F):	Reference		DAS Value	Difference	Specification	
	35.20		35.00	0.20	0.5	(2)
	57.80		57.70	0.10	0.5	(2)
	101.50		100.90	0.60	0.5	(2)
Relative Humidity (%)	Reference		DAS Value	Difference	Specification	
	37.0		38.9	1.9	7.0	(2)
Barometric Pressure (°Hg)		25.53	25.47	0.06	0.09	(2)
	Reference	Reference				
	RPM	cm/s	DAS Value	Difference	Specification	
Vert WS 10 meters (cm/s)	0	0.00	0.00	0.00	below threshold	
(CW)	20	100.00	91.10	8.90	25.00	(2)
U:	60	300.00	110.20	189.80	35.00	(2)
	100	1000.00	126.70	873.30	70.00	(2)
	500	2500.00	NA	NA	145.00	(2)
	RPM	cm/s	DAS Value	Difference	Specification	
Vert WS 10 meters (cm/s)	0	0.00	0.00	0.00	below threshold	
(CCW)	20	100.00	NA	NA	25.00	(2)
U:	60	300.00	NA	NA	35.00	(2)
	100	1000.00	NA	NA	70.00	(2)
	500	2500.00	NA	NA	145.00	(2)
BOLD difference values exceed performance specifications						
(1)= Performance specification listed in facilities' Quality Assurance Project Plan						
(2)= EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989						
(3)= Manufacturer's Specifications						
(4)= EPA On-Site Meteorological Program Guidance for Regulatory Modeling Applications						

Notes, Recommendations

Datalogger taken off line @ 1015 MST -- returned on-line 1810 MST.
Vertical Wind Speed connector broke during audit.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining
Audit Performed By: C. Medill - IML Air Science

Audit Date: 27-Aug-08

Sensor	Mfr./Model	Serial Number	Reference Device	Serial/ID Number
Vert. Wind Speed 10m:	RM Young Wind Monitor AQ	NA	quartz referenced drive motor	CA02423
Wind Speed (WS):	RM Young Wind Monitor AQ	WM75308	quartz referenced drive motor	IML0853 & IML0858
Wind Direction (WD):	RM Young Wind Monitor AQ	WM75308	transit, compass	Brunton 5080393535
Temperature @ 2 Meters:	Fenwall 107	NA	digital thermistor	IML0987
Relative Humidity:	Vaisala HMP50	C4240028	digital psychrometer	Thermo-Hygro 22087796
Barometric Pressure:	Vaisala PTB101B	C4240018	digital barometer	IML0968
Solar Radiation:	LI-COR LI200X	PY57681	Li-Cor	PY54289
Data acquisition system:	CSI CR1000 datalogger	13147	N/A	N/A

Audit Results

	RPM	MPH	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	below threshold	
	300	3.44	3.44	0.00	0.56	(2)
	800	9.16	9.16	0.00	0.56	(2)
	3000	34.35	34.35	0.00	1.72	(2)
	8000	91.60	91.60	0.00	4.58	(2)
	Reference		DAS Value	Difference	Specification	
WS start torque (gm-cm)	<.1		N/A	N/A	1.0	(3)
WD (degrees)		0.0	0.1	0.1	5.0	(2)
		90.0	89.4	0.6	5.0	(2)
		180.0	179.6	0.4	5.0	(2)
		270.0	270.0	0.0	5.0	(2)
	Reference		DAS Value	Difference	Specification	
Temp. (°F):		0.93	0.87	0.06	0.5	(2)
		23.28	23.32	0.04	0.5	(2)
		45.41	45.29	0.12	0.5	(2)
	Reference		DAS Value	Difference	Specification	
Relative Humidity (%)		27.0	26.9	0.1	7.0	(2)
Barometric Pressure ("Hg)		25.56	25.58	0.02	0.09	(2)
	Reference RPM	Reference cm/s	DAS Value	Difference	Specification	
Vert WS 10 meters (cm/s)	0	0.00	0.00	0.00	below threshold	
(CW)	20	100.00	100.80	0.80	25.00	(2)
	60	300.00	300.10	0.10	35.00	(2)
U:	100	1000.00	1001.00	1.00	70.00	(2)
	500	2500.00	2500.00	0.00	145.00	(2)
	RPM	cm/s	DAS Value	Difference	Specification	
Vert WS 10 meters (cm/s)	0	0.00	0.00	0.00	below threshold	
(CCW)	20	100.00	100.80	0.80	25.00	(2)
	60	300.00	295.30	4.70	35.00	(2)
U:	100	1000.00	999.10	0.90	70.00	(2)
	500	2500.00	2503.00	3.00	145.00	(2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications
 (4)= EPA On-Site Meteorological Program Guidance for Regulatory Modeling Applications

Notes, Recommendations

Datalogger taken off line @ 0826 MST -- returned on-line 1027 MST.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining
Audit Performed By: D.Barkan, R. Campbell - IML Air Science

Audit Date: 13-Feb-09

Sensor	Mfr./Model	Serial Number	Reference Device	Serial/ID Number
Vert. Wind Speed 10m:	RM Young Wind Monitor AQ	NA	quartz referenced drive motor	
Wind Speed (WS):	RM Young Wind Monitor AQ	WM75308	quartz referenced drive motor	
Wind Direction (WD):	RM Young Wind Monitor AQ	WM75308	transit, compass	
Temperature @ 2 Meters:	Fenwall 107	NA	digital thermistor	IML 0888
Relative Humidity:	Vaisala HMP50	C4240028	digital psychrometer	IML 0891
Barometric Pressure:	Vaisala PTB101B	C4240018	digital barometer	IML 0904
Solar Radiation:	LI-COR LI200X	PY57681	Li-Cor	
Data acquisition system:	CSI CR1000 datalogger	13147	N/A	N/A

Audit Results

	RPM	MPH	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	below threshold	
	300	3.44	3.44	0.00	0.56	(2)
	800	9.16	9.16	0.00	0.56	(2)
	3000	34.35	34.35	0.00	1.72	(2)
	8000	91.60	91.60	0.00	4.58	(2)
		Reference	DAS Value	Difference	Specification	
WS start torque (gm-cm)		<.1	N/A	N/A	1.0	(3)
WD (degrees)		0.0	1.0	1.0	5.0	(2)
		90.0	90.1	0.1	5.0	(2)
		180.0	180.3	0.3	5.0	(2)
		270.0	270.1	0.1	5.0	(2)
		Reference	DAS Value	Difference	Specification	
Temp. 2 meter (°F):		-0.09	-0.08	0.01	0.5	(2)
		18.20	18.10	0.10	0.5	(2)
		43.80	43.90	0.10	0.5	(2)
Temp. 10 meter (°F):		-0.09	-0.04	0.05	0.5	(2)
		18.20	18.10	0.10	0.5	(2)
		43.80	43.90	0.10	0.5	(2)
		Upper Sensor	Lower Sensor	Difference	Specification	
Delta T. (°C)		-0.08	-0.04	0.04	0.10	(2)
		18.10	18.10	0.00	0.10	(2)
		43.90	43.90	0.00	0.10	(2)
		Reference	DAS Value	Difference	Specification	
Relative Humidity (%)		73.5	70.5	3.0	7.0	(2)
Barometric Pressure ("Hg)		25.77	25.70	0.07	0.09	(2)

		Reference	Reference			
		RPM	cm/s	DAS Value	Difference	Specification
Vert WS 10 meters (cm/s) (CW)	U:	0	0.00	0.00	0.00	below threshold
		20	10.00	10.90	0.90	20.50 (2)
		60	30.00	29.10	0.90	21.50 (2)
		100	50.00	47.40	2.60	22.50 (2)
		500	245.00	246.50	1.50	32.25 (2)
		RPM	cm/s	DAS Value	Difference	Specification
Vert WS 10 meters (cm/s) (CCW)	U:	0	0.00	0.00	0.00	below threshold
		20	-10.00	-9.70	0.30	20.50 (2)
		60	-30.00	-31.60	1.60	21.50 (2)
		100	-50.00	-51.00	1.00	22.50 (2)
		500	-245.00	-253.90	8.90	32.25 (2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

(4)= EPA On-Site Meteorological Program Guidance for Regulatory Modeling Applications

Notes, Recommendations

Datalogger taken off line @ 0826 MST -- returned on-line 1027 MST.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining
Audit Performed By: D.Barkan, J. Goldsmith - IML Air Science

Audit Date: 30-Jul-09

Sensor	Mfr./Model	Serial Number	Reference Device	Serial/ID Number
Vert. Wind Speed 10m:	RM Young Wind Monitor AQ	NA	quartz referenced drive motor	IML 0857
Wind Speed (WS):	RM Young Wind Monitor AQ	WM75308	quartz referenced drive motor	IML 0857
Wind Direction (WD):	RM Young Wind Monitor AQ	WM75308	transit, compass	IML 0942
Temperature @ 2 Meters:	Fenwall 107	NA	digital thermistor	IML 1402
Relative Humidity:	Vaisala HMP50	C4240028	digital psychrometer	IML 0890
Barometric Pressure:	Vaisala PTB101B	C4240018	digital barometer	IML 1404
Solar Radiation:	LI-COR LI200X	PY57681	Li-Cor	PY52289
Data acquisition system:	CSI CR1000 datalogger	13147	N/A	N/A

Audit Results

	RPM	MPH	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	below threshold	
	300	3.44	3.43	0.00	0.56	(2)
	800	9.16	9.16	0.00	0.56	(2)
	3000	34.35	34.35	0.00	1.72	(2)
	8000	91.60	91.60	0.00	4.58	(2)
	Reference		DAS Value	Difference	Specification	
WS start torque (gm-cm)	<.1		N/A	N/A	1.0	(3)
WD (degrees)	0.0		0.1	0.1	5.0	(2)
	90.0		91.9	1.9	5.0	(2)
	180.0		180.2	0.2	5.0	(2)
	270.0		270.2	0.2	5.0	(2)
	Reference		DAS Value	Difference	Specification	
Temp. 2 meter (°F):	0.00		0.02	0.02	0.5	(2)
	24.49		24.66	0.17	0.5	(2)
	48.89		49.40	0.51	0.5	(2)
Temp. 10 meter (°F):	0.00		0.01	0.01	0.5	(2)
	24.49		24.66	0.17	0.5	(2)
	48.89		49.40	0.51	0.5	(2)
	Upper Sensor	Lower Sensor		Difference	Specification	
Delta T. (°C)	0.02	0.01		0.01	0.10	(2)
	24.66	24.66		0.00	0.10	(2)
	49.40	49.40		0.00	0.10	(2)
	Reference		DAS Value	Difference	Specification	
Relative Humidity (%)	70.6		69.1	1.5	7.0	(2)
Barometric Pressure ("Hg)	25.75		25.76	0.01	0.09	(2)

		Reference	Reference			
		RPM	cm/s	DAS Value	Difference	Specification
Vert WS 10 meters (cm/s) (CW)	U:	0	0.00	0.00	0.00	below threshold
		20	10.00	9.70	0.30	20.50 (2)
		60	30.00	26.70	3.30	21.50 (2)
		100	50.00	46.16	3.84	22.50 (2)
		500	245.00	242.90	2.10	32.25 (2)
		RPM	cm/s	DAS Value	Difference	Specification
Vert WS 10 meters (cm/s) (CCW)	U:	0	0.00	0.00	0.00	below threshold
		20	-10.00	-9.70	0.30	20.50 (2)
		60	-30.00	-29.10	0.90	21.50 (2)
		100	-50.00	-49.80	0.20	22.50 (2)
		500	-245.00	-250.20	5.20	32.25 (2)
BOLD difference values exceed performance specifications						
(1)= Performance specification listed in facilities' Quality Assurance Project Plan						
(2)= EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989						
(3)= Manufacturer's Specifications						
(4)= EPA On-Site Meteorological Program Guidance for Regulatory Modeling Applications						

Notes, Recommendations

Datalogger taken off line at 0841 MST and returned on-line 0942 MST.
Adjusted WD alingment, changed bearings.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining
Audit Performed By: D.Barkan, C. Medill - IML Air Science

Audit Date: 22-Mar-10

Sensor	Mfr./Model	Serial Number	Reference Device	Serial/ID Number
Vert. Wind Speed 10m:	RM Young Wind Monitor AQ	NA	quartz referenced drive motor	IML 0855
Wind Speed (WS):	RM Young Wind Monitor AQ	WM75308	quartz referenced drive motor	IML 0856
Wind Direction (WD):	RM Young Wind Monitor AQ	WM75308	transit, compass	IML 0942
Temperature @ 2 Meters:	Fenwall 107	NA	digital thermistor	IML 0888
Relative Humidity:	Vaisala HMP50	C4240028	digital psychrometer	IML 0892
Barometric Pressure:	Vaisala PTB101B	C4240018	digital barometer	IML 0904
Solar Radiation:	LI-COR LI200X	PY57681	Li-Cor	PY54289
Data acquisition system:	CSI CR1000 datalogger	13147	N/A	N/A

Audit Results

	RPM	MPH	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	below threshold	
	300	3.44	3.43	0.00	0.56	(2)
	800	9.16	9.16	0.00	0.56	(2)
	3000	34.35	34.35	0.00	1.72	(2)
	8000	91.60	91.60	0.00	4.58	(2)
		Reference	DAS Value	Difference	Specification	
WS start torque (gm-cm)		<.1	N/A	N/A	1.0	(3)
WD (degrees)		0.0	0.1	0.1	5.0	(2)
		90.0	88.9	1.1	5.0	(2)
		180.0	180.2	0.2	5.0	(2)
		270.0	271.0	1.0	5.0	(2)
		Reference	DAS Value	Difference	Specification	
Temp. 2 meter (°F):		0.06	0.14	0.08	0.5	(2)
		19.60	19.54	0.06	0.5	(2)
		35.03	35.12	0.09	0.5	(2)
Temp. 10 meter (°F):		0.06	0.13	0.07	0.5	(2)
		19.60	19.59	0.01	0.5	(2)
		35.03	35.15	0.12	0.5	(2)
		Upper Sensor	Lower Sensor	Difference	Specification	
Delta T. (°C)		0.14	0.13	0.01	0.10	(2)
		19.54	19.59	0.05	0.10	(2)
		35.12	35.15	0.03	0.10	(2)
		Reference	DAS Value	Difference	Specification	
Relative Humidity (%)		33.5	33.1	0.4	7.0	(2)
Barometric Pressure ("Hg)		25.43	25.43	0.00	0.09	(2)

		Reference	Reference			
		RPM	cm/s	DAS Value	Difference	Specification
Vert WS 10 meters (cm/s) (CW)	U:	0	0.00	0.00	0.00	below threshold
		20	10.00	9.71	0.29	20.50 (2)
		60	30.00	29.14	0.86	21.50 (2)
		100	50.00	47.36	2.64	22.50 (2)
		500	245.00	247.78	2.78	32.25 (2)
		RPM	cm/s	DAS Value	Difference	Specification
Vert WS 10 meters (cm/s) (CCW)	U:	0	0.00	0.00	0.00	below threshold
		20	-10.00	-9.71	0.29	20.50 (2)
		60	-30.00	-30.36	0.36	21.50 (2)
		100	-50.00	-49.47	0.53	22.50 (2)
		500	-245.00	-250.20	5.20	32.25 (2)
BOLD difference values exceed performance specifications						
(1)= Performance specification listed in facilities' Quality Assurance Project Plan						
(2)= EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989						
(3)= Manufacturer's Specifications						
(4)= EPA On-Site Meteorological Program Guidance for Regulatory Modeling Applications						

Notes, Recommendations

Datalogger taken off line at 08:30 MST and returned on-line 12:58 MST.
Replaced wind direction tail coupler and wind speed bearings.



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining

Audit Date: 20-Aug-10

Audit Performed By: T. Mendenhall, S. Hansen - IML Air Science

Sensor	Mfr./Model	Serial Number	Reference Device	Serial/ID Number
Vert. Wind Speed 10m:	RM Young Wind Monitor AQ	N/A	quartz referenced drive motor	IML 1407
Wind Speed (WS):	RM Young Wind Monitor AQ	WM75308	quartz referenced drive motor	IML 0889
Wind Direction (WD):	RM Young Wind Monitor AQ	WM75308	transit, compass	IML 1405
Temperature @ 2 Meters:	RM Young RTD	NA	digital thermistor	IML 1402
Temperature @ 10 Meters:	RM Young RTD	NA	digital thermistor	IML 1402
Relative Humidity:	Vaisala HMP50	C4240028	digital hygrometer	IML 0892
Barometric Pressure:	Vaisala PTB101B	C4240018	digital barometer	IML 0887
Solar Radiation:	LI-COR LI200X	PY57681	Li-Cor	N/A
Data acquisition system:	CSI CR1000 datalogger	13147	N/A	N/A

Audit Results

	RPM	MPH	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	below threshold	
	300	3.44	3.44	0.00	0.56	(2)
	800	9.16	9.16	0.00	0.56	(2)
	3000	34.35	34.35	0.00	0.56	(2)
	8000	91.60	91.60	0.00	0.56	(2)
		Reference	DAS Value	Difference	Specification	
WS start torque (gm-cm)		<1	1	0	1.0	(3)
Crossarm Alignment		235°	241°	6	5.0	
WD (degrees)	Clockwise	0.0	0.1	0.1	5.0	(2)
		90.0	90.6	0.6	5.0	(2)
		180.0	179.9	0.1	5.0	(2)
		270.0	269.1	0.9	5.0	(2)
	Counter Clockwise	0.0	0.9	0.9	5.0	(2)
		90.0	90.4	0.4	5.0	(2)
		180.0	180.1	0.1	5.0	(2)
		270.0	269.8	0.2	5.0	(2)
		Reference	DAS Value	Difference	Specification	
Temp. 2 meter (°F):		1.09	1.12	0.03	0.5	(2)
		54.90	54.84	0.06	0.5	(2)
		22.90	22.74	0.16	0.5	(2)
Temp. 10 meter (°F):		1.09	1.10	0.01	0.5	(2)
		54.90	54.91	0.01	0.5	(2)
		22.90	22.80	0.10	0.5	(2)
		Upper Sensor	Lower Sensor	Difference	Specification	
Delta T. (°C)		1.12	1.10	0.02	0.10	(2)
		54.84	54.91	0.07	0.10	(2)
		22.74	22.80	0.06	0.10	(2)
		Reference	DAS Value	Difference	Specification	
Relative Humidity (%)		19.2	16.7	2.5	7.0	(2)
Barometric Pressure (°Hg)		25.55	25.56	0.01	0.09	(2)

		Reference	Reference			
		RPM	cm/s	DAS Value	Difference	Specification
Vert WS 10 meters (cm/s) (CW)	U:	0	0.00	0.00	0.00	below threshold
		20	10.00	9.11	0.89	20.50 (2)
		60	30.00	24.69	5.31	21.50 (2)
		200	100.00	99.49	0.51	25.00 (2)
		500	245.00	248.60	3.60	32.25 (2)
		RPM	cm/s	DAS Value	Difference	Specification
Vert WS 10 meters (cm/s) (CCW)	U:	0	0.00	0.00	0.00	below threshold
		20	-10.00	-10.33	0.33	20.50 (2)
		60	-30.00	-24.91	5.09	21.50 (2)
		200	-100.00	-101.45	1.45	25.00 (2)
		500	-245.00	-248.60	3.60	32.25 (2)
BOLD difference values exceed performance specifications						
(1)= Performance specification listed in facilities' Quality Assurance Project Plan						
(2)= EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989						
(3)= Manufacturer's Specifications						
(4)= EPA On-Site Meteorological Program Guidance for Regulatory Modeling Applications						

Notes, Recommendations

Datalogger taken off line at 08:20 MST and returned on-line 09:20 MST.



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining

Audit Date: 3-Mar-11

Audit Performed By: S. Hansen, J. Masters – IML Air Science

Sensor	Mfr./Model	Serial Number	Reference Device	Serial/ID Number
Vert. Wind Speed 10m:	RM Young Wind Monitor AQ	N/A	quartz referenced drive motor	IML 1407
Wind Speed (WS):	RM Young Wind Monitor AQ	WM75308	quartz referenced drive motor	IML 1407
Wind Direction (WD):	RM Young Wind Monitor AQ	WM75308	transit, compass	IML 1405
Temperature @ 2 Meters:	RM Young RTD	NA	digital thermistor	IML 1401
Temperature @ 10 Meters:	RM Young RTD	NA	digital thermistor	IML 1401
Relative Humidity:	Vaisala HMP50	C4240028	digital hygrometer	IML 0890
Barometric Pressure:	Vaisala PTB101B	C4240018	digital barometer	IML 0968
Data acquisition system:	CSI CR1000 datalogger	13147	N/A	N/A

Audit Results

Adult Results							
	RPM	MPH	DAS Value	Difference	Specification		
WS (mph)	0	0.00	0.00	0.00	below threshold		
	300	3.44	3.44	0.00	0.56	(2)	
	800	9.16	9.16	0.00	0.56	(2)	
	3000	34.35	34.35	0.00	0.56	(2)	
	8000	91.60	91.60	0.00	0.56	(2)	
WS start torque (gm-cm)		1.0	<1.0	N/A	1.0	(3)	
WD (degrees)	Clockwise	0.0	0.1	0.1	5.0	(2)	
		90.0	90.8	0.8	5.0	(2)	
		180.0	180.6	0.6	5.0	(2)	
		270.0	268.7	1.3	5.0	(2)	
	Counter Clockwise	0.0	0.1	0.1	5.0	(2)	
		90.0	90.3	0.3	5.0	(2)	
		180.0	180.5	0.5	5.0	(2)	
		270.0	270.4	0.4	5.0	(2)	
Temp. 2 meter (°F):	Reference	DAS Value	Difference	Specification			
	18.91	18.72	0.19	0.5	(2)		
	0.27	0.00	0.27	0.5	(2)		
	45.70	45.56	0.14	0.5	(2)		
Temp. 10 meter (°F):	18.91	18.79	0.12	0.5	(2)		
	0.27	0.02	0.25	0.5	(2)		
	45.70	45.59	0.11	0.5	(2)		
Delta T. (°C)	Upper Sensor	Lower Sensor	Difference	Specification			
	18.72	18.79	0.07	0.10	(2)		
	0.00	0.02	0.02	0.10	(2)		
	45.56	45.59	0.03	0.10	(2)		
Relative Humidity (%)	48.7	48.2	0.5	7.0	(2)		
Barometric Pressure ("Hg)	25.49	25.51	0.02	0.09	(2)		

		Reference	Reference			
		RPM	cm/s	DAS Value	Difference	Specification
Vert WS 10 meters (cm/s) (CW)	U:	0	0.00	0.00	0.00	below threshold
		20	10.00	9.72	0.28	20.50 (2)
		60	30.00	29.15	0.85	21.50 (2)
		200	50.00	47.30	2.70	22.50 (2)
		500	250.00	248.60	1.40	32.50 (2)
		RPM	cm/s	DAS Value	Difference	Specification
Vert WS 10 meters (cm/s) (CCW)	U:	0	0.00	0.00	0.00	below threshold
		20	-10.00	-9.72	0.28	20.50 (2)
		60	-30.00	-29.15	0.85	21.50 (2)
		200	-50.00	-49.77	0.23	22.50 (2)
		500	-250.00	-247.30	2.70	32.50 (2)
BOLD difference values exceed performance specifications						
(1)= Performance specification listed in facilities' Quality Assurance Project Plan						
(2)= EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989						
(3)= Manufacturer's Specifications						
(4)= EPA On-Site Meteorological Program Guidance for Regulatory Modeling Applications						

Notes, Recommendations

Datalogger taken off line at 12:11 MST and returned on-line 12:59 MST.



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Wyoming Refining

Audit Date: 1-Sep-11

Audit Performed By: C. Cotton, J. Masters -- IML Air Science

Sensor	Mfr./Model	Serial Number	Reference Device	Serial/ID Number
Vert. Wind Speed 10m:	RM Young Wind Monitor AQ	N/A	quartz referenced drive motor	IML 0856
Wind Speed (WS):	RM Young Wind Monitor AQ	WM75308	quartz referenced drive motor	IML 0896
Wind Direction (WD):	RM Young Wind Monitor AQ	WM75308	transit, compass	IML 0894
Temperature @ 2 Meters:	RM Young RTD	NA	digital thermistor	IML 1401
Temperature @ 10 Meters:	RM Young RTD	NA	digital thermistor	IML 1401
Relative Humidity:	Vaisala HMP50	C4240028	digital hygrometer	IML 0899
Barometric Pressure:	Vaisala PTB101B	C4240018	digital barometer	IML 0968
Solar Radiation	LI-COR LI200X	PY57681	LI-COR 200X	PY68877
Data acquisition system:	CSI CR1000 datalogger	13147	N/A	N/A

Audit Results

	RPM	MPH	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	below threshold	
	300	3.44	3.44	0.00	0.56	(2)
	800	9.16	9.16	0.00	0.56	(2)
	3000	34.35	34.35	0.00	0.56	(2)
	8000	91.60	91.60	0.00	0.56	(2)
Crossarm Alignment		232.0	230.0	2.0	5.0	(3)
WS start torque (gm-cm)		1.0	1<1.0	N/A	1.0	(3)
WD (degrees)	Clockwise	0.0	0.1	0.1	5.0	(2)
		90.0	91.0	1.0	5.0	(2)
		180.0	180.1	0.1	5.0	(2)
		270.0	269.9	0.1	5.0	(2)
	Counter Clockwise	0.0	0.1	0.1	5.0	(2)
		90.0	90.5	0.5	5.0	(2)
		180.0	180.4	0.4	5.0	(2)
		270.0	269.0	1.0	5.0	(2)
Temp. 2 meter (°F):	Reference	DAS Value	Difference	Specification		
	0.20	0.19	0.01	0.5	(2)	
	34.46	34.53	0.07	0.5	(2)	
	51.50	51.34	0.16	0.5	(2)	
Temp. 10 meter (°F):	0.20	0.16	0.04	0.5	(2)	
	34.46	34.55	0.09	0.5	(2)	
	51.50	51.37	0.13	0.5	(2)	
Delta T. (°C)	Upper Sensor	Lower Sensor	Difference	Specification		
	0.19	0.16	0.03	0.10	(2)	
	34.53	34.55	0.02	0.10	(2)	
	51.34	51.37	0.03	0.10	(2)	
Relative Humidity (%)		33.9	33.3	0.6	7.0	(2)
Barometric Pressure ("Hg)		25.59	25.59	0.00	0.09	(2)

		Reference	Reference				
		RPM	cm/s	DAS Value	Difference	Specification	
Vert WS 10 meters (cm/s) (CW)	U:	0	0.00	0.00	0.00	below threshold	
		20	10.00	9.72	0.28	20.50	(2)
		60	30.00	29.16	0.84	21.50	(2)
		200	50.00	46.17	3.83	22.50	(2)
		500	250.00	243.00	7.00	32.50	(2)
		RPM	cm/s	DAS Value	Difference	Specification	
Vert WS 10 meters (cm/s) (CCW)	U:	0	0.00	0.00	0.00	below threshold	
		20	-10.00	-9.72	0.28	20.50	(2)
		60	-30.00	-29.16	0.84	21.50	(2)
		200	-50.00	-48.60	1.40	22.50	(2)
		500	-250.00	-245.00	5.00	32.50	(2)
BOLD difference values exceed performance specifications							
(1)= Performance specification listed in facilities' Quality Assurance Project Plan							
(2)= EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989							
(3)= Manufacturer's Specifications							
(4)= EPA On-Site Meteorological Program Guidance for Regulatory Modeling Applications							

Notes, Recommendations

System taken off-line at 12:36 MST and returned on-line 13:13 MST.



POWERTECH (USA) INC.

Antelope Mine Meteorological Station Audit Reports

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 17-Feb-97

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Insitu WTS-100	Hg-in-glass thermometer, or t-couple
Barometric Pressure (BP):	Insitu WBS-360	Altimeter
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10 & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00		
	3.44	3.43	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.25	0.10	1.72	(1)
	91.60	91.46	0.14	4.58	(1)
WS start torque (gm-cm)	$\tau < 0.7$	N/A	N/A	1.0	(3)
WD (degrees)	0.0	1.0	1.0	5.0	(1)
	90.0	91.2	1.2	5.0	(1)
	180.0	179.9	0.1	5.0	(1)
	270.0	270.1	0.1	5.0	(1)
WD start torque (gm-cm)	$\tau < 11.0$	N/A	N/A	11.0	(3)
Temperature (°F)	ambient	51.7	52.0	0.3	1.8 (1)
	ice bath	32.0	32.8	0.8	1.8 (1)
	warm bath	102.5	102.2	0.3	1.8 (1)
Precipitation (0.05" equiv.)	92.7	90.0	2.7	9.3	(1)
	92.7	93.0	0.3	9.3	(1)
	92.7	95.0	2.3	9.3	(1)
Pressure (in. Hg)	25.06	25.10	0.04	N/A	N/A

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1220 MST – returned on-line at 1300 MST.
 Wind screen is torn.
 Wind direction alignment is OK.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 21-Mar-97

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.05	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	$\tau < 0.2$	N/A	N/A	1.0	(3)
WD (degrees)	0.0	1.5	1.5	5.0	(1)
	90.0	89.0	1.0	5.0	(1)
	180.0	180.0	0.0	5.0	(1)
	270.0	271.0	1.0	5.0	(1)
WD start torque (gm-cm)	$\tau < 11.0$	N/A	N/A	11.0	(3)
Temperature (°F)	ambier	59.4	60.1	0.7	(1)
	ice bath	37.0	38.1	1.1	(1)
	warm bath	78.4	78.2	0.2	(1)
Precipitation (0.04" equiv.)	74.2	74.0	0.2	7.4	(1)
	74.2	74.0	0.2	7.4	(1)
	74.2	74.0	0.2	7.4	(1)
Pressure (in. Hg)	25.25	25.23	0.02	0.25	(2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1030 MST -- returned on-line at 1455 DST.

Installed new CR10X datalogger, pressure sensor, enclosure, surge protection, precipitation sensor cable and wind sensor cable.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 11-Mar-98

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Insitu WTS-100	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Insitu WBS-360	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10 & storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.40	0.05	1.72	(1)
		91.60	91.65	0.05	4.58	(1)
WS start torque (gm-cm)		$\tau < 0.2$	N/A	N/A	1.0	(3)
WD (degrees)		0.0	0.3	0.3	5.0	(1)
		90.0	91.5	1.5	5.0	(1)
		180.0	182.2	2.2	5.0	(1)
		270.0	272.1	2.1	5.0	(1)
WD start torque (gm-cm)		$\tau < 11.0$	N/A	N/A	11.0	(3)
Temperature (°F)	ambient	16.0	14.6	1.4	1.8	(1)
	ice bath	32.0	31.9	0.1	1.8	(1)
	warm bat	119.1	119.8	0.7	1.8	(1)
Precipitation (0.04" equiv.)		74.2	76.0	1.8	7.4	(1)
		74.2	77.0	2.8	7.4	(1)
		74.2	76.0	1.8	7.4	(1)
Pressure (in. Hg)		25.47	25.51	0.04	N/A	N/A

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed in EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1310 MST -- returned on-line at 1353 MST.
 System time, date and battery voltage are OK.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 18-Aug-98

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Insitu WTS-100	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Insitu WBS-360	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10 & storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.44	0.00	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.40	0.05	1.72 (1)
		91.60	91.65	0.05	4.58 (1)
WS start torque (gm-cm)		$\tau < 0.2$	N/A	N/A	1.0 (3)
WD (degrees)		0.0	0.1	0.1	5.0 (1)
		90.0	88.0	2.0	5.0 (1)
		180.0	179.0	1.0	5.0 (1)
		270.0	271.0	1.0	5.0 (1)
WD start torque (gm-cm)		$\tau < 11.0$	N/A	N/A	11.0 (3)
Temperature (°F)	ambient	78.6	78.5	0.1	1.8 (1)
	ice bath	32.0	32.1	0.1	1.8 (1)
	warm bat	116.2	116.3	0.1	1.8 (1)
Precipitation (0.04" equiv.)		74.2	76.0	1.8	7.4 (1)
		74.2	76.0	1.8	7.4 (1)
		74.2	76.0	1.8	7.4 (1)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 0848 MST -- returned on-line at 0923 MST.
 System time, date and battery voltage are OK.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 9-Mar-99

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Insitu WTS-100	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Insitu WBS-360	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10 & storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		$\tau < 0.2$	N/A	N/A	1.0	(3)
WD (degrees)		0.0	1.3	1.3	5.0	(1)
		90.0	90.6	0.6	5.0	(1)
		180.0	179.8	0.2	5.0	(1)
		270.0	270.8	0.8	5.0	(1)
WD start torque (gm-cm)		$\tau < 11.0$	N/A	N/A	11.0	(3)
Temperature (°F)	ambient	41.9	42.0	0.1	1.8	(1)
	ice bath	32.0	32.0	0.0	1.8	(1)
	warm bat	177.8	117.0	60.8	1.8	(1)
Precipitation (0.04" equiv.)		74.2	76.0	1.8	7.4	(1)
		74.2	74.0	0.2	7.4	(1)
		74.2	73.0	1.2	7.4	(1)
Pressure (in. Hg)		25.1	25.23	0.13	0.25	(2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1031 MST -- returned on-line at 1130 MST.
 System time, date and battery voltage are OK.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 1-Sep-99

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Insitu WTS-100	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Insitu WBS-360	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10 & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	$\tau < 0.2$	N/A	N/A	1.0	(3)
WD (degrees)	0.0	1.6	1.6	5.0	(1)
	90.0	90.5	0.5	5.0	(1)
	180.0	180.0	0.0	5.0	(1)
	270.0	269.0	1.0	5.0	(1)
WD start torque (gm-cm)	$\tau < 11.0$	N/A	N/A	11.0	(3)
Temperature (°F)	ambient	67.0	0.7	1.8	(1)
	ice bath	32.2	0.1	1.8	(1)
	warm bath	85.3	0.0	1.8	(1)
Precipitation (0.04" equiv.)	74.2	76.0	1.8	7.4	(1)
	74.2	74.0	0.2	7.4	(1)
	74.2	74.0	0.2	7.4	(1)
Pressure (in. Hg)	25.35	25.26	0.09	0.25	(2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1255 DST – returned on-line at 1340 DST.

Battery voltage at 13.38.

System operating in daylight savings time.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 14-Mar-00

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Insitu WTS-100	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Insitu WBS-360	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10 & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.05	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	$\tau < 0.2$	N/A	N/A	1.0	(3)
WD (degrees)	0.0	1.3	1.3	5.0	(1)
	90.0	89.0	1.0	5.0	(1)
	180.0	179.0	1.0	5.0	(1)
	270.0	270.0	0.0	5.0	(1)
WD start torque (gm-cm)	$\tau < 11.0$	N/A	N/A	11.0	(3)
Temperature (°F)	ambient	44.6	44.5	0.1	1.8 (1)
	ice bath	32.0	32.1	0.1	1.8 (1)
	warm bath	112.0	111.0	1.0	1.8 (1)
Precipitation (0.04" equiv.)	74.2	77.0	2.8	7.4	(1)
	74.2	75.0	0.8	7.4	(1)
	74.2	74.3	0.1	7.4	(1)
Pressure (in. Hg)	25.05	25.23	0.18	0.25	(2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1105 DST -- returned on-line at 1255 DST.
 Battery voltage at 13.64.
 System operating in daylight savings time.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 12-Sep-00

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Insitu WTS-100	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Insitu WBS-360	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10 & storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.05	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		$\tau < 0.2$	N/A	N/A	1.0	(3)
WD (degrees)		0.0	0.6	0.6	5.0	(1)
		90.0	92.5	2.5	5.0	(1)
		180.0	181.9	1.9	5.0	(1)
		270.0	271.7	1.7	5.0	(1)
WD start torque (gm-cm)		$\tau < 11.0$	N/A	N/A	11.0	(3)
Temperature (°F)	ambient	80.2	79.2	1.0	1.8	(1)
	ice bath	36.7	35.6	1.1	1.8	(1)
	warm bath	97.0	96.0	1.0	1.8	(1)
Precipitation (0.04" equiv.)		74.2	74.0	0.2	7.4	(1)
		74.2	74.0	0.2	7.4	(1)
		74.2	74.0	0.2	7.4	(1)
Pressure (in. Hg)		25.32	25.40	0.08	0.25	(2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed in EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1315 DST -- returned on-line at 1414 DST.
 Battery voltage at 13.04.
 System operating in daylight savings time.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 29-Aug-01
 Audit Performed by: D. Black, W. Adler - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.04	0.00	0.56 (1)
		3.44	3.50	0.06	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.35	0.00	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		$\tau < 0.2$	N/A	N/A	1.0 (3)
WD (degrees)		0.0	1.4	1.4	5.0 (1)
		90.0	91.6	1.6	5.0 (1)
		180.0	181.6	1.6	5.0 (1)
		270.0	270.9	0.9	5.0 (1)
WD start torque (gm-cm)		$\tau < 11.0$	N/A	N/A	11.0 (3)
Temperature (°F)	ambier	77.6	76.0	1.6	1.8 (1)
	ice bath	32.8	32.8	0.0	1.8 (1)
	warm bath	117.8	116.1	1.7	1.8 (1)
Precipitation (0.04" equiv.)		74.2	73.5	0.7	7.4 (1)
		74.2	73.4	0.8	7.4 (1)
		74.2	73.6	0.6	7.4 (1)
Pressure (in. Hg)		25.25	25.27	0.02	0.25 (2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1127 MST -- returned on-line at 1240 DST.
 Temperature sensor was not working upon arrival. Wire was chewed on and shorted. Spliced wire.
 Time was set to Daylight time. At the office, we re-set to Mountain Standard Time. (Time went from 1304 to 1203.)

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 25-Mar-02
 Audit Performed by: D. Black, J. Rogers - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification
WS (mph)	0.00	0.00	0.00	0.56 (1)
	3.77	3.70	0.07	0.56 (1)
	9.16	9.16	0.00	0.56 (1)
	34.35	34.35	0.00	1.72 (1)
	91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)	$\tau < 0.2$	N/A	N/A	1.0 (3)
WD (degrees)	0.0	1.0	1.0	5.0 (1)
	90.0	90.9	0.9	5.0 (1)
	180.0	180.3	0.3	5.0 (1)
	270.0	269.8	0.2	5.0 (1)
WD start torque (gm-cm)	$\tau < 11.0$	N/A	N/A	11.0 (3)
Temperature (°F) ambient	15.6	16.4	0.8	1.8 (1)
ice bath	32.0	31.2	0.8	1.8 (1)
warm bath	82.6	81.4	1.2	1.8 (1)
Precipitation (0.04" equiv.)	74.1	71.6	2.5	7.4 (1)
	74.1	72.0	2.1	7.4 (1)
	74.1	72.0	2.1	7.4 (1)
Pressure (in. Hg)	25.3	25.32	0.02	0.25 (2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1031 MST – returned on-line at 1101 MST.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company

Audit Date: 21-Jan-03

Audit Performed by: W. Adler, T. Shaw - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.50	0.06	0.56 (1)
		9.16	9.20	0.04	0.56 (1)
		34.35	34.35	0.00	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		$\tau < 0.2$	N/A	N/A	1.0 (3)
WD (degrees)		0.0	0.7	0.7	5.0 (1)
		90.0	90.5	0.5	5.0 (1)
		180.0	179.9	0.1	5.0 (1)
		270.0	270.0	0.0	5.0 (1)
WD start torque (gm-cm)		$\tau < 11.0$	N/A	N/A	11.0 (3)
Temperature (°F)	ambient	18.6	19.1	0.5	1.8 (1)
	ice bath	79.7	79.1	0.6	1.8 (1)
	warm bath	31.7	32.5	0.8	1.8 (1)
Precipitation (0.04" equiv.)		74.1	74.8	0.7	7.4 (1)
		74.1	74.2	0.1	7.4 (1)
		74.1	73.8	0.3	7.4 (1)
Pressure (in. Hg)		25.34	25.29	0.05	0.25 (2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1336 MST -- returned on-line at 1421 MST.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 30-Jul-03
 Audit Performed by: D. Lindberg, K. Jahnke - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.44	0.00	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.35	0.00	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0 (3)
WD (degrees)		0.0	0.0	0.0	5.0 (1)
		90.0	90.0	0.0	5.0 (1)
		180.0	180.0	0.0	5.0 (1)
		270.0	270.0	0.0	5.0 (1)
WD start torque (gm-cm)		t<11.0	N/A	N/A	11.0 (3)
Temperature (°F)	ambient	83.9	83.2	0.7	1.8 (1)
	ice bath	32.2	32.3	0.1	1.8 (1)
	warm bath	120.6	119.6	1.0	1.8 (1)
Precipitation (0.04" equiv.)		74.1	75.1	1.0	7.4 (1)
		74.1	74.8	0.7	7.4 (1)
		74.1	73.6	0.5	7.4 (1)
Pressure (in. Hg)		25.46	25.43	0.03	0.25 (2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 0940 -- returned on-line at 1044.

Wind Direction adjusted 15 degrees east of south.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 8-Mar-04
 Audit Performed by: W. Adler, T. Shaw - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification
WS (mph)	0.00	0.13	0.00	0.56 (1)
	3.44	3.44	0.00	0.56 (1)
	9.16	9.16	0.00	0.56 (1)
	34.35	34.35	0.00	1.72 (1)
	91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0 (3)
WD (degrees)	0.0	0.4	0.4	5.0 (1)
	90.0	90.2	0.2	5.0 (1)
	180.0	180.6	0.6	5.0 (1)
	270.0	270.3	0.3	5.0 (1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0 (3)
Temperature (°F) ambient	52.8	51.2	1.6	1.8 (1)
ice bath	32.6	33.0	0.4	1.8 (1)
warm bath	86.8	85.7	1.1	1.8 (1)
Precipitation (0.04" equiv.)	74.1	73.2	0.9	7.4 (1)
	74.1	73.4	0.7	7.4 (1)
	74.1	73.2	0.9	7.4 (1)
Pressure (in. Hg)	25.57	25.62	0.05	0.26 (2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1106 -- returned on-line at 1143.
 Precipitation tipping bucket was not registering upon arrival. The connection to the surge protector was re-established and working properly upon departure.
 Replaced bearings on wind speed sensor.
 The raptor protection needs to be extended another 6 inches.
 Will need a new tail next time.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 2-Sep-04
 Audit Performed by: K. Jahnke, T. Shaw - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification
WS (mph)	0.00	0.13	0.00	0.56 (1)
	3.44	3.44	0.00	0.56 (1)
	9.16	9.16	0.00	0.56 (1)
	34.35	34.30	0.05	1.72 (1)
	91.60	91.51	0.09	4.58 (1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0 (3)
WD (degrees)	0.0	0.1	0.1	5.0 (1)
	90.0	89.8	0.2	5.0 (1)
	180.0	180.9	0.9	5.0 (1)
	270.0	270.2	0.2	5.0 (1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0 (3)
Temperature (°F) ambient	71.5	71.0	0.5	1.8 (1)
ice water bath	33.1	34.0	0.9	1.8 (1)
warm water bath	126.4	125.5	0.9	1.8 (1)
Precipitation (0.04" equiv.)	74.1	73.2	0.9	7.4 (1)
	74.1	73.2	0.9	7.4 (1)
	74.1	73.2	0.9	7.4 (1)
Pressure (in. Hg)	25.16	25.21	0.04	0.25 (2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 0947 -- returned on-line at 1024.
 The raptor protection needs to be extended another 6 inches.
 A new tail will be installed in the next few weeks.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 22-Mar-05
 Audit Performed by: W. Adler, D. Tarver - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification
WS (mph)	0.00	0.00	0.00	0.56 (1)
	3.44	3.44	0.00	0.56 (1)
	9.16	9.16	0.00	0.56 (1)
	34.35	34.32	0.03	1.72 (1)
	91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0 (3)
WD (degrees)	0.0	0.0	0.0	5.0 (1)
	90.0	90.2	0.2	5.0 (1)
	180.0	181.2	1.2	5.0 (1)
	270.0	270.4	0.4	5.0 (1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0 (3)
Temperature (°F) ambient	42.3	40.9	1.4	1.8 (1)
ice water bath	33.1	34.2	1.1	1.8 (1)
warm water bath	125.2	123.9	1.3	1.8 (1)
Precipitation (0.04" equiv.)	74.1	69.0	5.1	7.4 (1)
	74.1	74.0	0.1	7.4 (1)
	74.1	75.5	1.4	7.4 (1)
Pressure (in. Hg)	25.29	25.24	0.05	0.25 (2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1020 -- returned on-line at 1048.

The raptor protection needs to be extended another 6 inches.

Replaced tail and wind speed bearings.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 27-Sep-05
 Audit Performed by: K. Jahnke, T. Shaw - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification
WS (mph)	0.00	0.45	0.00	0.56 (1)
	3.44	3.44	0.00	0.56 (1)
	9.16	9.16	0.00	0.56 (1)
	34.35	34.32	0.03	1.72 (1)
	91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0 (3)
WD (degrees)	0.0	0.7	0.7	5.0 (1)
	90.0	90.8	0.8	5.0 (1)
	180.0	179.9	0.1	5.0 (1)
	270.0	271.0	1.0	5.0 (1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0 (3)
Temperature (°F) ambient	79.6	81.2	1.6	1.8 (1)
ice water bath	35.8	34.4	1.4	1.8 (1)
warm water bath	97.3	96.3	1.0	1.8 (1)
Precipitation (0.04" equiv.)	74.1	73.0	1.1	7.4 (1)
	74.1	71.2	2.9	7.4 (1)
	74.1	70.1	4.0	7.4 (1)
Pressure (in. Hg)	25.22	25.28	0.06	0.25 (2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1020 MST -- returned on-line at 1053 MST.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 7-Mar-06
 Audit Performed by: Steven Engel & Tim Mendenhall--IML *Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification
WS (mph)	0.00	0.00	0.00	0.56 (1)
	3.44	3.48	0.05	0.56 (1)
	9.16	9.16	0.00	0.56 (1)
	34.35	34.35	0.00	1.72 (1)
	91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0 (3)
WD (degrees)	0.0	0.8	0.8	5.0 (1)
	90.0	90.5	0.5	5.0 (1)
	180.0	181.1	1.1	5.0 (1)
	270.0	269.8	0.2	5.0 (1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0 (3)
Temperature (°F) ambient	51.2	51.4	0.2	1.8 (1)
ice water bath	40.6	41.4	0.8	1.8 (1)
warm water bath	88.5	87.9	0.6	1.8 (1)
Precipitation (0.04" equiv.)	74.1	78.2	4.1	7.4 (1)
	74.1	76.2	2.1	7.4 (1)
	74.1	77.2	3.1	7.4 (1)
Pressure (in. Hg)	25.08	25.07	0.01	0.25 (2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1139 MST -- returned on-line at 1245 MST.
 Replaced windspeed bearings/ Needs O-ring for Youngs/ Precip bucket needs jewel bearings

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 19-Dec-06
 Audit Performed by: Shane Hansen and Steven Engel--IML *Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.66	3.66	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0	(3)
WD (degrees)	0.0	0.4	0.4	5.0	(1)
	90.0	90.4	0.4	5.0	(1)
	180.0	179.5	0.5	5.0	(1)
	270.0	270.4	0.4	5.0	(1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0	(3)
Temperature (°F) ambient	31.9	31.8	0.1	1.8	(1)
ice water bath	86.8	87.1	0.3	1.8	(1)
warm water bath	75.6	75.7	0.1	1.8	(1)
Precipitation (0.1" equiv.)	186.0	185.0	1.0	18.5	(1) Start Precip:1.09
	186.4	185.0	1.4	18.5	(1) End Precip: 1.51
	186.8	185.0	1.8	18.5	(1)
Pressure (in. Hg)	25.42	25.40	0.02	0.25	(2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System offline at 0950 mdt and online at 1040 mdt



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 22-Mar-07
 Audit Performed by: Kevin Jahnke and Steven Engel--IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0	(3)
WD (degrees)	0.0	0.4	0.4	5.0	(1)
	90.0	90.4	0.4	5.0	(1)
	180.0	179.5	0.5	5.0	(1)
	270.0	270.4	0.4	5.0	(1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0	(3)
Temperature (°F) hot water bath	121.5	120.1	1.4	1.8	(1)
ice water bath	33.2	33.0	0.2	1.8	(1)
warm water bath	56.0	56.4	0.4	1.8	(1)
Precipitation (0.1" equiv.)	182.2	185.2	3.0	18.5	(1) Start Precip: 1.68
	182.6	185.2	2.6	18.5	(1) End Precip: 2.01
	182.0	185.2	3.2	18.5	(1)
Pressure (in. Hg)	25.21	25.22	0.01	0.25	(2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System offline at 0948 MST and online at 1107 MST



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 10-Jul-07
 Audit Performed by: Kevin Jahnke and Steven Engel--IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0	(3)
WD (degrees)	0.0	0.1	0.1	5.0	(1)
	90.0	90.1	0.1	5.0	(1)
	180.0	180.5	0.5	5.0	(1)
	270.0	270.0	0.0	5.0	(1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0	(3)
Temperature (°F) hot water bath	90.1	89.5	0.6	0.9	(1)
ice water bath	37.6	37.3	0.3	0.9	(1)
warm water bath	67.3	67.2	0.1	0.9	(1)
Precipitation (0.1" equiv.)	181.2	185.2	4.0	18.5	(1) Start Precip:5.32
	183.4	185.2	1.8	18.5	(1) End Precip:5.62
	182.6	185.2	2.6	18.5	(1)
Pressure (in. Hg)	25.43	25.46	0.03	0.25	(2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System offline at 1348 MST and online at 1425 MST



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 11-Mar-08
 Audit Performed by: Shane Hansen and Steven Engel--IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification
WS (mph)	0.00	0.00	0.00	0.56 (1)
	3.44	3.44	0.00	0.56 (1)
	9.16	9.16	0.00	0.56 (1)
	34.35	34.35	0.00	1.72 (1)
	91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0 (3)
WD (degrees)	0.0	0.0	0.0	5.0 (1)
	90.0	90.0	0.0	5.0 (1)
	180.0	179.2	0.8	5.0 (1)
	270.0	269.1	0.9	5.0 (1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0 (3)
Temperature (°F) hot water bath	114.9	114.4	0.5	0.9 (1)
ice water bath	32.1	32.6	0.5	0.9 (1)
warm water bath	67.7	67.6	0.1	0.9 (1)
Precipitation (0.1" equiv.)	183.7	185.2	1.5	18.5 (1)
	183.9	185.2	1.3	18.5 (1)
	182.9	185.2	2.3	18.5 (1)
Pressure (in. Hg)	25.31	25.32	0.01	0.25 (2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System offline at 1202 MST and online at 1250 MST



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 31-Mar-09
 Audit Performed by: R. Campbell, M. Butler -- IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR1000	N/A

Audit Results

	Reference	DAS Value	Difference	Specification
WS (mph)	0.00	0.00	0.00	0.56 (1)
	3.44	3.44	0.00	0.56 (1)
	9.16	9.16	0.00	0.56 (1)
	34.35	34.35	0.00	1.72 (1)
	91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0 (3)
WD (degrees)	0.0	0.5	0.5	5.0 (1)
	90.0	90.5	0.5	5.0 (1)
	180.0	180.8	0.8	5.0 (1)
	270.0	271.3	1.3	5.0 (1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0 (3)
Temperature (°F) hot water bath	95.3	95.0	0.3	0.9 (1)
ice water bath	31.9	31.9	0.0	0.9 (1)
warm water bath	83.9	83.5	0.3	0.9 (1)
Precipitation (0.1" equiv.)	188.0	185.2	2.8	18.5 (1)
	186.0	185.2	0.8	18.5 (1)
	186.0	185.2	0.8	18.5 (1)
Pressure (in. Hg)	24.98	25.00	0.02	0.09 (2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System offline at 1200 MST and returned online at 1316 MST.
 Replaced bearings, replaced prop



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 17-Sep-09
 Audit Performed by: R. Campbell, J. Goldsmith -- IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR1000	N/A

Audit Results

	Reference	DAS Value	Difference	Specification
WS (mph)	0.00	N/A	N/A	0.56 (1)
	3.44	N/A	N/A	0.56 (1)
	9.16	N/A	N/A	0.56 (1)
	34.35	N/A	N/A	1.72 (1)
	91.60	N/A	N/A	4.58 (1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0 (3)
WD (degrees)	0.0	N/A	N/A	5.0 (1)
	90.0	N/A	N/A	5.0 (1)
	180.0	N/A	N/A	5.0 (1)
	270.0	N/A	N/A	5.0 (1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0 (3)
Temperature (°F) hot water bath	110.7	109.3	1.4	0.9 (1)
ice water bath	32.3	32.8	0.5	0.9 (1)
warm water bath	71.5	70.8	0.7	0.9 (1)
Precipitation (0.1" equiv.)	187.1	185.2	1.9	18.5 (1)
	184.8	185.2	0.4	18.5 (1)
	185.5	185.2	0.3	18.5 (1)
Pressure (in. Hg)	25.5	25.47	0.03	0.09 (2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System offline at 0807 MST and returned online at 0844 MST.
 Wind speed and wind direction audit was not completed due to safety concerns.



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company

Audit Date: 31-Mar-10

Audit Performed By: M. Butler, R. Campbell -- IML Air Science

Sensor	Mfr./Model	Reference Device	Serial ID
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz drive motor	IML 0855
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass	IML 0942
Temperature (T):	Fenwal 107	Digital Thermistor	IML 0888
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer	IML 0904
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette	N/A
Data acquisition system (DAS):	Campbell Scientific CR1000	N/A	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0	(3)
WD (degrees)	0.0	0.1	0.1	5.0	(1)
	90.0	90.4	0.4	5.0	(1)
	180.0	179.5	0.5	5.0	(1)
	270.0	270.3	0.3	5.0	(1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0	(3)
Temperature (°F) hot water bath	148.4	147.7	0.7	0.9	(1)
ice water bath	31.9	32.0	0.1	0.9	(1)
warm water bath	85.5	85.3	0.2	0.9	(1)
Precipitation (0.1" equiv.)	178.6	185.3	6.7	18.5	(1)
	183.0	185.3	2.3	18.5	(1)
	182.6	185.3	2.7	18.5	(1)
Pressure (in. Hg)	25.01	24.99	0.02	0.09	(2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System taken offline at 08:30 MST and returned online at 09:24 MST.

Changed wind speed bearings.

After Adjustment

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)

METEOROLOGICAL STATION AUDIT SUMMARY



Met Station: Antelope Coal Company
 Audit Date: 22-Sep-10
 Audit Performed By: M. Butler, J. Masters -- IML Air Science

Sensor	Mfr./Model	Reference Device	Serial ID
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz drive motor	IML 0896
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass	IML 0942
Temperature (T):	Fenwal 107	Digital Thermistor	IML 0885
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer	IML 1404
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette	N/A
Data acquisition system (DAS):	Campbell Scientific CR1000	N/A	N/A

Audit Results

	Reference	Reference	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	0.56	(1)
	300	3.44	3.44	0.00	0.56	(1)
	800	9.16	9.16	0.00	0.56	(1)
	3000	34.35	34.35	0.00	1.72	(1)
	8000	91.60	91.60	0.00	4.58	(1)
Crossarm Alignment (°)		266.0	264.0	2.0	5.0	(2)
WS start torque (gm-cm)		1.0	1<1.0	N/A	1.0	(3)
WD (degrees)	Clockwise	0.0	0.2	0.2	5.0	(1)
		90.0	88.7	1.3	5.0	(1)
		180.0	180.4	0.4	5.0	(1)
		270.0	270.7	0.7	5.0	(1)
	Counter Clockwise	0.0	2.1	2.1	5.0	(1)
		90.0	89.6	0.4	5.0	(1)
		180.0	179.6	0.4	5.0	(1)
		270.0	270.1	0.1	5.0	(1)
	Clockwise	11.0	1<11.0	N/A	11.0	(3)
		Counter Clockwise	11.0	1<11.0	N/A	(3)
Temperature (°F)		32.5	32.9	0.4	0.9	(1)
		70.4	70.5	0.1	0.9	(1)
		92.3	92.2	0.1	0.9	(1)
Precipitation (0.1" equiv.)		186.0	185.3	0.7	18.5	(1)
		183.8	185.3	1.5	18.5	(1)
		183.6	185.3	1.7	18.5	(1)
Pressure (in. Hg)		25.05	25.07	0.02	0.09	(2)
BOLD difference values exceed performance specifications						
(1)= Performance specification listed in facilities' Quality Assurance Project Plan						
(2)= Performance specification listed In EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. IV: Meteorological Measurements Version 2.0, 2008						
(3)= Manufacturer's Specifications						

Notes, Recommendations

System taken offline at 07:42 MST and returned online at 08:26 MST.



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company
 Audit Date: 25-Mar-11
 Audit Performed By: M. Butler, J. Masters -- IML Air Science

Sensor	Mfr./Model	Reference Device	Serial ID
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz drive motor	IML 0896
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass	IML 0900
Temperature (T):	Fenwal 107	Digital Thermistor	IML 1403
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer	IML 1404
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette	N/A
Data acquisition system (DAS):	Campbell Scientific CR1000	N/A	N/A

Audit Results

	Reference	Reference	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	0.45	(1)
	300	3.44	3.44	0.00	0.45	(1)
	800	9.16	9.16	0.00	0.45	(1)
	3000	34.35	34.35	0.00	0.45	(1)
	8000	91.60	91.60	0.00	0.45	(1)
Crossarm Alignment (°)		85.0	83.6	1.4	5.0	(2)
WS start torque (gm-cm)		1.0	t<1.0	N/A	1.0	(3)
WD (degrees)	Clockwise	0.0	0.1	0.1	5.0	(1)
		90.0	90.7	0.7	5.0	(1)
		180.0	179.7	0.3	5.0	(1)
		270.0	269.1	0.9	5.0	(1)
	Counter Clockwise	0.0	0.1	0.1	5.0	(1)
		90.0	90.2	0.2	5.0	(1)
		180.0	180.9	0.9	5.0	(1)
		270.0	269.7	0.3	5.0	(1)
	Clockwise	11.0	t<11.0	N/A	11.0	(3)
		Counter Clockwise	11.0	t<11.0	N/A	(3)
Temperature (°F)		32.8	32.7	0.1	0.9	(1)
		51.6	51.6	0.0	0.9	(1)
		122.5	122.4	0.2	0.9	(1)
Precipitation (0.1" equiv.)		170.0	185.3	15.3	18.5	(1)
		178.2	185.3	7.1	18.5	(1)
		178.4	185.3	6.9	18.5	(1)
Pressure (in. Hg)		24.95	25.03	0.08	0.09	(2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. IV: Meteorological Measurements Version 2.0, 2008
 (3)= Manufacturer's Specifications

Notes, Recommendations

System taken offline at 08:22 MST and returned online at 09:06 MST.



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Antelope Coal Company

Audit Date: 22-Sep-11

Audit Performed By: Z. Heid, J. Masters -- IML Air Science

Sensor	Mfr./Model	Reference Device	Serial ID
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz drive motor	IML 0896
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass	IML 0894
Temperature (T):	Fenwal 107	Digital Thermistor	IML 1411
Barometric Pressure (BP):	Vaisala PTB 101B	aneroid barometer	IML 0968
Precipitation (Ppt.):	Met One 12" tipping bucket with WY screen	lab grade burette	N/A
Data acquisition system (DAS):	Campbell Scientific CR1000	N/A	N/A

Audit Results

	Reference RPM	Reference MPH	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	0.45	(1)
	300	3.44	3.44	0.00	0.45	(1)
	800	9.16	9.16	0.00	0.45	(1)
	3000	34.35	34.35	0.00	0.45	(1)
	8000	91.60	91.60	0.00	0.45	(1)
Crossarm Alignment (°)		87.0	87.0	0.0	5.0	(2)
WS start torque (gm-cm)		1.0	<1.0	N/A	1.0	(3)
WD (degrees)	Clockwise	0.0	0.1	0.1	5.0	(1)
		90.0	89.3	0.7	5.0	(1)
		180.0	179.7	0.3	5.0	(1)
		270.0	270.4	0.4	5.0	(1)
	Counter Clockwise	0.0	0.1	0.1	5.0	(1)
		90.0	89.6	0.4	5.0	(1)
		180.0	179.7	0.3	5.0	(1)
		270.0	270.4	0.4	5.0	(1)
WD start torque (gm-cm)	Clockwise	11.0	<11.0	N/A	11.0	(3)
	Counter Clockwise	11.0	<11.0	N/A	11.0	(3)
Temperature (°F)		130.0	129.6	0.4	0.9	(1)
		66.2	66.2	0.0	0.9	(1)
		31.9	32.1	0.2	0.9	(1)
Precipitation (0.1" equiv.)		186.0	185.3	0.7	18.5	(1)
		179.4	185.3	5.9	18.5	(1)
		185.2	185.3	0.1	18.5	(1)
Pressure (in. Hg)		25.42	25.40	0.02	0.09	(2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. IV: Meteorological Measurements Version 2.0, 2008

(3)= Manufacturer's Specifications

Notes, Recommendations

System taken offline at 08:01 MST and returned online at 08:33 MST.



POWERTECH (USA) INC.

Buckskin Mine Meteorological Station Audit Reports

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine

Audit Date: 10-Feb-97

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	CSci 107 thermistor with 6-plate shield	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One, Inc. 12 " tipping bucket	lab grade burette
Data acquisition system (DAS):	CSci CR-10 datalogger with storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.43	0.01	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.44	0.09	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		≤1.0	N/A	N/A	1.0 (3)
WD (degrees)		0.0	1.7	1.7	5.0 (1)
		90.0	89.0	1.0	5.0 (1)
		180.0	179.0	1.0	5.0 (1)
		270.0	271.0	1.0	5.0 (1)
WD start torque, CW (gm-cm)		N/A	N/A	N/A	9.0 (3)
WD start torque, CCW (gm-cm)		N/A	N/A	N/A	9.0 (3)
Temperature (°F)	ambient	68.0	68.5	0.5	1.8 (1)
	ice bath	32.0	32.0	0.0	1.8 (1)
	warm bath	109.4	109.4	0.0	1.8 (1)
Precipitation (0.05" equiv.)		92.7	94	1.3	9.3 (1)
		92.7	93	0.3	9.3 (1)
		92.7	95	2.3	9.3 (1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for
Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

Replaced wind speed bearings.

Inaccurate styrofoam propeller on anemometer, replaced with correct propeller on 2/17/96.

Heater in precipitation gauge not working.

System taken off-line at 1545 MST – returned on-line at 1645 MST

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 13-Aug-97

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	CSI 107 thermistor with 6-plate shield	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One, Inc. 12 " tipping bucket	lab grade burette
Data acquisition system (DAS):	CSI CR-10 datalogger with storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification
WS (mph)	0.00	0.00	0.00	0.56 (1)
	3.44	3.44	0.00	0.56 (1)
	9.16	9.16	0.00	0.56 (1)
	34.35	34.35	0.00	1.72 (1)
	91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0 (3)
WD (degrees)	0.0	5.0	5.0	5.0 (1)
	90.0	90.0	0.0	5.0 (1)
	180.0	180.0	0.0	5.0 (1)
	270.0	270.0	0.0	5.0 (1)
WD start torque, CW (gm-cm)	OK	N/A	N/A	9.0 (3)
WD start torque, CCW (gm-cm)	OK	N/A	N/A	9.0 (3)
Temperature (°F) ambient	70.6	72.9	2.3	1.8 (1)
ice bath	32.0	32.2	0.2	1.8 (1)
warm bath	91.3	91.2	0.1	1.8 (1)
Precipitation (0.08" equiv.)	148.3	85.8	62.5	14.8 (1)
	148.3	81.0	67.3	14.8 (1)
	148.3	82.4	65.9	14.8 (1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed in EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System taken off-line at 1530 MST – returned on-line at 1558MST

Day was sunny and still, ambient temperature reading difference of 2.3°F is not out of control

Precipitation gauge was found to be greatly overestimating precipitation. Gauge was disassembled and one bucket was found to be filled with a sticky dirt, throwing the balance off the tipping buckets.

Gauge was cleaned, and then found to be measuring accurately. It is not known how long gauge was dirty, and overestimating precipitation.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 19-Mar-98

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	CSI 107 thermistor with 6-plate shield	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One, Inc. 12 " tipping bucket	lab grade burette
Data acquisition system (DAS):	CSI CR-10 datalogger with storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.44	0.00	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.43	0.08	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0 (3)
WD (degrees)		0.0	0.0	0.0	5.0 (1)
		90.0	90.2	0.2	5.0 (1)
		180.0	179.4	0.6	5.0 (1)
		270.0	271.0	1.0	5.0 (1)
WD start torque, CW (gm-cm)		OK	N/A	N/A	9.0 (3)
WD start torque, CCW (gm-cm)		OK	N/A	N/A	9.0 (3)
Temperature (°F)	ambient	33.1	33.4	0.3	1.8 (1)
	ice bath	32.0	32.5	0.5	1.8 (1)
	warm bath	103.5	104.2	0.7	1.8 (1)
Precipitation (0.04" equiv.)		74.1	76.0	1.9	7.4 (2)
		74.1	74.0	0.1	7.4 (2)
		74.1	74.0	0.1	7.4 (2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System taken off-line at 1553 MST -- returned on-line at 1625 MST

Installed new wind speed bearings

2.29" precipitation since last reset

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine

Audit Date: 28-Sep-98

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	CSI 107 thermistor with 6-plate shield	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One, Inc. 12 " tipping bucket	lab grade burette
Data acquisition system (DAS):	CSI CR-10 datalogger with storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification
WS (mph)	0.00	0.00	0.00	0.56 (1)
	3.44	3.44	0.00	0.56 (1)
	9.16	9.16	0.00	0.56 (1)
	34.35	34.35	0.00	1.72 (1)
	91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0 (3)
WD (degrees)	0.0	2.9	2.9	5.0 (1)
	90.0	89.5	0.5	5.0 (1)
	180.0	180.8	0.8	5.0 (1)
	270.0	272.0	2.0	5.0 (1)
WD start torque, CW (gm-cm)	OK	N/A	N/A	9.0 (3)
WD start torque, CCW (gm-cm)	OK	N/A	N/A	9.0 (3)
Temperature (°F) ambient	68.4	68.0	0.4	1.8 (1)
ice bath	32.0	33.2	1.2	1.8 (1)
warm bath	90.0	89.6	0.4	1.8 (1)
Precipitation (0.04" equiv.)	74.1	74.0	0.1	7.4 (2)
	74.1	74.0	0.1	7.4 (2)
	74.1	74.0	0.1	7.4 (2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System taken off-line at 0840 MST -- returned on-line at 0903 MST

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 9-Mar-99

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	CSI 107 thermistor with 6-plate shield	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One, Inc. 12 " tipping bucket	lab grade burette
Data acquisition system (DAS):	CSI CR-10 datalogger with storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.44	0.00	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.35	0.00	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0 (3)
WD (degrees)		0.0	2.0	2.0	5.0 (1)
		90.0	90.0	0.0	5.0 (1)
		180.0	178.0	2.0	5.0 (1)
		270.0	269.0	1.0	5.0 (1)
WD start torque, CW (gm-cm)		OK	N/A	N/A	9.0 (3)
WD start torque, CCW (gm-cm)		OK	N/A	N/A	9.0 (3)
Temperature (°F)	ambient	41.7	41.6	0.1	1.8 (1)
	ice bath	34.5	34.3	0.2	1.8 (1)
	warm bath	69.9	70.5	0.6	1.8 (1)
Precipitation (0.04" equiv.)		74.1	73.5	0.6	7.4 (2)
		74.1	75.0	0.9	7.4 (2)
		74.1	75.0	0.9	7.4 (2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System taken off-line at 1620 MST -- returned on-line at 1655 MST Time was 15 minutes too slow

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 23-Sep-99

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	CSI 107 thermistor with 6-plate shield	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One, Inc. 12 " tipping bucket	lab grade burette
Data acquisition system (DAS):	CSI CR-10 datalogger with storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification
WS (mph)	0.00	0.00	0.00	0.56 (1)
	3.44	3.44	0.00	0.56 (1)
	9.16	9.16	0.00	0.56 (1)
	34.35	34.35	0.00	1.72 (1)
	91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0 (3)
WD (degrees)	0.0	1.0	1.0	5.0 (1)
	90.0	89.0	1.0	5.0 (1)
	180.0	179.0	1.0	5.0 (1)
	270.0	269.7	0.3	5.0 (1)
WD start torque, CW (gm-cm)	OK	N/A	N/A	9.0 (3)
WD start torque, CCW (gm-cm)	OK	N/A	N/A	9.0 (3)
Temperature (°F) ambient	82.2	82.1	0.1	1.8 (1)
ice bath	40.8	40.9	0.1	1.8 (1)
warm bath	87.0	86.8	0.2	1.8 (1)
Precipitation (0.04" equiv.)	74.1	74.0	0.1	7.4 (2)
	74.1	75.0	0.9	7.4 (2)
	74.1	74.0	0.1	7.4 (2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System taken off-line at 1605 MST -- returned on-line at 1640 MST

2.43" precipitation since last reset

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 16-Mar-00

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	CSI 107 thermistor with 6-plate shield	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One, Inc. 12 " tipping bucket	lab grade burette
Data acquisition system (DAS):	CSI CR-10 datalogger with storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.44	0.00	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.35	0.00	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0 (3)
WD (degrees)		0.0	0.5	0.5	5.0 (1)
		90.0	89.2	0.8	5.0 (1)
		180.0	179.5	0.5	5.0 (1)
		270.0	270.3	0.3	5.0 (1)
WD start torque, CW (gm-cm)		OK	N/A	N/A	9.0 (3)
WD start torque, CCW (gm-cm)		OK	N/A	N/A	9.0 (3)
Temperature (°F)	ambient	50.2	50.1	0.1	1.8 (1)
	ice bath	32.0	32.4	0.4	1.8 (1)
	warm bath	111.0	110.8	0.2	1.8 (1)
Precipitation (0.04" equiv.)		74.1	75.0	0.9	7.4 (2)
		74.1	75.0	0.9	7.4 (2)
		74.1	75.0	0.9	7.4 (2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System taken off-line at 1655 MST -- returned on-line at 1730 MST
 Replaced tail and wind speed bearings.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 13-Sep-00

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	CSI 107 thermistor with 6-plate shield	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One, Inc. 12 " tipping bucket	lab grade burette
Data acquisition system (DAS):	CSI CR-10 datalogger with storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.44	0.00	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.35	0.00	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		<0.2	N/A	N/A	1.0 (3)
WD (degrees)		0.0	211.0	211.0	5.0 (1)
		90.0	230.0	140.0	5.0 (1)
		180.0	250.0	70.0	5.0 (1)
		270.0	273.0	3.0	5.0 (1)
WD start torque, CW (gm-cm)		OK	N/A	N/A	9.0 (3)
WD start torque, CCW (gm-cm)		OK	N/A	N/A	9.0 (3)
Temperature (°F)	ambient	74.5	74.3	0.2	1.8 (1)
	ice bath	32.0	32.9	0.9	1.8 (1)
	warm bath	101.1	100.9	0.2	1.8 (1)
Precipitation (0.04" equiv.)		74.1	76.8	2.7	7.4 (2)
		74.1	74.7	0.6	7.4 (2)
		74.1	74.4	0.3	7.4 (2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed in EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1995

(3)= Manufacturer's Specifications

Notes, Recommendations

System taken off-line at 0801 MST -- returned on-line at 1339 MST
A new PROM upgrading the logger software capabilities was installed in the logger
The system evidently had taken a lightning strike sometime prior to arrival
Precipitation was not being recorded by logger, and wind direction was not working
Bypassing the "fried" signal surge protection corrected the lack of a precipitation signal reaching the logger
New signal surge protection will be installed during an upcoming visit
Replacement of the wind direction potentiometer and vertical wind direction bearings fixed the erroneous wind direction readings
All sensors were audited again and operating properly at the conclusion of the service

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 10-Mar-04
 Audit Performed by: J. Rogers, K. Jahnke - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	CSI 107 thermistor with 6-plate shield	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One, Inc. 12 " tipping bucket	lab grade burette
Data acquisition system (DAS):	CSI CR-10 datalogger with storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0	(3)
WD (degrees)	0.0	0.1	0.1	5.0	(1)
	90.0	90.8	0.8	5.0	(1)
	180.0	180.7	0.7	5.0	(1)
	270.0	270.4	0.4	5.0	(1)
WD start torque, CW (gm-cm)	OK	N/A	N/A	9.0	(3)
WD start torque, CCW (gm-cm)	OK	N/A	N/A	9.0	(3)
Temperature (°F)	ambient	38.7	38.4	0.3	1.8 (1)
	ice bath	32.1	32.4	0.3	1.8 (1)
	warm bath	74.2	73.0	1.2	1.8 (1)
Precipitation (0.04" equiv.)	74.1	73.2	0.9	7.4	(2)
	74.1	74.2	0.1	7.4	(2)
	74.1	74.4	0.3	7.4	(2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1995
 (3)= Manufacturer's Specifications

Notes, Recommendations

System taken off-line at 1337 -- returned on-line at 1403.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 2-Sep-04
 Audit Performed by: T. Shaw, W. Adler - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	transit, compass
Temperature (T):	CSI 107 thermistor with 6-plate shield	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One, Inc. 12 " tipping bucket	lab grade burette
Data acquisition system (DAS):	CSI CR-10 datalogger with storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.20	0.40	4.58	(1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0	(3)
WD (degrees)	0.0	0.2	0.2	5.0	(1)
	90.0	90.0	0.0	5.0	(1)
	180.0	180.1	0.1	5.0	(1)
	270.0	270.1	0.1	5.0	(1)
WD start torque, CW (gm-cm)	OK	N/A	N/A	9.0	(3)
WD start torque, CCW (gm-cm)	OK	N/A	N/A	9.0	(3)
Temperature (°F)	ambient	74.4	73.4	1.0	1.8 (1)
	ice water bath	32.8	32.7	0.1	1.8 (1)
	warm water bath	111.3	111.2	0.1	1.8 (1)
Precipitation (0.04" equiv.)	74.1	75.4	1.3	7.4	(2)
	74.1	75.8	1.7	7.4	(2)
	74.1	74.4	0.3	7.4	(2)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1995
 (3)= Manufacturer's Specifications

Notes, Recommendations

System taken off-line at 1551 – returned on-line at 1612.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 31-Mar-05
 Audit Performed by: K. Jahnke, D. Tarver - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Precipitation (Ppt.):	Met One 12" tipping bucket with wind screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification
WS (mph)	0.00	0.00	0.00	0.56 (1)
	3.44	3.44	0.00	0.56 (1)
	9.16	9.16	0.00	0.56 (1)
	34.35	34.35	0.00	1.72 (1)
	91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0 (3)
WD (degrees)	0.0	0.1	0.1	5.0 (1)
	90.0	90.0	0.0	5.0 (1)
	180.0	180.8	0.8	5.0 (1)
	270.0	271.4	1.4	5.0 (1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0 (3)
Temperature (°F) ambient	47.0	46.9	0.1	1.8 (1)
ice water bath	33.7	32.7	1.0	1.8 (1)
warm water bath	84.5	84.5	0.0	1.8 (1)
Precipitation (0.04" equiv.)	75.0	74.1	0.9	7.4 (1)
	73.8	74.1	0.3	7.4 (1)
	76.2	74.1	2.1	7.4 (1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1601 -- returned on-line at 1700.
 Replaced tail and wind speed bearings.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 30-Sep-05
 Audit Performed by: B. Hanewald, T. Shaw - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Precipitation (Ppt.):	Met One 12" tipping bucket with wind screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0	(3)
WD (degrees)	0.0	-0.5	0.5	5.0	(1)
	90.0	89.9	0.1	5.0	(1)
	180.0	179.8	0.2	5.0	(1)
	270.0	271.8	1.8	5.0	(1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0	(3)
Temperature (°F)	ambient	84.5	83.6	0.9	1.8 (1)
	ice water bath	44.8	45.3	0.5	1.8 (1)
	warm water bath	86.6	87.0	0.4	1.8 (1)
Precipitation (0.04" equiv.)	74.8	74.1	0.7	7.4	(1)
	74.6	74.1	0.5	7.4	(1)
	73.8	74.1	0.3	7.4	(1)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1410 -- returned on-line at 1432.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 7-Mar-06
 Audit Performed by: B. Hanewald, T. Shaw - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Precipitation (Ppt.):	Met One 12" tipping bucket with wind screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification
WS (mph)	0.00	0.00	0.00	0.56 (1)
	3.44	3.44	0.00	0.56 (1)
	9.16	9.16	0.00	0.56 (1)
	34.35	34.35	0.00	1.72 (1)
	91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0 (3)
WD (degrees)	0.0	0.6	0.6	5.0 (1)
	90.0	90.4	0.4	5.0 (1)
	180.0	179.9	0.1	5.0 (1)
	270.0	270.5	0.4	5.0 (1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0 (3)
Temperature (°F) ambient	50.6	49.2	1.4	1.8 (1)
ice water bath	81.3	80.6	0.7	1.8 (1)
warm water bath	38.2	38.2	0.0	1.8 (1)
Precipitation (0.04" equiv.)	73.0	74.1	1.1	7.4 (1)
	74.0	74.1	0.1	7.4 (1)
	74.0	74.1	0.1	7.4 (1)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1440 -- returned on-line at 1512.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 1-Aug-06
 Audit Performed by: K. Jahnke & S. Engel - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Precipitation (Ppt.):	Met One 12" tipping bucket with wind screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0	(3)
WD (degrees)		0.0	0.2	0.2	5.0	(1)
		90.0	90.1	0.1	5.0	(1)
		180.0	180.2	0.2	5.0	(1)
		270.0	270.1	0.1	5.0	(1)
WD start torque (gm-cm)		t<11.0	N/A	N/A	11.0	(3)
Temperature (°F)	ice water bath	33.6	34.3	0.7	1.8	(1)
	warm water bath	70.7	70.9	0.2	1.8	(1)
	hot water bath	115.1	114.7	0.4	1.8	(1)
Precipitation (0.04" equiv.)		74.0	74.1	0.1	7.4	(1)
		74.6	74.1	0.5	7.4	(1)
		74.4	74.1	0.3	7.4	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed in EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1009 MST -- returned on-line at 1110 MST.

7 mice found living in logger enclosure. Fixed entry point of enclosure. Prop on RM Young was dinged up a little bit and will need to be replaced next time it is audited.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 23-Mar-07
 Audit Performed by: K. Jahnke & S. Engel - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Precipitation (Ppt.):	Met One 12" tipping bucket with wind screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0	(3)
WD (degrees)		0.0	0.5	0.5	5.0	(1)
		90.0	90.5	0.5	5.0	(1)
		180.0	179.9	0.1	5.0	(1)
		270.0	269.9	0.1	5.0	(1)
WD start torque (gm-cm)		t<11.0	N/A	N/A	11.0	(3)
Temperature (°F)	ice water bath	32.4	32.5	0.1	1.8	(1)
	warm water bath	52.6	52.8	0.2	1.8	(1)
	hot water bath	116.9	117.4	0.5	1.8	(1)
Precipitation (0.04" equiv.)		191.6	185.2	6.4	18.5	(1)
		194.8	185.2	9.6	18.5	(1)
		191.6	185.2	6.4	18.5	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 0849 MDT -- returned on-line at 0945 MDT.

Prop was replaced

Reloaded program and Adjusted time

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 10-Jul-07
 Audit Performed by: K. Jahnke & S. Engel - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Precipitation (Ppt.):	Met One 12" tipping bucket with wind screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0	(3)
WD (degrees)		0.0	0.1	0.1	5.0	(1)
		90.0	90.1	0.1	5.0	(1)
		180.0	180.6	0.6	5.0	(1)
		270.0	270.6	0.6	5.0	(1)
WD start torque (gm-cm)		t<11.0	N/A	N/A	11.0	(3)
Temperature (°F)	ice water bath	33.2	33.2	0.0	1.8	(1)
	warm water bath	70.5	70.2	0.3	1.8	(1)
	hot water bath	115.8	114.7	1.1	1.8	(1)
Precipitation (0.04" equiv.)		186.0	185.2	0.8	18.5	(1)
		185.8	185.2	0.6	18.5	(1)
		185.8	185.2	0.6	18.5	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 0847 MST -- returned on-line at 0922 MST.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 12-Mar-08
 Audit Performed by: C. Medill & S. Hansen - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Precipitation (Ppt.):	Met One 12" tipping bucket with wind screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0	(3)
WD (degrees)		0.0	0.8	0.8	5.0	(1)
		90.0	90.1	0.1	5.0	(1)
		180.0	180.4	0.4	5.0	(1)
		270.0	269.8	0.2	5.0	(1)
WD start torque (gm-cm)		t<11.0	N/A	N/A	11.0	(3)
Temperature (°F)	ice water bath	42.4	42.5	0.1	1.8	(1)
	warm water bath	75.7	75.8	0.1	1.8	(1)
	hot water bath	90.9	90.8	0.1	1.8	(1)
Precipitation (0.04" equiv.)		191.4	185.2	6.2	18.5	(1)
		187.2	185.2	2.0	18.5	(1)
		190.2	185.2	5.0	18.5	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 2030 MST -- returned on-line at 2106 MST.

Replaced broken CS107 temp probe.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 3-Sep-08
 Audit Performed by: S. Hansen & K. Chartier - IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Precipitation (Ppt.):	Met One 12" tipping bucket with wind screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0	(3)
WD (degrees)		0.0	0.0	0.0	5.0	(1)
		90.0	89.0	1.0	5.0	(1)
		180.0	182.0	2.0	5.0	(1)
		270.0	269.0	1.0	5.0	(1)
WD start torque (gm-cm)		t<11.0	N/A	N/A	11.0	(3)
Temperature (°F)	ice water bath	32.1	31.9	0.2	0.9	(1)
	warm water bath	59.2	59.3	0.1	0.9	(1)
	hot water bath	86.2	85.8	0.4	0.9	(1)
Precipitation (0.01" equiv.)		201.4	185.2	16.2	18.5	(1)
		195.5	185.2	10.3	18.5	(1)
		196.0	185.2	10.8	18.5	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1339 MST & returned on-line at 1420 MST

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 20-Mar-09
 Audit Performed by: R. Campbell, J. Goldsmith - IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor
Precipitation (Ppt.):	Met One 12" tipping bucket with wind screen	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0	(3)
WD (degrees)		0.0	0.2	0.2	5.0	(1)
		90.0	90.5	0.5	5.0	(1)
		180.0	179.7	0.3	5.0	(1)
		270.0	270.4	0.4	5.0	(1)
WD start torque (gm-cm)		t<11.0	N/A	N/A	11.0	(3)
Temperature (°F)	ice water bath	36.8	36.9	0.1	0.9	(1)
	warm water bath	66.5	65.9	0.6	0.9	(1)
	hot water bath	87.5	87.1	0.4	0.9	(1)
Precipitation (0.01" equiv.)		191.6	185.2	6.4	18.5	(1)
		192.9	185.2	7.7	18.5	(1)
		191.0	185.2	5.8	18.5	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed in EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1236 MST & returned on-line at 1248 MST

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 9-Sep-09
 Audit Performed by: R. Campbell, C. Medill - IML Air Science

Sensor	Mfr./Model	Reference Device	Serial ID
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor	IML 0895
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass	IML 0895
Temperature (T):	Fenwal 107	Hg-in-glass thermometer, or thermistor	IML 0888
Precipitation (Ppt.):	Met One 12" tipping bucket with wind screen	lab grade burette	N/A
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	t<0.2	N/A	N/A	1.0	(3)
WD (degrees)	0.0	0.8	0.8	5.0	(1)
	90.0	90.4	0.4	5.0	(1)
	180.0	179.9	0.1	5.0	(1)
	270.0	270.6	0.6	5.0	(1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.0	(3)
Temperature (°F)	ice water bath	32.9	33.0	0.1	0.9 (1)
	warm water bath	74.5	74.4	0.1	0.9 (1)
	hot water bath	108.2	107.9	0.3	0.9 (1)
Precipitation (0.01" equiv.)	191.4	185.2	6.2	18.5	(1)
	192.0	185.2	6.8	18.5	(1)
	189.0	185.2	3.8	18.5	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 1022 MST and returned on-line at 1055 MST

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 9-Mar-10
 Audit Performed by: R. Campbell, S. Warner -- IML Air Science

Sensor	Mfr./Model	Reference Device	Serial ID
Wind Speed (WS):	R.M. Young Wind Monitor AQ	quartz referenced drive motor	IML 0896
Wind Direction (WD):	R.M. Young Wind Monitor AQ	transit, compass	
Temperature (T):	Fenwal 107	Hg-in-glass thermometer	IML 1402
Precipitation (Ppt.):	Met One 12" tipping bucket with wind screen	lab grade burette	N/A
Data acquisition system (DAS):	Campbell Scientific CR-10X & storage module	N/A	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		t<0.2	N/A	N/A	1.0	(3)
WD (degrees)		0.0	0.9	0.9	5.0	(1)
		90.0	90.4	0.4	5.0	(1)
		180.0	179.2	0.8	5.0	(1)
		270.0	270.0	0.0	5.0	(1)
WD start torque (gm-cm)		t<11.0	N/A	N/A	11.0	(3)
Temperature (°F)	ice water bath	32.8	32.6	0.2	0.9	(1)
	warm water bath	54.2	54.7	0.5	0.9	(1)
	hot water bath	64.1	63.9	0.1	0.9	(1)
Precipitation (0.01" equiv.)		188.2	185.2	3.0	18.5	(1)
		189.4	185.2	4.2	18.5	(1)
		187.8	185.2	2.6	18.5	(1)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed in EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 15:28 MST and returned on-line at 16:09 MST
 Changed wind speed bearings.

After Adjustment

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WD (degrees)	0.0	0.1	0.1	5.0	(1)
	90.0	90.3	0.3	5.0	(1)
	180.0	180.1	0.1	5.0	(1)
	270.0	269.9	0.1	5.0	(1)



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine

Audit Date: 17-Sep-10

Audit Performed By: S. Hansen, T. Mendenhall -- IML Air Science

Sensor	Mfr./Model	Serial Number	Reference Device	Serial ID
Wind Speed (WS):	R.M. Young Wind Monitor AQ	37074	quartz drive motor	IML 1407
Wind Direction (WD):	R.M. Young Wind Monitor AQ	37074	transit, compass	IML 1405
Temperature (T):	Fenwal 107	N/A	Hg-in-glass thermometer	IML 1402
Precipitation (Ppt.):	Met One 12" tipping bucket	Illegible	lab grade burette	N/A
Data acquisition system (DAS):	Campbell Scientific CR-10X	19256	N/A	N/A

Audit Results

	Reference RPM	Reference MPH	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	0.56	(1)
	300	3.44	3.44	0.00	0.56	(1)
	800	9.16	9.16	0.00	0.56	(1)
	3000	34.35	34.35	0.00	1.72	(1)
	8000	91.60	91.60	0.00	4.58	(1)
Crossarm Alignment (°)		3.0	3.2	0.2	5.0	(2)
WS start torque (gm-cm)		1.0	t<1.0	N/A	1.0	(3)
WD (°)	Clockwise	0.0	0.1	0.1	5.0	(1)
		90.0	89.6	0.4	5.0	(1)
		180.0	179.4	0.6	5.0	(1)
		270.0	269.8	0.2	5.0	(1)
	Counter Clockwise	0.0	0.2	0.2	5.0	(1)
		90.0	90.5	0.5	5.0	(1)
		180.0	180.7	0.7	5.0	(1)
		270.0	269.2	0.8	5.0	(1)
WD start torque (gm-cm)	Clockwise	11.0	t<11.0	N/A	11.0	(3)
	Counter Clockwise	11.0	t<11.0	N/A	11.0	(3)
Temperature (°F)		32.5	31.9	0.6	0.9	(1)
		127.8	127.2	0.6	0.9	(1)
		68.4	67.9	0.4	0.9	(1)
Precipitation (0.01" equiv.)		189.2	185.2	4.0	18.5	(1)
		190.4	185.2	5.2	18.5	(1)
		186.0	185.2	0.8	18.5	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. IV: Meteorological Measurements Version 2.0, 2008

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 08:30 MST and returned on-line at 09:22 MST



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine
 Audit Date: 10-Mar-11
 Audit Performed By: T. Mendenhall -- IML Air Science

Sensor	Mfr./Model	Serial Number	Reference Device	Serial ID
Wind Speed (WS):	R.M. Young Wind Monitor AQ	37074	quartz drive motor	IML 1407
Wind Direction (WD):	R.M. Young Wind Monitor AQ	37074	transit, compass	IML 1405
Temperature (T):	Fenwal 107	N/A	digital thermistor	IML 0885
Precipitation (Ppt.):	Met One 12" tipping bucket	Illegible	lab grade burette	N/A
Data acquisition system (DAS):	Campbell Scientific CR-10X	19256	N/A	N/A

Audit Results

	Reference RPM	Reference MPH	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	0.45	(1)
	300	3.44	3.44	0.00	0.45	(1)
	800	9.16	9.16	0.00	0.45	(1)
	3000	34.35	34.35	0.00	0.45	(1)
	8000	91.60	91.60	0.00	0.45	(1)
Crossarm Alignment (°)		194.0	192.5	1.5	5.0	(2)
WS start torque (gm-cm)		1.0	t<1.0	N/A	1.0	(3)
WD (°)	Clockwise	0.0	0.1	0.1	5.0	(1)
		90.0	90.0	0.0	5.0	(1)
		180.0	178.8	1.2	5.0	(1)
		270.0	268.8	1.2	5.0	(1)
	Counter Clockwise	0.0	0.2	0.2	5.0	(1)
		90.0	90.4	0.4	5.0	(1)
		180.0	180.1	0.1	5.0	(1)
		270.0	270.9	0.9	5.0	(1)
WD start torque (gm-cm)	Clockwise	11.0	t<11.0	N/A	11.0	(3)
	Counter Clockwise	11.0	t<11.0	N/A	11.0	(3)
Temperature (°F)		34.0	34.2	0.2	0.9	(1)
		84.0	83.9	0.1	0.9	(1)
		117.3	117.5	0.2	0.9	(1)
Precipitation (0.01" equiv.)		188.8	185.2	3.6	18.5	(1)
		187.4	185.2	2.2	18.5	(1)
		187.8	185.2	2.6	18.5	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. IV:
 Meteorological Measurements Version 2.0, 2008

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken offline at 09:09 MST and returned online at 09:55 MST.



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Buckskin Mine

Audit Date: 16-Sep-11

Audit Performed By: C. Cottom, J. Masters -- IML Air Science

Sensor	Mfr./Model	Serial Number	Reference Device	Serial ID
Wind Speed (WS):	R.M. Young Wind Monitor AQ	37074	quartz drive motor	IML 0896
Wind Direction (WD):	R.M. Young Wind Monitor AQ	37074	transit, compass	IML 0894
Temperature (T):	Fenwal 107	N/A	digital thermistor	IML 1411
Precipitation (Ppt.):	Met One 12" tipping bucket	Illegible	lab grade burette	N/A
Data acquisition system (DAS):	Campbell Scientific CR-10X	19256	N/A	N/A

Audit Results

	Reference RPM	Reference MPH	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	0.45	(1)
	300	3.44	3.44	0.00	0.45	(1)
	800	9.16	9.16	0.00	0.45	(1)
	3000	34.35	34.35	0.00	0.45	(1)
	8000	91.60	91.60	0.00	0.45	(1)
Crossarm Alignment (°)		189.0	191.0	2.0	5.0	(2)
WS start torque (gm-cm)		1.0	1<1.0	N/A	1.0	(3)
WD (°)	Clockwise	0.0	0.2	0.2	5.0	(1)
		90.0	90.4	0.4	5.0	(1)
		180.0	179.8	0.2	5.0	(1)
		270.0	270.0	0.0	5.0	(1)
	Counter Clockwise	0.0	0.1	0.1	5.0	(1)
		90.0	90.8	0.8	5.0	(1)
		180.0	179.2	0.8	5.0	(1)
		270.0	269.3	0.7	5.0	(1)
WD start torque (gm-cm)	Clockwise	11.0	1<11.0	N/A	11.0	(3)
	Counter Clockwise	11.0	1<11.0	N/A	11.0	(3)
Temperature (°F)		0.7	0.8	0.1	0.9	(1)
		24.0	23.4	0.6	0.9	(1)
		42.7	42.4	0.3	0.9	(1)
Precipitation (0.01" equiv.)		172.0	185.2	13.2	18.5	(1)
		184.2	185.2	1.0	18.5	(1)
		185.0	185.2	0.2	18.5	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. IV: Meteorological Measurements Version 2.0, 2008

(3)= Manufacturer's Specifications

Notes, Recommendations

System was taken off-line at 13:13 MST and returned on-line at 13:42 MST.



POWERTECH (USA) INC.

Dry Fork Mine Meteorological Station Audit Reports

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 16-May-97

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 064-2, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One 12" tipping bucket	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR 10 w/ storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.43	0.01	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.6	91.6	0.00	4.58	
WS start torque (gm-cm)	t<1.00	N/A	N/A	1.00	(3)
WD (degrees)	0.0	0.1	0.1	5.0	(1)
	90.0	90.7	0.7	5.0	(1)
	180.0	176.0	4.0	5.0	(1)
	270.0	270.2	0.2	5.0	(1)
WD start torque (gm-cm)	t<11.0	N/A	N/A	11.00	(3)
Temperature (C)	28.8	28.0	0.8	1.0	(1)
	2.5	3.0	0.5	1.0	(1)
	32.3	32.2	0.1	1.0	(1)
Precipitation (0.1" equiv.)	92.7	99.0	6.3	8.2	(1)
	92.7	96.3	3.6	8.2	(1)
	92.7	96.0	3.3	8.2	(1)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed in EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System not operating upon arrival
 Battery voltage at 13.4.
 System off-line at 0800 MST and returned on-line at 1054 MST.
 New datalogger installed with new program.
 Installed new wind speed bearings.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 5-Nov-97

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 064-2, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One 12" tipping bucket	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR 10 w/ storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.6	91.6	0.00	4.58	
WS start torque (gm-cm)	$\tau < 0.2$	N/A	N/A	1.00	(3)
WD (degrees)	0.0	0.0	0.0	5.0	(1)
	90.0	91.0	1.0	5.0	(1)
	180.0	181.0	1.0	5.0	(1)
	270.0	270.0	0.0	5.0	(1)
WD start torque (gm-cm)	$\tau < 5.0$	N/A	N/A	11.00	(3)
Temperature (°C)	16.0	16.1	0.1	1.0	(1)
	44.5	44.2	0.3	1.0	(1)
	9.0	9.3	0.3	1.0	(1)
Precipitation (0.1" equiv.)	92.7	92.0	0.7	8.2	(1)
	92.7	98.0	5.3	8.2	(1)
	92.7	95.0	2.3	8.2	(1)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed in EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

Battery voltage at 13.9
 System off-line at 1148 MST and returned on-line at 1255 MST.
 Removed bug screen from ppt. gauge for winter

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 23-Jun-98

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 064-2, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One 12" tipping bucket	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR 10 w/ storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.6	91.6	0.00	4.58	
WS start torque (gm-cm)	$\tau < 0.2$	N/A	N/A	1.00	(3)
WD (degrees)	0.0	0.2	0.2	5.0	(1)
	90.0	89.0	1.0	5.0	(1)
	180.0	178.0	2.0	5.0	(1)
	270.0	270.0	0.0	5.0	(1)
WD start torque (gm-cm)	$\tau < 5.0$	N/A	N/A	11.00	(3)
Temperature (°C)	26.5	25.6	0.9	1.0	(1)
	32.0	31.1	0.9	1.0	(1)
	0.0	1.6	1.6	1.0	(1)
Precipitation (0.1" equiv.)	74.1	73.0	1.1	8.2	(1)
	74.1	73.0	1.1	8.2	(1)
	74.1	74.0	0.1	8.2	(1)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed in EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

Battery voltage at 13.39
 System off-line at 1250 MST and returned on-line at 1317 MST.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 30-Dec-98

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 064-2, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One 12" tipping bucket	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR 10 w/ storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.6	91.6	0.00	4.58	
WS start torque (gm-cm)	0.2< τ <0.3	N/A	N/A	1.00	(3)
WD (degrees)	0.0	1.0	1.0	5.0	(1)
	90.0	89.0	1.0	5.0	(1)
	180.0	180.0	0.0	5.0	(1)
	270.0	270.0	0.0	5.0	(1)
Temperature (°C)	-1.0	-1.0	0.0	1.0	(1)
	45.1	44.2	0.9	1.0	(1)
	0.1	0.0	0.1	1.0	(1)
Precipitation (0.1" equiv.)	74.1	69.0	5.1	8.2	(1)
	74.1	75.5	1.4	8.2	(1)
	74.1	75.8	1.7	8.2	(1)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1989
 (3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 0942 MST and returned on-line at 1031MST
 Precipitation gauge heater not operable as found; breaker was turned off. Returned breaker to on position
 Cleaned precipitation gauge

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 30-Jun-99

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR-21XL	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	0.2<T<0.3	N/A	N/A	1.00	(3)
WD (degrees)	0.0	0.3	0.3	5.0	(1)
	90.0	89.3	0.7	5.0	(1)
	180.0	179.7	0.3	5.0	(1)
	270.0	271.8	1.8	5.0	(1)
Temperature (°C)	18.6	18.4	0.2	1.0	(1)
	0.0	0.8	0.8	1.0	(1)
	46.3	45.8	0.5	1.0	(1)
Precipitation (0.1" equiv.)	74.1	72.0	2.1	7.4	(1)
	74.1	72.0	2.1	7.4	(1)
	74.1	73.0	1.1	7.4	(1)
BOLD difference values exceed performance specifications					
(1)= Performance specification listed in facilities' Quality Assurance Project Plan					
(2)= Performance specification listed In EPA Quality Assurance Manual for					
Air Pollution Measurement Systems, Vol. IV, 1939					
(3)= Manufacturer's Specifications					

Notes, Recommendations

System off-line at 1117 MST and on-line at 1143 MST
31.781 since last reset
Battery voltage at 13.86

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 22-Jun-00

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 064-2, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One 12" tipping bucket	lab grade burette
Data acquisition system (DAS):	Campbell Scientific CR 10 w/ storage module	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.6	91.6	0.00	4.58	
WS start torque (gm-cm)	0.2< τ <0.3	N/A	N/A	1.00	(3)
WD (degrees)	0.0	0.2	0.2	5.0	(1)
	90.0	89.8	0.2	5.0	(1)
	180.0	180.3	0.3	5.0	(1)
	270.0	269.8	0.2	5.0	(1)
Temperature (°C)	32.1	33.0	0.9	1.0	(1)
	0.3	0.8	0.5	1.0	(1)
	45.6	45.3	0.3	1.0	(1)
Precipitation (0.1" equiv.)	74.1	73.0	1.1	8.2	(1)
	74.1	74.0	0.1	8.2	(1)
	74.1	74.0	0.1	8.2	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 1530 MST and returned on-line at 1555MST.
 Changed year on DAS from 9- to 00.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 27-Dec-00

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-21XL	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.66	3.66	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	0.2<T<0.3	N/A	N/A	1.00	(3)
WD (degrees)	0.0	1.4	1.4	5.0	(1)
	90.0	91.0	1.0	5.0	(1)
	180.0	181.0	1.0	5.0	(1)
	270.0	271.0	1.0	5.0	(1)
Temperature (°C)	6.0	6.3	0.3	1.0	(1)
	0.4	0.5	0.1	1.0	(1)
	20.2	20.1	0.1	1.0	(1)
Precipitation (0.1" equiv.)	74.1	74.0	0.1	7.4	(1)
	74.1	73.0	1.1	7.4	(1)
	74.1	73.0	1.1	7.4	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed in EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1989

(3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 1329 MST and on-line at 1358 MST
 Battery voltage at 13.8

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 26-Jun-02
 Audit Performed by: D. Black, W. Adler - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-21XL	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	0.2<T<0.3	N/A	N/A	1.00	(3)
WD (degrees)	0.0	0.3	0.3	5.0	(1)
	90.0	90.0	0.0	5.0	(1)
	180.0	180.0	0.0	5.0	(1)
	270.0	271.0	1.0	5.0	(1)
Temperature (°C)	35.8	36.4	0.6	1.0	(1)
	0.6	1.3	0.7	1.0	(1)
	15.7	15.8	0.1	1.0	(1)
Precipitation (0.1" equiv.)	74.1	75.0	0.9	7.4	(1)
	74.1	71.4	2.7	7.4	(1)
	74.1	71.6	2.5	7.4	(1)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1995
 (3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 1551 MST and on-line at 1620 MST
 Battery voltage at 13.092

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 12, Nov. 2002
 Audit Performed by: S. Heil, T. Shaw - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-21XL	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	0.2<T<0.3	N/A	N/A	1.00	(3)
WD (degrees)	0.0	0.0	0.0	5.0	(1)
	90.0	90.6	0.6	5.0	(1)
	180.0	180.0	0.0	5.0	(1)
	270.0	271.4	1.4	5.0	(1)
Temperature (°C)	35.8	34.8	1.0	1.0	(1)
	0.3	0.0	0.3	1.0	(1)
	3.9	4.1	0.2	1.0	(1)
Precipitation (0.1" equiv.)	74.1	74.4	0.3	7.4	(1)
	74.1	73.8	0.3	7.4	(1)
	74.1	74.2	0.1	7.4	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed in EPA Quality Assurance Manual for

Air Pollution Measurement Systems, Vol. IV, 1995

(3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 1708 MST and on-line at 1744 MST
 Battery voltage at 13.733

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 24-Apr-03
 Audit Performed by: S. Heil, K. Jahnke - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-21XL	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	0.2<T<0.3	N/A	N/A	1.00	(3)
WD (degrees)	0.0	0.1	0.1	5.0	(1)
	90.0	89.9	0.1	5.0	(1)
	180.0	180.1	0.1	5.0	(1)
	270.0	270.0	0.0	5.0	(1)
Temperature (°C)	N/A	N/A	NA	1.0	(1)
	N/A	N/A	N/A	1.0	(1)
	N/A	N/A	N/A	1.0	(1)
Precipitation (0.1" equiv.)	74.1	70.6	3.5	7.4	(1)
	74.1	72.2	1.9	7.4	(1)
	74.1	72.4	1.7	7.4	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1995

(3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 1800 MST and on-line at 1834 MST

Battery voltage at 13.660

Met One temperature sensor was broken during the audit and will require replacement.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 15-Oct-03
 Audit Performed by: T. Shaw, K. Jahnke - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-21XL	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.44	0.00	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.35	0.00	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		0.2<T<0.3	N/A	N/A	1.00 (3)
WD (degrees)		0.0	0.3	0.3	5.0 (1)
		90.0	90.1	0.1	5.0 (1)
		180.0	180.2	0.2	5.0 (1)
		270.0	270.3	0.3	5.0 (1)
Temperature (°C)	ambient	12.6	12.5	0.1	1.0 (1)
	ice bath	0.5	1.6	1.1	1.0 (1)
	warm bath	24.2	24.0	0.2	1.0 (1)
Precipitation (0.1" equiv.)		72.8	74.1	1.3	7.4 (1)
		72.2	74.1	1.9	7.4 (1)
		73.2	74.1	0.9	7.4 (1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1995

(3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 1443 MST and on-line at 1505 MST
 Battery voltage at 13.685
 Replaced propeller

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 11-Jun-04
 Audit Performed by: T. Shaw, T. Mendenhall - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-21XL	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.44	0.00	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.12	0.23	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		0.2<T<0.3	N/A	N/A	1.00 (3)
WD (degrees)		0.0	0.0	0.0	5.0 (1)
		90.0	91.8	1.8	5.0 (1)
		180.0	183.0	3.0	5.0 (1)
		270.0	270.0	0.0	5.0 (1)
Temperature (°C)	ambient	14.9	14.0	0.9	1.0 (1)
	ice bath	0.5	0.9	0.4	1.0 (1)
	warm bath	36.4	36.6	0.2	1.0 (1)
Precipitation (0.1" equiv.)		72.6	74.1	1.5	7.4 (1)
		72.4	74.1	1.7	7.4 (1)
		72.8	74.1	1.3	7.4 (1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

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 Air Pollution Measurement Systems, Vol. IV, 1995

(3)= Manufacturer's Specifications

Notes, Recommendations

System on-line at 1235 MST

Precipitation bucket was not working upon arrival, adjusted reed switch & both set screws.

Precipitation bucket was working upon departure.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 19-Nov-04
 Audit Performed by: D. Powers, K. Jahnke - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-21XL	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)			0.00	0.56	(1)
			0.00	0.56	(1)
			0.00	0.56	(1)
			0.00	0.56	(1)
			0.00	0.56	(1)
WS start torque (gm-cm)	0.2<T<0.3	N/A	N/A	1.00	(3)
WD (degrees)			0.0	5.0	(1)
			0.0	5.0	(1)
			0.0	5.0	(1)
			0.0	5.0	(1)
Temperature (°C)	ambient		0.0	1.0	(1)
	ice bath		0.0	1.0	(1)
	warm bath		0.0	1.0	(1)
Precipitation (0.1" equiv.)	74.0	74.1	0.1	7.4	(1)
	74.0	74.1	0.1	7.4	(1)
	74.0	74.1	0.1	7.4	(1)

BOLD difference values exceed performance specifications
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 Air Pollution Measurement Systems, Vol. IV, 1995
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Notes, Recommendations

System off-line at 1200 MST, on-line at 1222 MST.
 Installed new read switch on the precipitation bucket.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 14-Jun-05
 Audit Performed by: W. Adler, K. Jahnke - *iml Air Science*

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-21XL	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		0.2<T<0.3	N/A	N/A	1.00	(3)
WD (degrees)		0.0	0.0	0.0	5.0	(1)
		90.0	89.8	0.2	5.0	(1)
		180.0	180.2	0.2	5.0	(1)
		270.0	270.9	0.9	5.0	(1)
Temperature (°C)	ambient	24.4	25.5	1.1	1.0	(1)
	ice bath	0.5	1.0	0.5	1.0	(1)
	warm bath	60.0	59.8	0.2	1.0	(1)
Precipitation (0.1" equiv.)		72.2	74.1	1.9	7.4	(1)
		71.8	74.1	2.3	7.4	(1)
		72.4	74.1	1.7	7.4	(1)

BOLD difference values exceed performance specifications

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Air Pollution Measurement Systems, Vol. IV, 1995

(3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 1001 MST, on-line at 1119 MST.

The wind direction was not working upon arrival, stuck between 315 and 345 degrees.

Replaced the wind direction potentiometer, wind direction bearings, wind speed bearings, tail, and nose cone. System running following the repairs.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 12-Dec-05
 Audit Performed by: B. Hanewald, S. Hansen - iml Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-21XL	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.44	0.00	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.35	0.00	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		0.2<T<0.3	N/A	N/A	1.00 (3)
WD (degrees)		0.0	0.6	0.6	5.0 (1)
		90.0	90.2	0.2	5.0 (1)
		180.0	179.3	0.7	5.0 (1)
		270.0	269.6	0.4	5.0 (1)
Temperature (°C)	ambient	2.3	2.9	0.6	1.0 (1)
	ice bath	0.3	0.8	0.5	1.0 (1)
	warm bath	13.2	13.0	0.2	1.0 (1)
Precipitation (0.1" equiv.)		73.2	74.1	0.9	7.4 (1)
		71.8	74.1	2.3	7.4 (1)
		71.6	74.1	2.5	7.4 (1)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1995
 (3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 1553 MST, on-line at 1627 MST.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 12-Apr-06
 Audit Performed by: S.Engel & T.Shaw--- IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-21XL	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		0.2<T<0.3	N/A	N/A	1.00	(3)
WD (degrees)		0.0	0.2	0.2	5.0	(1)
		90.0	90.6	0.6	5.0	(1)
		180.0	181.0	1.0	5.0	(1)
		270.0	270.7	0.7	5.0	(1)
Temperature (°C)	ambient	21.6	20.2	1.4	1.0	(1)
	ice bath	2.2	1.2	1.0	1.0	(1)
	warm bath	49.8	48.9	0.9	1.0	(1)
Precipitation (0.1" equiv.)		69.8	74.1	4.3	7.4	(1)
		71.0	74.1	3.1	7.4	(1)
		70.8	74.1	3.3	7.4	(1)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1995
 (3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 0925 MST, on-line at 0957 MST.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 20-Dec-06
 Audit Performed by: S.Engel & S. Hansen--- IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-21XL	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.00	0.00	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	0.2<T<0.3	N/A	N/A	1.00	(3)
WD (degrees)	0.0	0.2	0.2	5.0	(1)
	90.0	89.7	0.3	5.0	(1)
	180.0	179.7	0.3	5.0	(1)
	270.0	270.4	0.4	5.0	(1)
Temperature (°C)	ambient	12.0	12.9	0.9	1.0 (1)
	ice bath	0.3	0.0	0.3	1.0 (1)
	warm bath	32.9	32.1	0.8	1.0 (1)
Precipitation (0.1" equiv.)	180.4	185.3	4.8	18.5	(1)
	179.4	185.3	5.8	18.5	(1)
	176.6	185.3	8.7	18.5	(1)

BOLD difference values exceed performance specifications

- (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1995
 (3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 1244 MST, on-line at 1317 MST.
 Battery voltage was 14.18 v

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 20-Jun-07
 Audit Performed by: C. Medill & K. Jahnke--- IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-10	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.44	0.00	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.35	0.00	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		0.2<T<0.3	N/A	N/A	1.00 (3)
WD (degrees)		0.0	0.6	0.6	5.0 (1)
		90.0	90.4	0.4	5.0 (1)
		180.0	179.8	0.2	5.0 (1)
		270.0	270.1	0.1	5.0 (1)
Temperature (°C)	hot bath	50.9	50.4	0.5	1.0 (1)
	ice bath	1.3	2.1	0.8	1.0 (1)
	warm bath	22.0	22.4	0.4	1.0 (1)
Precipitation (0.1" equiv.)		181.8	185.3	3.4	18.5 (1)
		177.0	185.3	8.3	18.5 (1)
		178.2	185.3	7.1	18.5 (1)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1995
 (3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 844 MST, on-line at 931 MST.
 Tail on R.M. Young was not lined up with cuppler, WD was off by about 40 degrees.
 Battery voltage was 11.033 v

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 20-Dec-07
 Audit Performed by: C. Medill & S. Hansen--- IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-10	N/A

Audit Results

	Reference	DAS Value	Difference	Specification	
WS (mph)	0.00	0.23	0.23	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	>.5	N/A	N/A	<0.5	(3)
WS (mph) after adjustment	0.00	0.23	0.23	0.56	(1)
	3.44	3.44	0.00	0.56	(1)
	9.16	9.16	0.00	0.56	(1)
	34.35	34.35	0.00	1.72	(1)
	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)	0.2<T<0.3	N/A	N/A	<0.5	(3)
WD (degrees)	0.0	0.2	0.2	5.0	(1)
	90.0	89.4	0.6	5.0	(1)
	180.0	179.1	0.9	5.0	(1)
	270.0	270.3	0.3	5.0	(1)
Temperature (°C)	hot bath	35.6	35.9	0.3	1.0 (1)
	ice bath	0.1	0.6	0.5	1.0 (1)
	warm bath	20.3	20.2	0.1	1.0 (1)
Precipitation (0.1" equiv.)	175.7	185.3	9.6	18.5	(1)
	173.8	185.3	11.5	18.5	(1)
	173.6	185.3	11.7	18.5	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1995

(3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 1602 MST, on-line at 1656 MST.
 Start torque was greater than .5 gm-cm so bearings were replaced.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 20-Jun-08
 Audit Performed by: C. Medill & S. Engel--- IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-10	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.44	0.00	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.35	0.00	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		>.5	N/A	N/A	<0.5 (3)
WD (degrees)		0.0	0.2	0.2	5.0 (1)
		90.0	89.8	0.2	5.0 (1)
		180.0	180.6	0.6	5.0 (1)
		270.0	270.6	0.6	5.0 (1)
Temperature (°C)	hot bath	47.0	46.6	0.4	1.0 (1)
	ice bath	1.2	1.2	0.0	1.0 (1)
	warm bath	3.9	4.3	0.4	1.0 (1)
Precipitation (0.1" equiv.)		196.4	185.3	11.2	18.5 (1)
		197.2	185.3	12.0	18.5 (1)
		185.4	185.3	0.2	18.5 (1)

BOLD difference values exceed performance specifications
 (1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1995
 (3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 0743 MST, on-line at 0835 MST.
 16 extra tips for adjustment to bucket.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company
 Audit Date: 14-Nov-08
 Audit Performed by: J. Goldsmith - R. Campbell --- IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette
Data acquisition system:	Campbell Scientific CR-10	N/A

Audit Results

		Reference	DAS Value	Difference	Specification
WS (mph)		0.00	0.00	0.00	0.56 (1)
		3.44	3.44	0.00	0.56 (1)
		9.16	9.16	0.00	0.56 (1)
		34.35	34.35	0.00	1.72 (1)
		91.60	91.60	0.00	4.58 (1)
WS start torque (gm-cm)		>.5	N/A	N/A	<0.5 (3)
WD (degrees)		0.0	0.1	0.1	5.0 (1)
		90.0	88.5	1.5	5.0 (1)
		180.0	179.3	0.7	5.0 (1)
		270.0	270.0	0.0	5.0 (1)
Temperature (°C)	hot bath	30.2	30.2	0.0	1.0 (1)
	ice bath	-0.1	0.2	0.3	1.0 (1)
	warm bath	8.2	8.3	0.1	1.0 (1)
Precipitation (0.1" equiv.)		174.4	185.3	10.9	18.5 (1)
		173.7	185.3	11.6	18.5 (1)
		174.0	185.3	11.3	18.5 (1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan
 (2)= Performance specification listed In EPA Quality Assurance Manual for
 Air Pollution Measurement Systems, Vol. IV, 1995
 (3)= Manufacturer's Specifications

Notes, Recommendations

System off-line at 0944 MST, on-line at 1105 MST.
 No torque due to high winds

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company

Audit Date: 19-May-09

Audit Performed By: J. Goldsmith -- IML Air Science

Sensor	Mfr./Model	Reference Device	Serial ID
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor	IML 0943
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit	
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer	IML 1403
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette	N/A
Data acquisition system:	Campbell Scientific CR-10	N/A	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		>.5	N/A	N/A	<0.5	(3)
WD (degrees)		0.0	0.2	0.2	5.0	(1)
		90.0	90.7	0.7	5.0	(1)
		180.0	178.7	1.3	5.0	(1)
		270.0	270.7	0.7	5.0	(1)
Temperature (°C)	hot bath	37.1	36.9	0.1	1.0	(1)
	ice bath	0.6	1.0	0.4	1.0	(1)
	warm bath	22.0	22.4	0.4	1.0	(1)
Precipitation (0.1" equiv.)		183.3	185.3	1.9	18.5	(1)
		185.7	185.3	0.4	18.5	(1)
		186.0	185.3	0.8	18.5	(1)
BOLD difference values exceed performance specifications						
(1)= Performance specification listed in facilities' Quality Assurance Project Plan						
(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1995						
(3)= Manufacturer's Specifications						

Notes, Recommendations

System taken offline at 07:34MST and returned online at 09:17 MST.

Changed wind speed bearings

Tipping bucket was broken off hinges, reset the precip bucket and then audited

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company

Audit Date: 7-Oct-09

Audit Performed By: J. Goldsmith, R. Campbell -- IML Air Science

Sensor	Mfr./Model	Reference Device	Serial ID
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor	IML 0896
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit	IML 0896
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer	IML 1403
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette	N/A
Data acquisition system:	Campbell Scientific CR-10	N/A	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		>.5	N/A	N/A	<0.5	(3)
WD (degrees)		0.0	0.1	0.1	5.0	(1)
		90.0	89.7	0.3	5.0	(1)
		180.0	179.0	1.0	5.0	(1)
		270.0	269.2	0.8	5.0	(1)
Temperature (°C)	hot bath	38.3	38.1	0.2	1.0	(1)
	ice bath	1.8	1.6	0.2	1.0	(1)
	warm bath	26.2	26.1	0.1	1.0	(1)
Precipitation (0.1" equiv.)		177.0	185.3	8.3	18.5	(1)
		177.4	185.3	7.8	18.5	(1)
		176.4	185.3	8.8	18.5	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for
Air Pollution Measurement Systems, Vol. IV, 1995

(3)= Manufacturer's Specifications

Notes, Recommendations

System taken offline at 1125 MST and returned online at 1206 MST.

METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company

Audit Date: 9-Jun-10

Audit Performed By: R. Campbell, S. Warner -- IML Air Science

Sensor	Mfr./Model	Reference Device	Serial ID
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor	IML 0856
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit	
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer	IML 0885
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette	N/A
Data acquisition system:	Campbell Scientific CR-10	N/A	N/A

Audit Results

		Reference	DAS Value	Difference	Specification	
WS (mph)		0.00	0.00	0.00	0.56	(1)
		3.44	3.44	0.00	0.56	(1)
		9.16	9.16	0.00	0.56	(1)
		34.35	34.35	0.00	1.72	(1)
		91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		>.5	N/A	N/A	<0.5	(3)
WD (degrees)		0.0	1.1	1.1	5.0	(1)
		90.0	89.4	0.6	5.0	(1)
		180.0	179.9	0.2	5.0	(1)
		270.0	269.8	0.2	5.0	(1)
Temperature (°C)	Ice bath	2.8	3.1	0.3	1.0	(1)
	warm bath	22.2	22.0	0.2	1.0	(1)
	hot bath	36.8	36.6	0.2	1.0	(1)
Precipitation (0.1" equiv.)		183.8	185.3	1.4	18.5	(1)
		180.3	185.3	5.0	18.5	(1)
		179.9	185.3	5.4	18.5	(1)
BOLD difference values exceed performance specifications						
(1)= Performance specification listed in facilities' Quality Assurance Project Plan						
(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1995						
(3)= Manufacturer's Specifications						

Notes, Recommendations

System taken offline at 14:53 MST and returned online at 16:02 MST.



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company

Audit Date: 8-Dec-10

Audit Performed By: K. Jahnke, J. Rogers -- IML Air Science

Sensor	Mfr./Model	Reference Device	Serial ID
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor	IML 0896
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit	IML 0942
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer	T050906
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette	N/A
Data acquisition system:	Campbell Scientific CR-10	N/A	N/A

Audit Results

	Reference RPM	Reference MPH	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	0.56	(1)
	300	3.44	3.44	0.00	0.56	(1)
	800	9.16	9.16	0.00	0.56	(1)
	3000	34.35	34.35	0.00	1.72	(1)
	8000	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		1.0	t<1.0	N/A	1.0	(3)
WD (degrees)		0.0	0.1	0.1	5.0	(1)
		90.0	90.2	0.2	5.0	(1)
		180.0	180.1	0.1	5.0	(1)
		270.0	270.4	0.4	5.0	(1)
Temperature (°C)		0.0	0.0	0.0	0.5	(1)
		68.4	68.0	0.4	0.5	(1)
		49.1	48.8	0.3	0.5	(1)
Precipitation (0.1" equiv.)		182.0	185.3	3.25	18.5	(1)
		184.5	185.3	0.75	18.5	(1)
		181.6	185.3	3.65	18.5	(1)
BOLD difference values exceed performance specifications						
(1)= Performance specification listed in facilities' Quality Assurance Project Plan						
(2)= Performance specification listed In EPA Quality Assurance Manual for Air Pollution Measurement Systems, Vol. IV, 1995						
(3)= Manufacturer's Specifications						

Notes, Recommendations

System taken offline at 12:18 MST and returned online at 12:55 MST.



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Coal Company

Audit Date: 28-Apr-11

Audit Performed By: S. Hansen, Z. Heid -- IML Air Science

Sensor	Mfr./Model	Reference Device	Serial ID
Wind Speed (WS):	RM Young Wind Monitor AQ	quartz referenced drive motor	IML 1407
Wind Direction (WD):	RM Young Wind Monitor AQ	Brunton transit	IML 1405
Temperature (T):	Met ONE 2066, naturally aspirated	Hg-in-glass thermometer	IML 0885
Precipitation (Ppt.):	Sierra Misco 099R tipping bucket	lab grade burette	N/A
Data acquisition system:	Campbell Scientific CR-10	N/A	N/A

Audit Results

	Reference RPM	Reference MPH	DAS Value	Difference	Specification	
WS (mph)	0	0.00	0.00	0.00	0.56	(1)
	300	3.44	3.44	0.00	0.56	(1)
	800	9.16	9.16	0.00	0.56	(1)
	3000	34.35	34.35	0.00	1.72	(1)
	8000	91.60	91.60	0.00	4.58	(1)
WS start torque (gm-cm)		1.0	≤1.0	N/A	1.0	(3)
Crossarm Alignment		1.00	0.40	0.60	5.0	(3)
WD (degrees)	Clockwise	0.0	0.4	0.4	5.0	(1)
		90.0	90.3	0.3	5.0	(1)
		180.0	179.8	0.2	5.0	(1)
		270.0	269.7	0.3	5.0	(1)
	Counter Clockwise	0.0	0.2	0.2	5.0	(1)
		90.0	90.0	0.0	5.0	(1)
		180.0	179.1	0.9	5.0	(1)
		270.0	270.0	0.0	5.0	(1)
Temperature (°C)		1.6	1.4	0.2	0.5	(1)
		38.9	39.1	0.2	0.5	(1)
		16.1	16.5	0.4	0.5	(1)
Precipitation (0.1" equiv.)		185.2	185.3	0.05	18.5	(1)
		185.6	185.3	0.35	18.5	(1)
		185.0	185.3	0.25	18.5	(1)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Manual for
Air Pollution Measurement Systems, Vol. IV, 1995

(3)= Manufacturer's Specifications

Notes, Recommendations

System taken offline at 12:03 MST and returned online at 12:57 MST.

Temp probe needs replaced.



METEOROLOGICAL STATION AUDIT SUMMARY

Met Station: Dry Fork Mine
 Audit Date: 16-Nov-11
 Audit Performed By: C. Cotton, Z. Heid – IML Air Science

Sensor	Mfr./Model	Serial Number	Reference Device	Serial/ID Number
Wind Speed (WS):	RM Young Wind Monitor AQ		quartz drive motor	IML 0855
Wind Direction (WD):	RM Young Wind Monitor AQ		transit, compass	IML 0894
Temperature @ 2 Meters:	RM Young 41342, power aspirated	TS20278	digital thermistor	IML 1402
Temperature @ 10 Meters:	RM Young 41342, power aspirated	TS20279	digital thermistor	IML 1402
Precipitation:	Sierra Misco 099R tipping bucket		lab grade burette	N/A
Data acquisition system:	CSI CR1000 Datalogger	43527	N/A	N/A

Audit Results

	Reference RPM	Reference m/sec	DAS Value	Difference	Specification	
WS (m/sec)	0	0.00	0.00	0.00	below threshold	
	300	1.54	1.54	0.00	0.20	(2)
	800	4.10	4.10	0.00	0.20	(2)
	3000	15.36	15.36	0.00	0.20	(2)
	8000	40.96	40.96	0.00	0.20	(2)
Crossarm Alignment		180.0	180.0	0.0	5.0	(2)
WS start torque (gm-cm)		1.0	<1.0	N/A	1.0	(3)
WD (degrees)	Clockwise	0.0	0.1	0.1	5.0	(2)
		90.0	90.2	0.2	5.0	(2)
		180.0	180.1	0.1	5.0	(2)
		270.0	270.4	0.4	5.0	(2)
	Counter clockwise	0.0	0.1	0.1	5.0	(2)
		90.0	89.8	0.2	5.0	(2)
		180.0	180.5	0.5	5.0	(2)
		270.0	269.9	0.1	5.0	(2)
Temp. (°C): Upper Sensor		0.0	0.0	0.0	0.5	(2)
		9.8	9.9	0.1	0.5	(2)
		12.8	12.8	0.0	0.5	(2)
Temp. (°C): Lower Sensor		0.0	0.0	0.0	0.5	(2)
		9.8	9.8	0.1	0.5	(2)
		12.8	12.8	0.0	0.5	(2)
Precipitation (0.1" equiv.)	DAS Value (in)	Reference (ml)	DAS Equivalent	Difference	Specification	
	0.10	194.0	185.3	8.7	18.5	(2)
	0.10	185.0	185.3	0.3	18.5	(2)
	0.10	185.5	185.3	0.2	18.5	(2)
			Average Diff.	3.1	8.2	(2)
Delta Temperature (°C):	Reference (°C)	Lower Sensor	Upper Sensor	ΔT	Specification	
	0.0	0.0	0.0	0.03	0.10	(2)
	9.8	9.8	9.9	0.05	0.10	(2)
	12.8	12.8	12.8	0.00	0.10	(2)

BOLD difference values exceed performance specifications

(1)= Performance specification listed in facilities' Quality Assurance Project Plan

(2)= Performance specification listed In EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. IV: Meteorological Measurements Version 2.0, 2008

(3)= Manufacturer's Specifications

(4)= EPA On-Site Meteorological Program Guidance for Regulatory Modeling Applications

Notes, Recommendations

System returned on-line at 17:42 MST.
 Upgraded to AERMOD system.
 Bearings were replaced prior to start up.



POWERTECH (USA) INC.

Standard Operating Procedures

Standard Operating Procedure For Meteorological Monitoring Station Audit

1.0 Scope and Application

1.1 Accurate meteorological measurements are critical to interpretation of ambient air pollution data. The proper operation and accuracy of measurements must be assessed on a periodic basis.

1.2 The objective of this procedure is to ensure that recorded meteorological data match readings provided by known inputs within specified limits.

1.3 This procedure applies to meteorological monitoring stations that measure ambient air temperature, wind speed, wind direction, barometric pressure, relative humidity, solar radiation, and precipitation (tipping bucket method).

2.0 Summary of Method

2.1 The accuracy of meteorological measurements is assessed by stimulating meteorological measurement sensors with known inputs. Sensor outputs, as translated and recorded by the system data acquisition system, are compared to the known values. The differences are compared to the specified limits to assess system accuracy.

3.0 Health and Safety Warnings

3.1 General safety precautions related to electrical hazards must be observed at all times when working with electronic equipment. Electrical receptacles and equipment must be properly grounded. Use caution when servicing or operating electrical equipment in wet conditions.

3.2 General precautions for working with heavy equipment and electro-mechanical equipment should be taken.

3.3 Meteorological towers present a serious physical hazard. Great care must be taken when lower, raising, or climbing towers.

4.0 Cautions

4.1 Damage to the instrument may result if caution is not taken to properly install and maintain the device. Follow the manufacturer's instructions for maintenance of all equipment and for safe, secure installation.

5.0 Personnel Qualifications

- 5.1 Persons performing this SOP must be familiar with the operation of environmental measurement instrumentation.
- 5.2 Instrumentation skills are necessary for interacting with the data acquisition system.
- 5.3 Familiarity with electronic and mechanical test equipment is required.

6.0 Equipment

- 6.1 Quartz-referenced motor, with adaptors
- 6.2 Starting torque measurement disc and weights
- 6.3 NIST traceable thermometer, accurate to $\pm 0.1^{\circ}\text{C}$
- 6.4 Two insulated containers (one with ice water and the other with hot water)
- 6.5 Engineer's transit
- 6.6 Class B pipette
- 6.7 NIST traceable digital pressure standard
- 6.8 Reference relative humidity sensor/instrument, or psychrometer
- 6.9 Solar radiation sensor/instrument & independent datalogger
- 6.10 Field data sheet
- 6.11 Time piece
- 6.12 Miscellaneous tools

7.0 Procedure

- 7.1 Record date and time, station ID, name of person(s) performing the procedure, on field data sheet.
- 7.2 Compare the datalogger's readings with your own assessment of the ambient weather conditions. Note any anomalies on the field data sheet.
- 7.3 Check the initial alignment of the wind direction sensor using the transit, being sure to adjust for local declination.
- 7.4 Record the following information on the audit data: site ID, auditors, date, time, and system components.

- 7.5 Record the current time as *time system off line* on the field data sheet.
- 7.6 Remove the appropriate restraints and **carefully** lower the tower to a point where sensors are at a safe working height.
- 7.7 Remove the anemometer propeller. Attach the propeller torque disc to shaft. Measure and record the starting torque in the counter-clockwise direction.
- 7.8 Attach the anemometer drive motor to the shaft and rotate at speeds corresponding to approximately 3 mph, 9 mph, 30 mph, and 90 mph recording the motor speeds and wind speed readings from the data logger.
- 7.9 Assess the linearity of the wind direction sensor by physically aligning the body of the anemometer with the base at angles corresponding to 0°, 90°, 180°, and 270°, recording the corresponding readings from the data logger.
- 7.10 Remove each temperature sensor from its radiation shield and immerse the sensor in an ice water bath along with the reference thermometer. Allow the sensor and thermometer to attain equilibrium and record both measurements.
- 7.11 Immerse each temperature sensor in a warm water bath (80° - 100°F) along with the reference thermometer. Allow the sensor and thermometer to attain equilibrium and record both measurements.
- 7.12 Create a reference-temperature midpoint by mixing ice water and warm water. Immerse each temperature sensor in the water bath along with the reference thermometer. Allow the sensor and thermometer to attain equilibrium and record both measurements.
- 7.13 Inspect all sensors, cables, and mounting hardware. Conduct any repairs or scheduled preventive maintenance **to only those sensors audited to this point**.
- 7.14 Make sure all cables and mounting hardware are secure. **Carefully** raise the tower, secure the base, and equalize the guy wire tensions.
- 7.15 Mount the independent datalogger (or RH reference) in a safe and secure place, and collocate the audit sensors for solar radiation and relative humidity. Allow the sensors time to equilibrate. Record the solar radiation and RH measurements from the system and the reference.
- 7.16 Using the pipette, admit water slowly into the inlet of the precipitation gauge (as *found, i.e. do not clean*) until the bucket tips 10 times (0.10" precipitation equivalent). Record the amount of water required for the 10 tips and the amount registered on the data logger. Repeat the procedure two more times.
- 7.17 Clean the precipitation gauge inlet and perform any indicated adjustments and/or repairs can be performed and noted. If adjustments are made, repeat step 7.15. Note the condition of the gauge prior to, and after the audit. If the ambient temperature is cold enough, assess whether the heater is working.

7.18 Record and compare pressure measurements from the station logger and the pressure standard. Record both values.

7.19 Display and record the data acquisition system time. Record the time displayed by the reference time piece. Note: the data acquisition system operates on Standard Time year round.

7.20 Display and record the data acquisition battery voltage.

7.21 Record any findings, repairs, replacements, and any other anomalies in the field data sheet. Record the time the station was returned to normal operating condition.

8.0 References

8.1 Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV. Meteorological Measurements; EPA/600/4-90/003; August 1989; U.S. Environmental Protection Agency

8.2 Quality Assurance Handbook for Air Pollution Measurement Systems: Volume V. Precipitation Measurement Systems; EPA/600/R-94/038e; April; U.S. Environmental Protection Agency

8.3 On-Site Meteorological Program Guidance for Regulatory Modeling Applications; EPA-450/4-87-013; June, 1987; U.S. Environmental Protection Agency

8.4 Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD); EPA-450/4-87-007; May, 1987; U.S. Environmental Protection Agency

9.0 Attachments

9.1 Meteorological Station Audit Field Data Sheet

**IML Air
Science**

a division of Inter-Mountain
Laboratories, Inc.



555 Absaraka, Sheridan, WY
82801

Meteorological Station Audit

Page 1 of 2

Network:

Date:

Auditors:

DAS time
off-line:

Notes; system as
found:

Standards

Parameter	Reference Device	Mfr./Model	SN/ID
Wind Speed	Quartz Drive Motor		
Wind Direction Alignment	Compass		
Temperature	Digital Thermistor		
Relative Humidity	Collocated Sensor		
Pressure	Digital Barometer		
Precipitation	Lab Grade Burette	N/A	N/A
Solar Radiation	Collocated Sensor		

Sensors

	Mfr./Model	SN/ID
DAS:		
Wind Speed:		
Wind Direction:		
Temp/Asp 2m:		
Temp/Asp 10m:		
Precipitation:		
Barometric Pressure :		
Relative Humidity:		
Solar Radiation:		

System Audit

Temperature

Height:	2m	10m
Reference	DAS	DAS
°C		
°C		
°C		

Barometric Pressure

ref.
DAS

Relative Humidity

ref. RH	ref. RH Temp
DAS RH	DAS RH Temp

Page 2 of 2

Wind Speed

starting torque gm-cm		
reference	DAS	after adj.
0 rpm		
rpm		
mph		
rpm		
mph		
rpm		
mph		
rpm		
mph		

Wind Direction

starting torque			DAS Reading
ccw:	cw:	gm-cm	
initial alignment:			
reference	CW	CCW	After Adj
360			
060			
090			
120			
180			
240			
270			
300			

Precipitation (Tipping Bucket)

mls/weight	tips	in. equiv.
	10	0.10
	10	0.10
	10	0.10
Heater working?		
Inspection		
DAS precip start:		
DAS precip end:		

Solar Radiation

	Ref	DAS
Covered		
Un-covered		

Notes:

DAS Day: _____

DAS Time: _____

DAS Year: _____

DAS Battery: _____

SM Battery OK ? _____
Enclosure Humidity OK? _____

WS Channel: _____

WD Channel: _____

Ta Channel: _____

Precip. Channel: _____

RH Channel: _____

Pa Channel: _____

Batt. Channel: _____
Solar Radiation Channel: _____

End System
Audit

DAS time on-line: _____

Standard Operating Procedure For Meteorological Monitoring Station Calibration

1.0 Scope and Application

- 1.1 Accurate meteorological measurements are critical to interpretation of ambient air pollution data. The proper operation and accuracy of measurements must be assessed on a periodic basis.
- 1.2 The objective of this procedure is to ensure that recorded meteorological data match readings provided by known inputs within specified limits.
- 1.3 This procedure applies to meteorological monitoring stations that measure ambient air temperature, wind speed, wind direction, barometric pressure, relative humidity, solar radiation, and precipitation (tipping bucket method).

2.0 Summary of Method

- 2.1 The accuracy of meteorological measurements is assessed by stimulating meteorological measurement sensors with known inputs. Sensor outputs, as translated and recorded by the system data acquisition system, are compared to the known values. The differences are compared to the specified limits to assess system accuracy. If any differences between reference standard and sensor are discovered, corrective actions must be taken.

3.0 Health and Safety Warnings

- 3.1 General safety precautions related to electrical hazards must be observed at all times when working with electronic equipment. Electrical receptacles and equipment must be properly grounded. Use caution when servicing or operating electrical equipment in wet conditions.
- 3.2 General precautions for working with heavy equipment and electro-mechanical equipment should be taken.
- 3.3 Meteorological towers present a serious physical hazard. Great care must be taken when lower, raising, or climbing towers.

4.0 Cautions

- 4.1 Damage to the instrument may result if caution is not taken to properly install and maintain the device. Follow the manufacturer's instructions for maintenance of all equipment and for safe, secure installation.

5.0 Personnel Qualifications

- 5.1 Persons performing this SOP must be familiar with the operation of environmental measurement instrumentation.
- 5.2 Instrumentation skills are necessary for interacting with the data acquisition system.
- 5.3 Familiarity with electronic and mechanical test equipment is required.

6.0 Equipment

- 6.1 Quartz-referenced motor, with adaptors
- 6.2 Starting torque measurement disc and weights
- 6.3 NIST traceable thermometer, accurate to $\pm 0.1^{\circ}\text{C}$
- 6.4 Two insulated containers (one with ice water and the other with hot water)
- 6.5 Engineer's transit
- 6.6 Class B pipette
- 6.7 NIST traceable digital pressure standard
- 6.8 Reference relative humidity sensor/instrument
- 6.9 Solar radiation sensor/instrument & independent datalogger
- 6.10 Field data sheet
- 6.11 Time piece
- 6.12 Miscellaneous tools

7.0 Procedure

- 7.1 Record date and time, station ID, name of person(s) performing the procedure, on field data sheet.
- 7.2 Compare the datalogger's readings with your own assessment of the ambient weather conditions. Note any anomalies on the field data sheet.
- 7.3 Check the initial alignment of the wind direction sensor and orientation of mounting crossarm using the transit, being sure to adjust for local declination.
- 7.4 Record the following information on the calibration data: site ID, auditors, date, time, and system components.

7.5 Record the current time as *time system off line* on the field data sheet.

7.6 Remove the appropriate restraints and **carefully** lower the tower to a point where sensors are at a safe working height if calibrating a “tip down” system. For towers where climbing is required to access mounted sensors, put on climbing harness with appropriate safety equipment including fall protection and lanyard. All climbing apparatus must be inspected for safety before each use and all safety guidelines specific to the site must be followed.

7.7 Remove the anemometer propeller. Attach the propeller torque disc to shaft. Measure and record the starting torque in the counter-clockwise direction.

7.8 Attach the anemometer drive motor to the shaft and rotate at speeds corresponding to approximately 3 mph, 9 mph, 30 mph, and 90 mph recording the motor speeds and wind speed readings from the data logger.

7.9 Assess the linearity of the wind direction sensor by physically aligning the body of the anemometer with the base at angles corresponding to 0°, 90°, 180°, and 270°, recording the corresponding readings from the data logger. The checks must be performed in both a clockwise and counterclockwise rotation.

7.10 Remove each temperature sensor from its radiation shield and immerse the sensor in an ice water bath along with the reference thermometer. Allow the sensor and thermometer to attain equilibrium and record both measurements.

7.11 Immerse each temperature sensor in a warm water bath (90° - 110°F) along with the reference thermometer. Allow the sensor and thermometer to attain equilibrium and record both measurements.

7.12 Create a reference-temperature midpoint by mixing ice water and warm water. Immerse each temperature sensor in the water bath along with the reference thermometer. Allow the sensor and thermometer to attain equilibrium and record both measurements.

7.13 Inspect all sensors, cables, and mounting hardware. Conduct any repairs or scheduled preventive maintenance **to only those sensors assessed to this point**.

7.14 Make sure all cables and mounting hardware are secure. **Carefully** raise the tower, secure the base, and equalize the guy wire tensions.

7.15 Mount the independent datalogger (or RH reference) in a safe and secure place, and collocate the reference sensors for solar radiation and relative humidity. Allow the sensors time to equilibrate. Record the solar radiation and RH measurements from the system and the reference.

7.16 Using the pipette, admit water slowly into the inlet of the precipitation gauge (as found, *i.e. do not clean*) until the bucket tips 10 times (0.10” precipitation equivalent). Record the amount of water required for the 10 tips and the amount registered on the data logger. Repeat the procedure two more times.

7.17 Clean the precipitation gauge inlet and perform and note any indicated adjustments and/or repairs. If adjustments are made, repeat step 7.16. Note the condition of the gauge prior to, and after the assessment. If the ambient temperature is cold enough, assess whether the heater is working.

7.18 Record and compare pressure measurements from the station logger and the pressure standard. Record both values.

7.19 Display and record the data acquisition system time. Record the time displayed by the reference time piece. Note: the data acquisition system operates on Standard Time year round.

7.20 Display and record the data acquisition battery voltage.

7.21 Record any findings, repairs, replacements, and any other anomalies in the field data sheet. Should any sensor not meet specifications of sensor or calibration criteria, appropriate action must be performed including onsite sensor calibration/adjustment, removal for factory recalibration, or replacement if deemed necessary. Record the time the station was returned to normal operating condition.

8.0 References

8.1 Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV. Meteorological Measurements; EPA/600/4-90/003; August 1989; U.S. Environmental Protection Agency

8.2 Quality Assurance Handbook for Air Pollution Measurement Systems: Volume V. Precipitation Measurement Systems; EPA/600/R-94/038e; April; U.S. Environmental Protection Agency

8.3 On-Site Meteorological Program Guidance for Regulatory Modeling Applications; EPA-450/4-87-013; June, 1987; U.S. Environmental Protection Agency

8.4 Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD); EPA-450/4-87-007; May, 1987; U.S. Environmental Protection Agency

9.0 Attachments

9.1 Meteorological Station Calibration Field Data Sheet

Standard Operating Procedure for Meteorological Data Processing

1.0 Scope and Application

1.1 The objective of this procedure is to ensure that all data collected, processed, and reported by IML Air Science are of similar high quality. The transformation of raw meteorological data to validated, reportable data is critical to the ability of a client to meet QAPP requirements, and to the ability of IML Air Science to meet contractual requirements to the client. This procedure also ensures that time-sensitive work, e.g. quarterly reporting needed to satisfy EPA, state, and network QAPP requirements, is performed.

1.2 This procedure applies to those ambient air monitoring networks for which IML Air Science has been contracted to perform routine meteorological data collection and/or processing.

1.3 This SOP describes the method for handling, reviewing, verifying, and validating data collected by clients' meteorological systems.

2.0 Summary of Method

2.1 Clients are responsible for operation of meteorological systems. Actual data collection/transmittal may be performed by customers' personnel or contracted to IML Air Science.

2.2 Once collected, meteorological data are transmitted to IML headquarters in Sheridan, WY, where the data are processed (imported, reviewed, verified, and validated).

2.3 Each reviewer is responsible for verifying each of the parts that are designated for their review and for completing the log/checklist (Attachment 1) associated with the data package.

2.4 Data qualifiers are used where they are appropriate. Data qualifiers used during data processing and reporting are included in Attachment 2.

3.0 Definitions

3.1 Data processing refers to the generic procedures used to transform raw data into validated data, and the subsequent steps taken to summarize, format, and report validated data.

3.2 Data review refers to the overall process of verifying that a meteorological system is functioning properly, data are being accurately logged and transmitted, and QA/QC procedures are being followed.

3.3 Data verification is the process of evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, and/or contractual requirements.

3.4 Data validation is the data-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance to determine the analytical quality of a specific data set. Data validation includes the determination, where possible, of the reasons for any failure to meet method, procedural, or contractual requirements, and an evaluation of the impact of such failure on the overall data set. Data validation applies to activities in the field as well as data processing activities.

3.5 Quality Assurance Project Plan (QAPP) is a document that describes project - specific information such as quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated acceptance criteria.

3.6 Acceptance criteria: the specific quality objectives for a given project, described in the QAPP.

3.7 Screening criteria: suggested or preliminary upper and lower limits for data values based on instrument thresholds, experience, or historical data.

4.0 Personnel Qualifications

4.1 Persons performing this SOP must be familiar with the operation of meteorological measurement instrumentation.

4.2 These persons must also be trained in the use of IML's proprietary database to process and report meteorological data.

4.3 Further, personnel will be trained in general QA/QC requirements and procedures pertaining to the measurement of environmental data.

5.0 Raw Data Requirements

5.1 The reviewer must verify that all information necessary for data review is present. This includes not only raw electronic data files, but other hard copy or electronic information used to review and verify the data.

5.2 Electronic raw data: Comma-delimited text files, spreadsheet files, or similarly formatted files containing raw data to be imported into the processing database.

5.3 QA/QC raw data: These include field notes, audit field sheets, client correspondence, and any other data used to verify proper operation of the system and establish the validity of the data.

6.0 Data Review

6.1 In those cases where Air Science is contracted to initiate data retrieval/transmittal on-site, preliminary data review and verification occurs in the field or at a satellite office. Data are examined for completeness and reasonableness. Meteorological instruments are physically examined on a routine basis to detect failures that could impact data accuracy and validity.

6.2 Data transmitted directly to Air Science is also examined for completeness and reasonableness before import into the processing database.

7.0 Data Verification and Validation

Detailed instructions for users of IML Air Science's meteorological database contain proprietary information. General procedural steps are outlined below. Screening and acceptance criteria used to verify, qualify, and invalidate data are shown in Attachment 3.

7.1 Raw data are imported into a client-specific database to preserve data integrity and eliminate the possibility of data crossover between clients.

7.2 During the import process, records are checked for the proper station (client) ID, and the time stamp is examined to prevent importing duplicate records.

7.3 As an aid to the reporting process, the database allows for the automatic insertion of blank, invalid records in place of missing data. The data reviewer must determine if the data are actually lost, or if an error has occurred during downloading, transmission, or importing that led to the missing records.

7.4 The database has provision for both automatic and manual data flagging and invalidation. It is important to **perform automatic invalidations prior to manual invalidations**. Reversing this order could result in overwriting a manual invalidation code. Manual invalidation codes should be inserted in reverse order of preference, so that the last code entered is the highest priority (i.e. most accurate diagnostic) code for a given record. Any attempt to manually invalidate one or more already flagged records, will result in a warning and a list of the affected records. The user may cancel the operation at this point to preserve existing flags, or elect to overwrite these records.

7.5 Automated Step 1 flags records indicating instrument failure (logger error codes) or low battery voltage.

7.6 Automated Step 2 flags records with any met values outside pre-established limits (screening criteria).

7.7 Automated Step 3 flags records with either minimal or inordinately large changes in the various met parameters from hour to hour.

7.8 Using professional judgment and experience, the data reviewer must examine the results of Steps 2 and 3 and accept or reject the data. Rejected data are manually coded with the appropriate qualifier.

7.9 After automated results have been evaluated and accepted, the reviewer must verify the overall quality of the dataset by examining field notes, audit results, and any other pertinent documentation.

7.10 Records/data deemed invalid must be manually coded by the reviewer. Qualifiers can be inserted at the field level (i.e. for a particular parameter in a record), or at the record level (i.e. all parameters recorded during the period).

7.11 Additional checks of the data qualifying/invalidation process occur when report products are generated. Irregularities in meteorological summaries, wind roses, and other summary products may lead to a re-examination of the data

8.0 Records Management

8.1 Data transmittal can occur along a variety of routes, and a particular network may use more than one route. Example routes include:

Datalogger → storage module → Air Science PC (direct connect)

Datalogger → field laptop → office PC → Air Science PC (disc, e-mail)

Datalogger → Air Science PC (phone or radio telemetry)

Datalogger → Client PC (direct connect, telemetry, etc.) → Air Science PC (disc, e-mail)

8.2 Upon receipt of data at IML offices, an entry is made into a hard-copy or electronic log. Date of receipt, data-range received, date data is QC'd, and any additional notes are recorded.

8.3 Raw data are archived electronically in their original format on the IML network. The network has automated data back-up and recovery functions to prevent data loss.

8.4 Raw data contain a client-specific ID number recognized by the processing database. Raw and processed data for each client are stored separately from that of other clients.

8.5 A common processing database is used by all reviewers in Air Science. This common interface links to the client-specific database and tables needed by the data reviewer to import, process, and report specific data.

9.0 References

9.1 Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV. Meteorological Measurements Version 2.0 (Final); EPA/454/B-08-002; March 2008; U.S. Environmental Protection Agency

9.2 Quality Assurance Handbook for Air Pollution Measurement Systems: Volume V. Precipitation Measurement Systems; EPA/600/R-94/038e; April 1994; U.S. Environmental Protection Agency

9.3 On-Site Meteorological Program Guidance for Regulatory Modeling Applications; EPA-450/4-87-013; June, 1987; U.S. Environmental Protection Agency

9.4 Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD); EPA-450/4-87-007; May, 1987; U.S. Environmental Protection Agency

10.0 Attachments

10.1 Meteorological data processing log and checklist

Station: _____

					Database			Notes
Date Rec'd	Dates Recorded	Field Activities/ Audits?	Complete YTD?	Data Archived?	Imported?	QC'd?	Validated?	

10.2 Meteorological data qualifiers

AIRS Numeric	AQS Alpha	Description
0	0	Valid Record
9967	AA	Sample Pressure Out of Limits - 9967 - AA
9968	AB	Technician Unavailable - 9968 - AB
9969	AC	Construction/Repairs in Area - 9969 - AC
9970	AD	Shelter Storm Damage - 9970 - AD
9971	AE	Shelter Temperature Out of Limits - 9971 - AE
9972	AF	Scheduled But Not Collected - 9972 - AF
9975	AI	Insufficient Data (Can't Calculate) - 9975 - AI
9978	AL	Voided by Operator - 9978 - AL
9979	AM	Miscellaneous Void - 9979 - AM
9980	AN	Machine Malfunction - 9980 - AN
9981	AO	Bad Weather - 9981 - AO
9982	AP	Vandalism - 9982 - AP
9983	AQ	Collection Error - 9983 - AQ
9984	AR	Lab Error - 9984 - AR
9985	AS	Poor Quality Assurance Results - 9985 - AS
9986	AT	Calibration - 9986 - AT
9987	AU	Monitoring Waived - 9987 - AU
9988	AV	Power Failure (Powr) - 9988 - AV
9989	AW	Wildlife Damage - 9989 - AW
9992	AZ	QC Audit (Audit) - 9992 - AZ
9993	BA	Maintenance/Routine Repairs - 9993 - BA
9994	BB	Unable to Reach Site - 9994 - BB
9995	BC	Multi-Point Calibration - 9995 - BC
9996	BD	Auto Calibration - 9996 - BD
9997	BE	Building/Site Repair - 9997 - BE

10.3 Meteorological screening and acceptance criteria

Variable	Screening Criteria: Flag data if the value
Wind Speed	<ul style="list-style-type: none"> - is less than zero or greater than 25 m/s (56 mph) - does not vary by more than 0.1 m/s (0.2 mph) for 3 consecutive hours - does not vary by more than 0.5 m/s (1.1 mph) for 12 consecutive hours
Wind Direction	<ul style="list-style-type: none"> - is less than zero or greater than 360 degrees - does not vary by more than 1 degree for more than 3 consecutive hours - does not vary by more than 10 degrees for 18 consecutive hours
Temperature	<ul style="list-style-type: none"> - is greater than the local record high - is less than the local record low (The above limits could be applied on a monthly basis.) - is greater than a 5° C change from the previous hour - does not vary by more than 0.5° C for 12 consecutive hours
Temperature Difference	<ul style="list-style-type: none"> - is greater than 0.1° C/m during the daytime - is less than – 0.1° C/m during the night time - is greater than 5.0° C or less than -3.0° C
Dew Point Temp.	<ul style="list-style-type: none"> - is greater than the ambient temperature for the given time period - is greater than a 5° C change from the previous hour - does not vary by more than 0.5° C for 12 consecutive hours - equals the ambient temperature for 12 consecutive hours
Precipitation	<ul style="list-style-type: none"> - is greater than 25 mm (1 inch) in one hour - is greater than 100 mm (4 inches) in 24 hours - is less than 50 mm (2 inches) in three months (The above values can be adjusted based on local climate.)
Pressure	<ul style="list-style-type: none"> - is greater than 1060 mb (sea level) - is less than 940 mb (sea level) (The above values should be adjusted for elevations other than sea level.) - changes by more than 6 mb in three hours
Radiation	<ul style="list-style-type: none"> - is greater than zero at night - is greater than the maximum possible for the date and latitude

Standard Operating Procedure for Meteorological Monitoring Station Inspection

1.0 Scope and Application

- 1.1 Accurate meteorological measurements are critical to interpretation of ambient air pollution data. Proper operation must be assessed on a periodic basis.
- 1.2 The objective of this procedure is to inspect operations of the meteorological sensors and recording device, and conduct repairs as needed.
- 1.3 This procedure applies to meteorological monitoring stations that measure ambient air temperature, wind speed, and wind direction.

2.0 Summary of Method

- 2.1 Meteorological measurement sensors are inspected for proper operation, physical condition, and reasonableness.

3.0 Health and Safety Warnings

- 3.1 General safety precautions related to electrical hazards must be observed at all times when working with electronic equipment. Electrical receptacles and equipment must be properly grounded. Use caution when servicing or operating electrical equipment in wet conditions.
- 3.2 General precautions for working with heavy equipment and electro-mechanical equipment should be taken.
- 3.3 Meteorological towers present a serious physical hazard. Great care must be taken when lower, raising, or climbing towers.

4.0 Cautions

- 4.1 Damage to the instrument may result if caution is not taken to properly install and maintain the device. Follow the manufacturer's instructions for maintenance of all equipment and for safe, secure installation.

5.0 Personnel Qualifications

- 5.1 Persons performing this SOP must be familiar with the operation of environmental measurement instrumentation.
- 5.2 Instrumentation skills are necessary for interacting with the data acquisition system.
- 5.3 Familiarity with electronic and mechanical test equipment is required.

6.0 Equipment

- 6.1 Meteorological monitoring station log book
- 6.2 Time piece
- 6.3 Miscellaneous tools

7.0 Procedure

- 7.1 Register visit on the meteorological monitoring station log book, noting location, technician, date and time in STANDARD TIME (data acquisition system is not changed for daylight savings time). Verify that the data acquisition clock is accurate.
- 7.2 Visibly check each sensor for proper operation, lower tower if necessary.
- 7.3 Compare the datalogger's meteorological parameter outputs with your own assessment of the ambient weather conditions. Note any anomalies on the log book. Conduct any repairs or replacements if necessary.
- 7.4 Record concluding time of visit on field data sheet, noting any repairs or changes

8.0 References

- 8.1 Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV. Meteorological Measurements Version 2.0 (Final); EPA/454/B-08-002; March 2008; U.S. Environmental Protection Agency



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Addendum to

APPENDIX 2.5-E

**Statistical Methodology for Assessing
Representativeness of Wind Data**

Addendum to TR RAI Appendix 2.5-E Statistical Methodology for Assessing Representativeness of Wind Data

The purpose of Appendix 2.5-E was to illustrate minimal temporal variation in wind direction distributions in the Powder River Basin (PRB) of northeastern Wyoming, an area similar in topography and climate to the Dewey-Burdock Project site. At the same time Appendix 2.5-E showed the spatial variation in PRB wind direction distributions to be substantial, even for relatively small geographic displacements. Four sites were chosen to demonstrate these trends:

1. Antelope Coal Mine – 20 years of hourly average wind direction analyzed
2. Buckskin Coal Mine – 20 years of hourly wind direction analyzed
3. Dry Fork Coal Mine – 15 years of hourly wind direction analyzed
4. Gillette Airport – 13 years of hourly wind direction analyzed

The Air Science Division of Inter-Mountain Laboratories operates meteorological monitoring stations at the three mines, according to EPA-approved monitoring protocol. The Gillette Airport meteorological station is operated by the National Weather Service. The most recent full year of monitoring (2010) at these sites was originally chosen to represent short-term wind data in Appendix 2.5-E. In order to more closely tie the analysis in Appendix 2.5-E to the TR RAI 2.5-1(c) response, the following revised analysis replaces year 2010 with the Dewey-Burdock baseline monitoring year of July 18, 2007 through July 17, 2008. Long-term data for the mine sites remain the same as in the original Appendix 2.5-E; eight more years of data were obtained for the Gillette Airport. For each linear regression analysis using the baseline monitoring year for the short-term wind data source, p-values were documented to provide a degree of confidence in the regression results.

The following figures have been revised to reflect the Dewey-Burdock baseline monitoring year as the source of short-term wind direction data. In addition, the linear regression analyses are graphed with basic statistical parameters (including ANOVA and p-value) listed below each graph. As noted in Appendix 2.5-E, poor data resolution offered by the NWS may weaken the Gillette wind direction frequency correlation. Also, the Buckskin correlation is compromised by the meteorological station move in spring 2008 (near, but not at the end of the Dewey-Burdock baseline monitoring year). In both cases, however, unique site signatures and strong correlations between long-term and baseline-year direction frequencies are still apparent.

Results of linear regression analysis are summarized in Table 1.

Table 1 – Long-Term vs. Baseline Year Wind Direction Frequency Regression Analysis

Site	Long-Term Data	Short-Term Data	R² Coefficient	p-value
Antelope Mine	1990-2009	Jul 2007 - Jul 2008	95.3%	0.000
Dry Fork Mine	1995-2009	Jul 2007 - Jul 2008	95.7%	0.000
Buckskin Mine	1986-2005	Jul 2007 - Jul 2008	87.0%	0.000
Gillette Airport	1999-2011	Jul 2007 - Jul 2008	93.6%	0.000



Table 1 demonstrates strong correlation between the 2007-2008 baseline-year wind direction frequencies and the longer term at each of these four monitoring sites. All four correlations produced a p-value of 0.000 indicating extremely high confidence in the correlations.

Appendix 2.5-E showed that for the Buckskin site, moving the meteorological monitoring tower a few miles to the north-northeast resulted in a different wind direction signature. The correlation between one year (2010) at the new site and 20 years (1990-2009) at primarily the old site was very weak, with an R^2 value of 50%. To further illustrate the spatial sensitivity of wind direction frequency distributions this addendum compares data from the baseline monitoring year at Buckskin and Gillette. The two sites are approximately eight miles apart. Figure 16 shows a faint linear relationship. The p-value of 0.015 indicates a fairly low probability that the two distributions are completely unrelated; however, the R^2 value of 17.6% does not justify the conclusion that a linear correlation exists. Thus, wind directions for the same time period are distributed differently between these two sites despite their close proximity.

Figure 3 Revised – Dry Fork 1995-2009 95% Confidence Interval

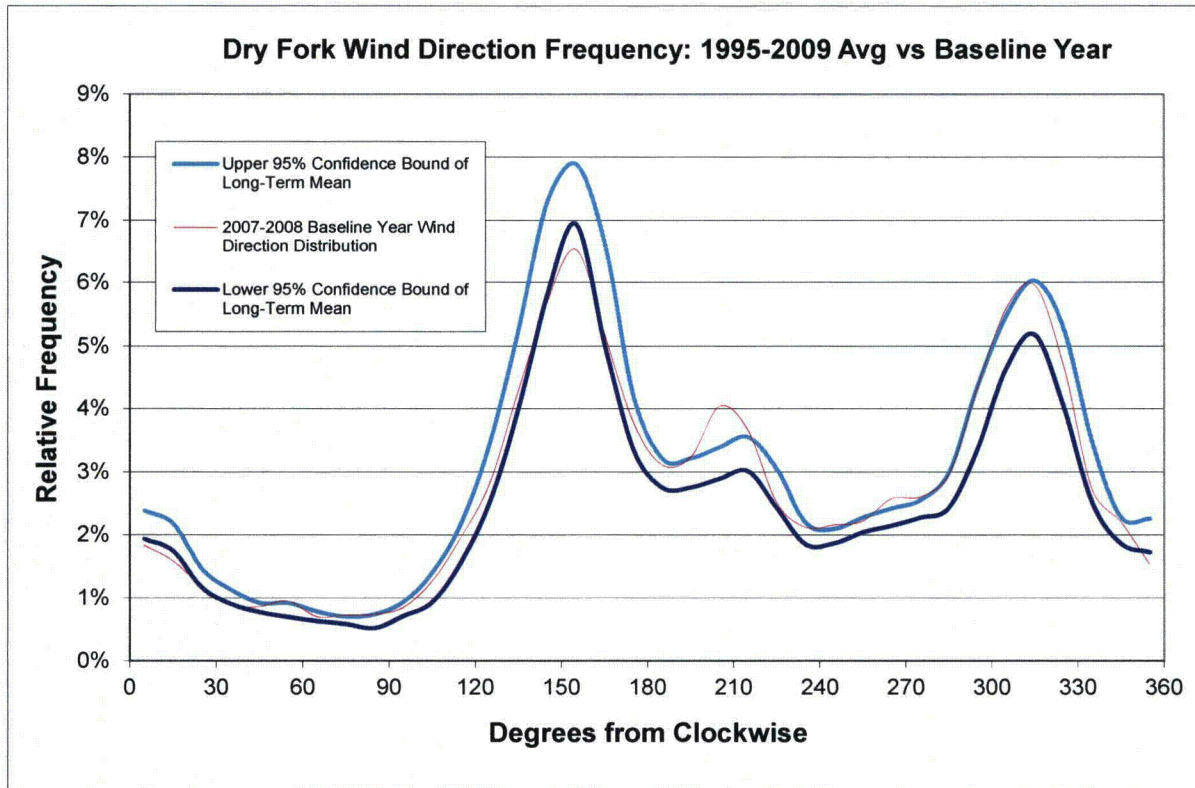


Figure 4 Revised – Dry Fork 1995-2009 One Standard Deviation Band

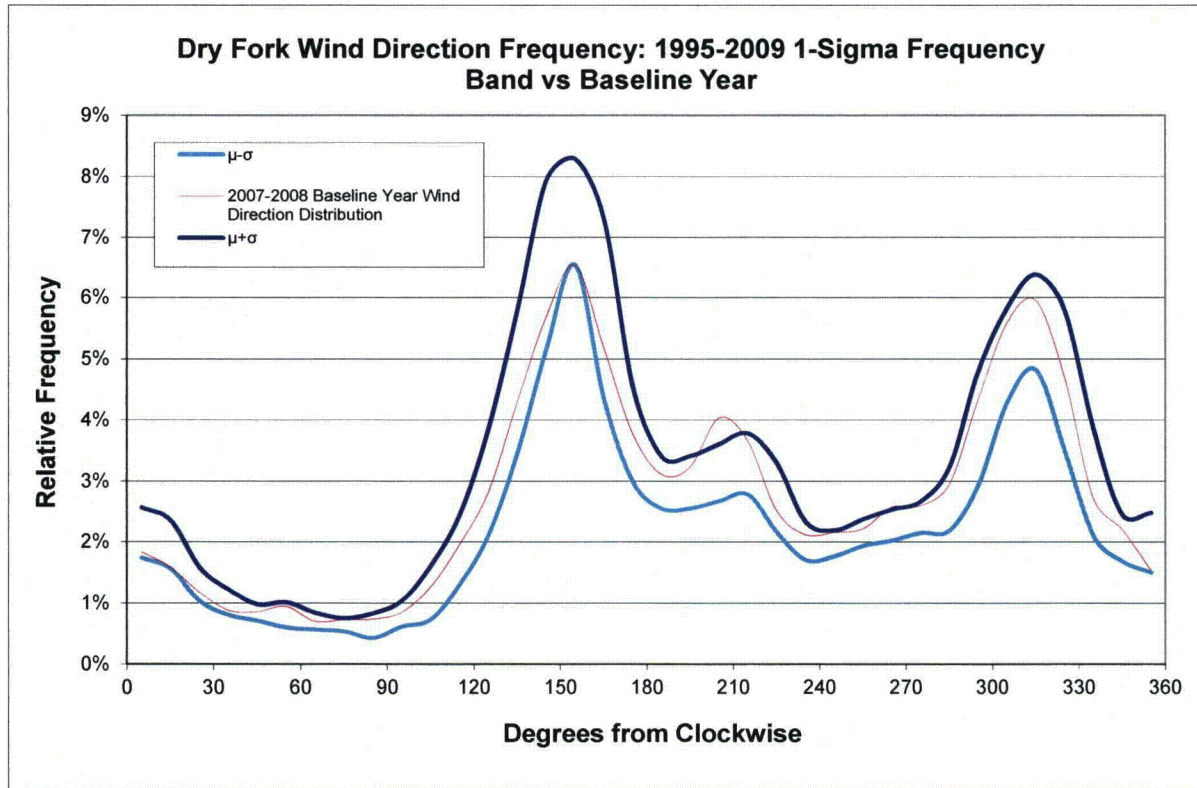


Figure 6 Revised – Buckskin 1986-2005 95% Confidence Interval

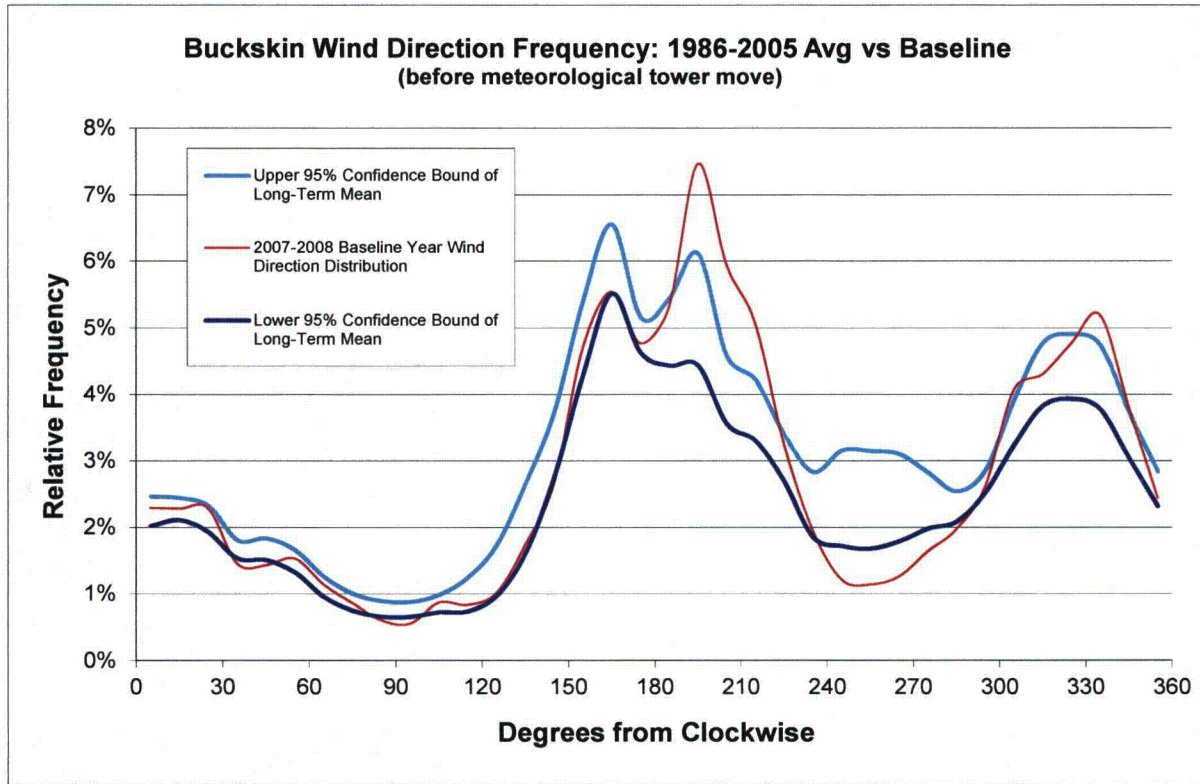
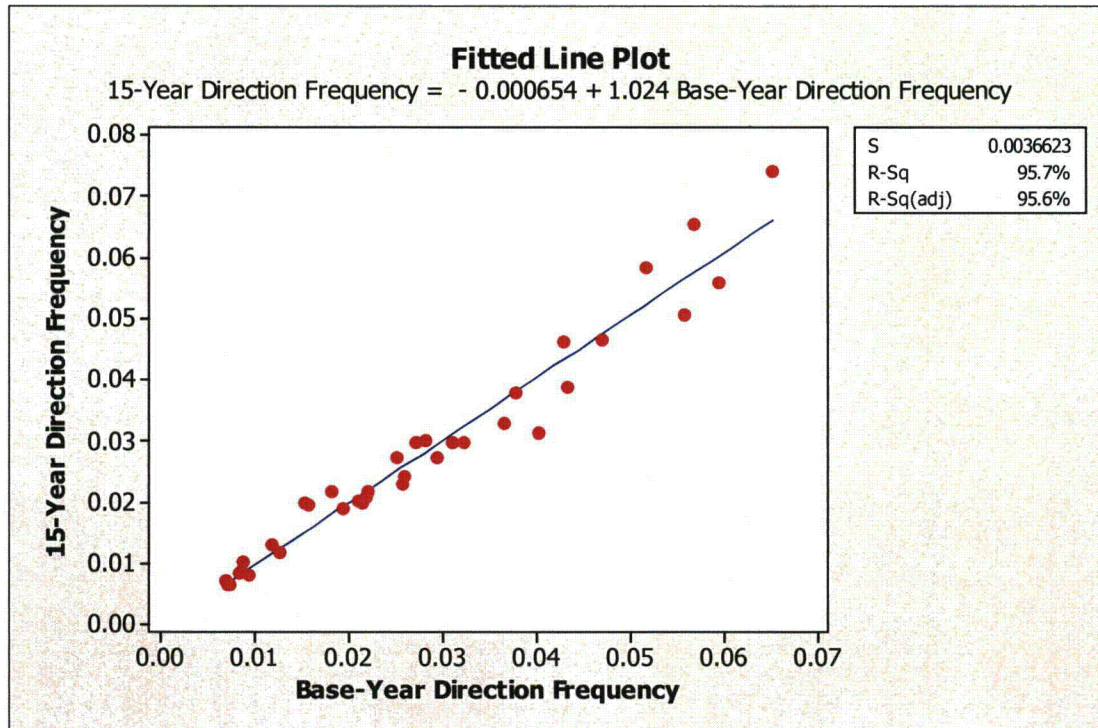


Figure 7 Revised – Dry Fork Regression Analysis



From MINITAB: The regression equation is:

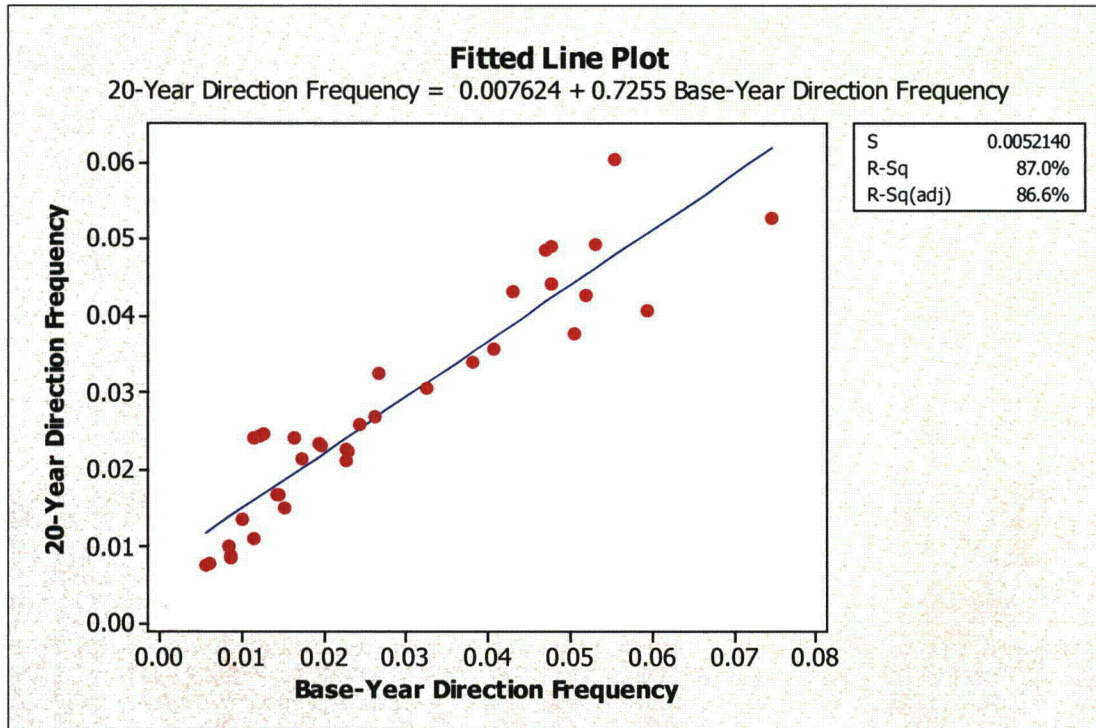
15-Year Direction Frequency = - 0.00065 + 1.02 Base-Year Direction Frequency

S = 0.00366230 $R^2 = 95.7\%$ R^2 (adj.) = 95.6%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.010098	0.010098	752.87	0.000
Residual Error	34	0.000456	0.000013		
Total	35	0.010554			

Figure 8 Revised – Buckskin Regression Analysis



From MINITAB: The regression equation is:

$$\text{20-Year Direction Frequency} = 0.00762 + 0.726 \text{ Base-Year Direction Frequency}$$

$$S = 0.00521403 \quad R^2 = 87.0\% \quad R^2 (\text{adj.}) = 86.6\%$$

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.0062003	0.0062003	228.07	0.000
Residual Error	34	0.0009243	0.0000272		
Total	35	0.0071247			

Figure 11 Revised – Antelope 1990-2009 95% Confidence Interval

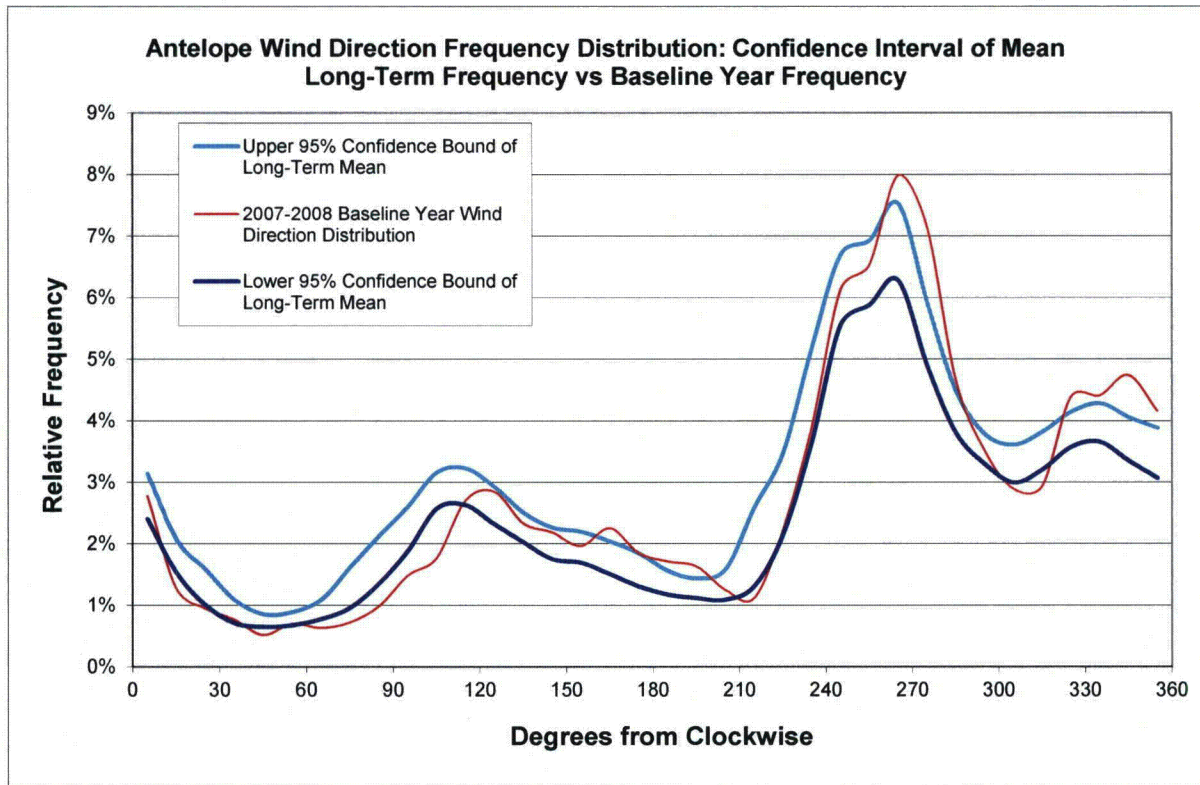
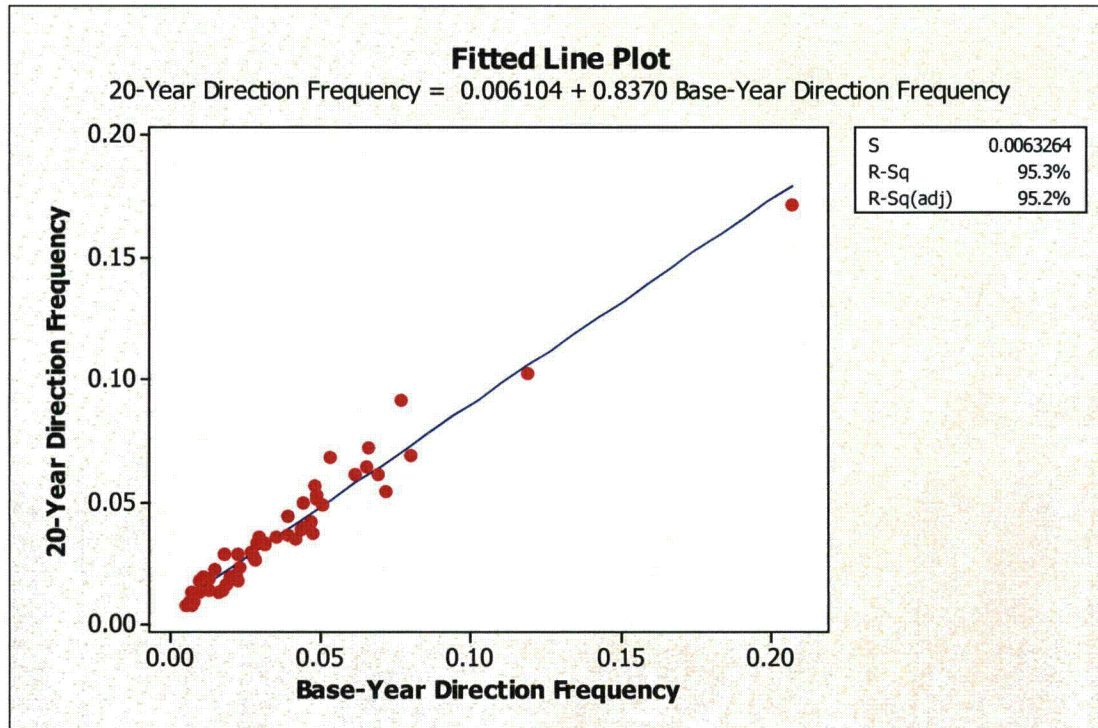


Figure 12 Revised – Antelope Regression Analysis



From MINITAB: The regression equation is:

20-Year Direction Frequency = 0.00610 + 0.837 Base-Year Direction Frequency

S = 0.00632643 $R^2 = 95.3\%$ R^2 (adj.) = 95.2%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.039455	0.039455	985.80	0.000
Residual Error	49	0.001961	0.000040		
Total	50	0.041417			

Figure 13 Revised – Gillette 1999-2011 95% Confidence Interval

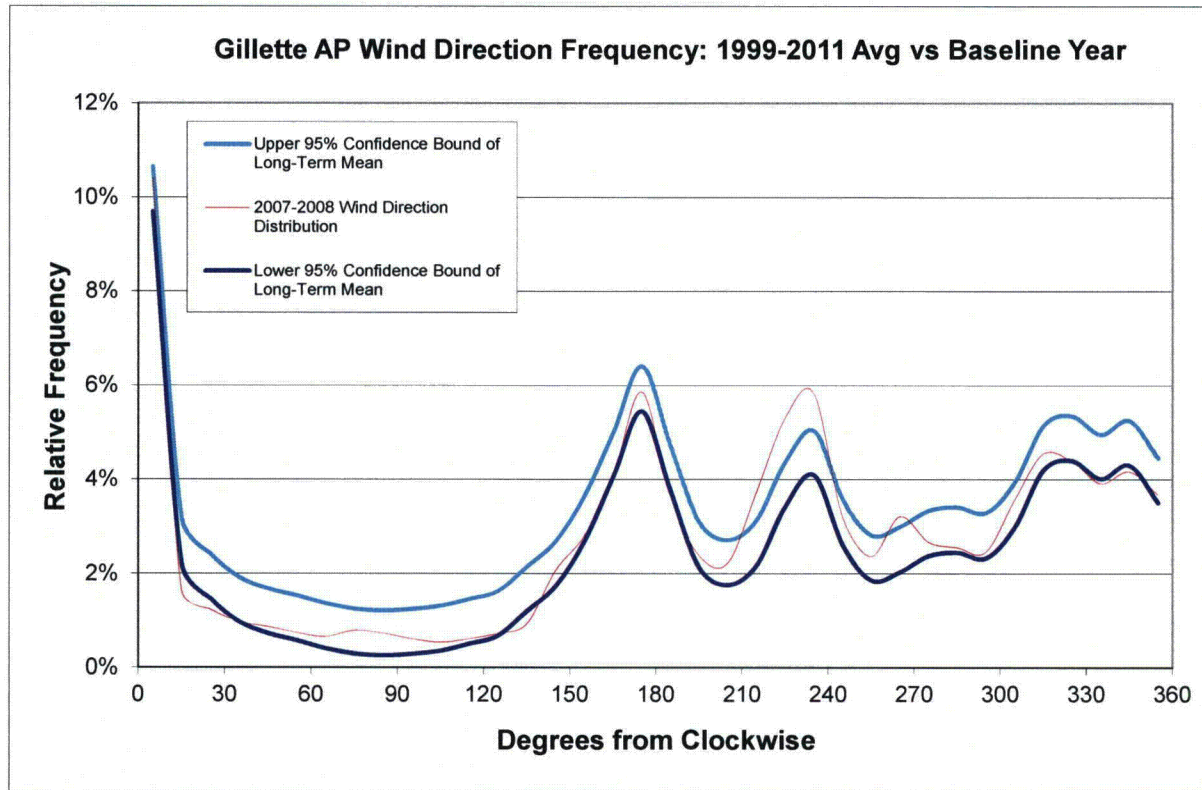
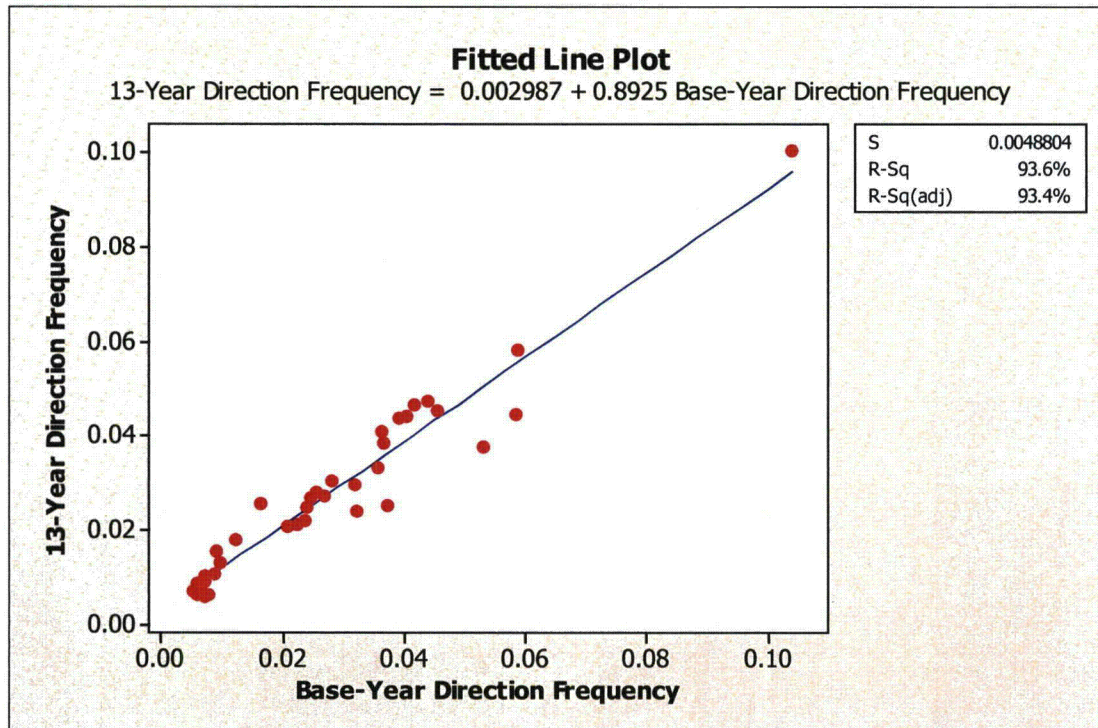


Figure 14 Revised – Gillette Regression Analysis



From MINITAB: The regression equation is:

13-Year Direction Frequency = 0.00299 + 0.892 Base-Year Direction Frequency

S = 0.00488041 $R^2 = 93.6\%$ R^2 (adj.) = 93.4%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.011813	0.011813	495.94	0.000
Residual Error	34	0.000810	0.000024		
Total	35	0.012622			

Figure 15 Revised – Comparative Site Signatures

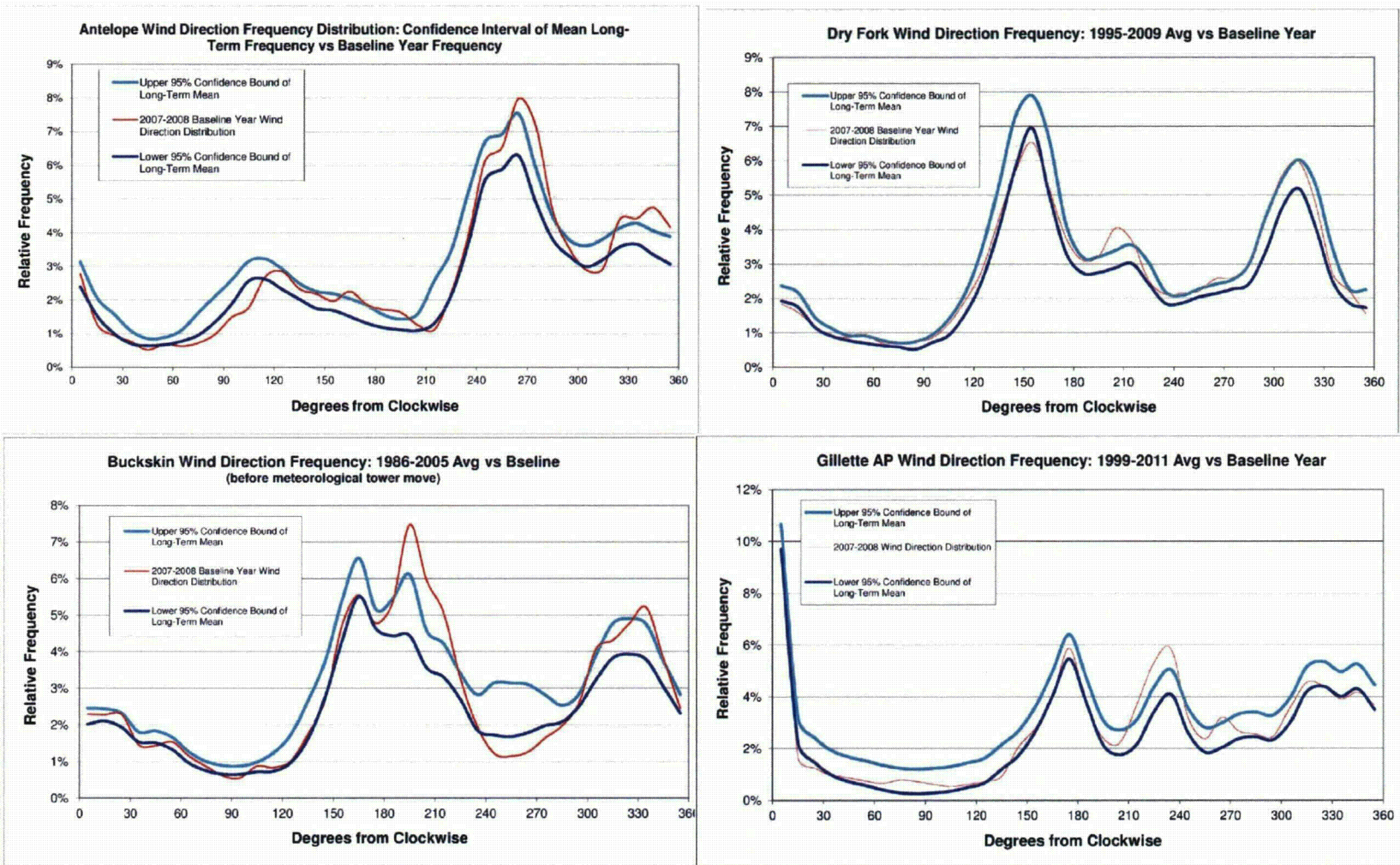
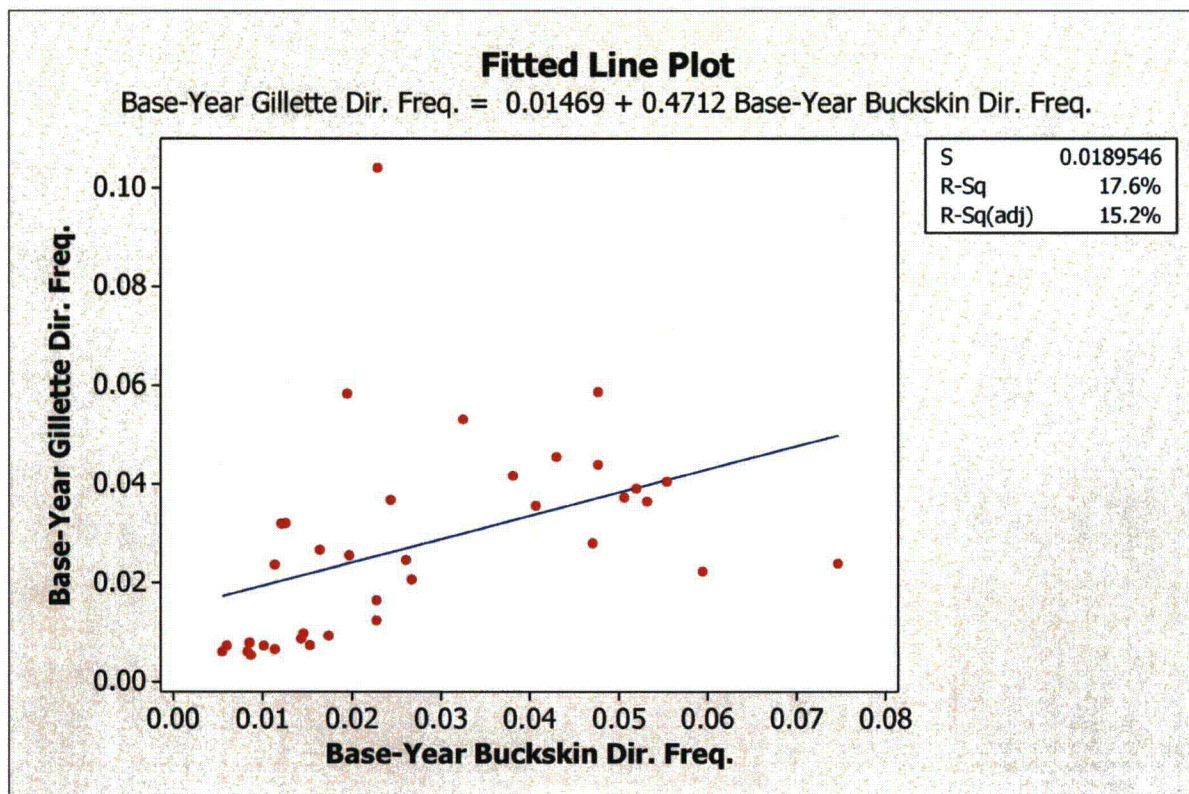


Figure 16 – Baseline-Year Wind Direction Frequency Correlation: Gillette vs. Buckskin



From MINITAB: The regression equation is:

Base-Year Gillette Dir. Freq. = 0.01469 + 0.4712 Base-Year Buckskin Dir. Freq.

S = 0.0189546 $R^2 = 17.6\%$ R^2 (adj.) = 15.2%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.0026156	0.0026156	7.28	0.011
Error	34	0.0122154	0.0003593		
Total	35	0.0148310			

ORIGIN ID: APAA (303) 790-7528
POWERTECH USA INC

5575 DTC PKWY

GREENWOOD VILLAGE, CO 801113008
UNITED STATES US

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CAD: /OFFFC1302
DIMS: 0x0x0 IN

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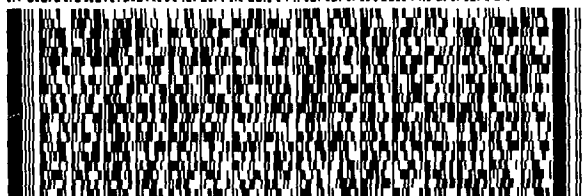
TO **RONALD BURROWS**
TWO WHITE FLINT NORTH
11545 ROCKVILLE PIKE
FSME/DWMEP/DURLD MAIL STOP 8F5
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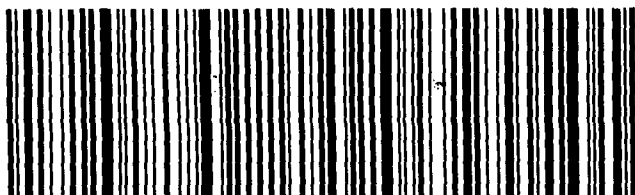
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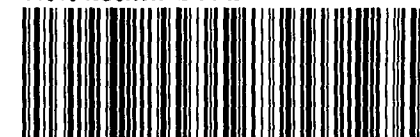
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