From: Jon Winter (USA - Casper) [Jon.Winter@uranium1.com]
Sent: Tuesday, November 24, 2009 2:44 PM
To: Mandeville, Douglas
Subject: RE: Conference call
Attachments: Met RAI responses to NRC July 2008.pdf; Antelope 24-Yr Wind Rose.pdf; Antelope 1986-2009 MetSum.pdf; Meteorological Data Standards.PDF; Upper Air Data Source.pdf; Antelope 97-06 MetSum Rev1.pdf; NRC Approval Offsite Met Monitoring.pdf; Antelope 10-Yr Wind Rose.pdf

Ok, I have attached some information we can look over in our discussion.

Jon F. Winter
Manager Environmental & Regulatory Affairs, Wyoming

907 North Poplar
Suite 260
Casper, WY 82601
Phone: 307-234-8235 ext. 331

uraniumone™
investing in our energy

This email, including any attachments, is confidential and may be privileged. Please check any attachments for viruses before opening them. If you are not the intended recipient, then any disclosure, copying, distribution or use of this email or any attachment, other than to or by the sender, is prohibited. If you received this email in error, please notify us immediately by returning it to the sender and delete this copy from your system.

From: Mandeville, Douglas [mailto:Douglas.Mandeville@nrc.gov]
Sent: Tuesday, November 24, 2009 11:29 AM
To: Jon Winter (USA - Casper)
Subject: Conference call

Jon -

I didn't set up a call in number and was hoping that we could just conference people in.

Doug

Received: from mail1.nrc.gov (148.184.176.41) by OWMS01.nrc.gov
(148.184.100.43) with Microsoft SMTP Server id 8.1.393.1; Tue, 24 Nov 2009
14:45:06 -0500
X-Ironport-ID: mail1
X-SBRS: None
X-MID: 8668994
X-fn: Met RAI responses to NRC July 2008.pdf, Antelope 24-Yr Wind Rose.pdf,
Antelope 1986-2009 MetSum.pdf, Meteorological Data Standards.PDF,
Upper Air Data Source.pdf, Antelope 97-06 MetSum Rev1.pdf,
NRC Approval Offsite Met Monitoring.pdf, Antelope 10-Yr Wind Rose.pdf
X-IronPort-AV: E=Sophos;i="4.47,280,1257138000";
d="pdf?jpg'145?scan'145,208,217,145";a="8668994"
Received: from pe1-2.uranium1.com ([69.90.31.228]) by mail1.nrc.gov with
ESMTP; 24 Nov 2009 14:44:42 -0500
Received: from srv-cas-mx-01.cas.u1.internal (10.10.150.10) by
srv-pe1-mx-01.u1.internal (10.10.10.10) with Microsoft SMTP Server (TLS) id
8.1.393.1; Tue, 24 Nov 2009 11:44:19 -0800
Received: from srv-cas-mx-01.cas.u1.internal ([10.10.150.10]) by
srv-cas-mx-01.cas.u1.internal ([10.10.150.10]) with mapi; Tue, 24 Nov 2009
12:44:18 -0700
From: "Jon Winter (USA - Casper)" <Jon.Winter@uranium1.com>
To: "Mandeville, Douglas" <Douglas.Mandeville@nrc.gov>
Date: Tue, 24 Nov 2009 12:44:15 -0700
Subject: RE: Conference call
Thread-Topic: Conference call
Thread-Index: AcptM/f26z8mFjhGTg+dcMM0AmdafQACfisg
Message-ID: <EF2FF00E3AB2A947B8EE03551C596EF07DFAA03E@srv-cas-mx-
01.cas.u1.internal>
References: <A41C2340DAB39B44AD0B9623285CB33304A78BD238@HQCLSTR02.nrc.gov>
In-Reply-To:
<A41C2340DAB39B44AD0B9623285CB33304A78BD238@HQCLSTR02.nrc.gov>
Accept-Language: en-US
Content-Language: en-US
X-MS-Has-Attach: yes
X-MS-TNEF-Correlator:
acceptlanguage: en-US
Content-Type: multipart/mixed;
boundary="_013_EF2FF00E3AB2A947B8EE03551C596EF07DFAA03Esrvcasmx01cas
u1_"
MIME-Version: 1.0
Return-Path: Jon.Winter@uranium1.com

2-2. Meteorology (Section 2.5)

The applicant has not provided sufficient information regarding the meteorological and atmospheric diffusion characteristics of the site in section 2.5. Specifically, the following information should be provided:

a. The applicant indicated that no onsite meteorological data was collected at the Moore Ranch site but instead, used meteorological data collected from Antelope Coal (ACC) and Glenrock Coal (GCC) to represent the Moore Ranch site. However, the applicant has not discussed its basis to assume that the data can be used to represent the Moore Ranch site without any data from the Moore Ranch site. Therefore, provide the justification to use the data from these two sites (ACC and GCC), without onsite meteorological data, to represent the Moore Ranch site.

Response:

The proposed project is situated in east-central Wyoming. It is encompassed by the area between the North Platte valley and the Montana border, generally referred to as the Powder River Basin (PRB). Due to uniformities in geography and climate, the PRB is treated by state and federal regulators as a single air quality control area.

As stated in the conclusion of the Climatology Report, the Antelope Mine (ACC) meteorology most nearly represents that of the Moore Ranch project site, and is therefore proposed as the source of meteorological data to be substituted for on-site monitoring. Data from the Glenrock Mine (GCC) was intended only to supplement ACC and to support the general conclusions made regarding local meteorology. To illustrate the similarities between Moore Ranch and ACC, several images from Google Earth are presented below. Figure 2.2a-1 shows an aerial view of the Moore Ranch area, and Figure 2.2a-2 shows a similar view of the ACC site (with meteorological station pinpointed). The ACC site has similar topographic features (Figure 2.2a-3) and is about 25 miles from the project site (Figure 2.2a-4). Both sites are characterized by mildly rolling hills covered with grass and sparse shrubs. The nearest mountain ranges are:

- the Bighorn Mountains, approximately 50 miles from the Moore Ranch project site and 75 miles from ACC
- the Black Hills, approximately 60 miles from ACC and 85 miles from the Moore Ranch
- the northern Laramie Range, approximately 50 miles south of Moore Ranch and 65 miles southwest of ACC

Due to these large distances, neither the ACC site nor the Moore Ranch site experiences significant wind channeling or shielding from any of the three mountain ranges. Also, there are no major bodies of water affecting the meteorology of these two sites. The ACC site is several hundred feet lower in elevation than Moore Ranch. Both, however, are situated on the southeasterly side of the hydrologic divide with a similar vertical relationship to the divide.

FIGURE 2.2a-1

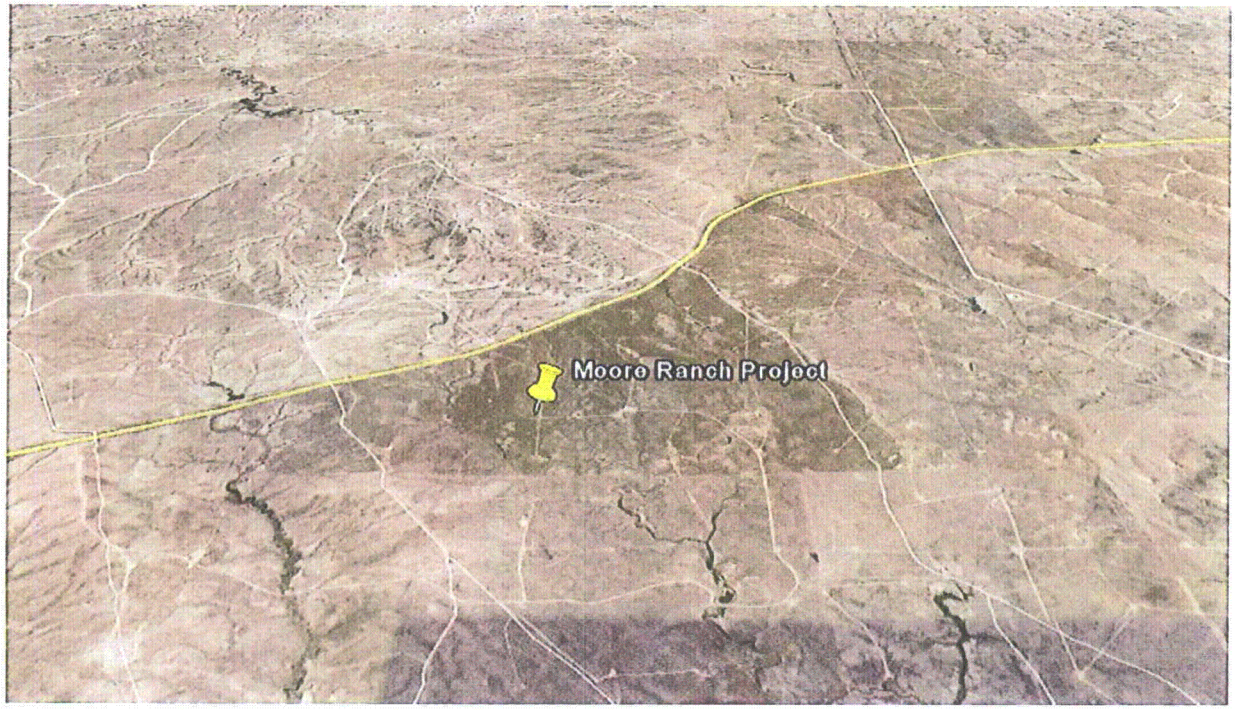


FIGURE 2.2a-2

FIGURE 2.2a-3

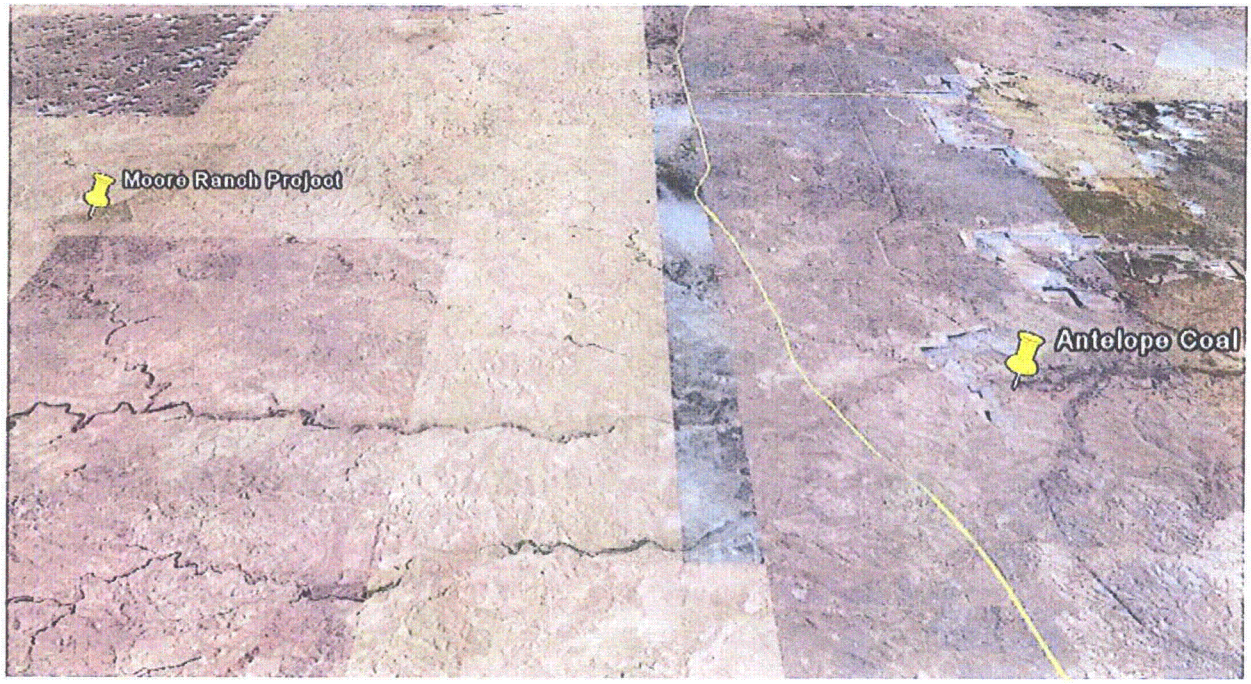
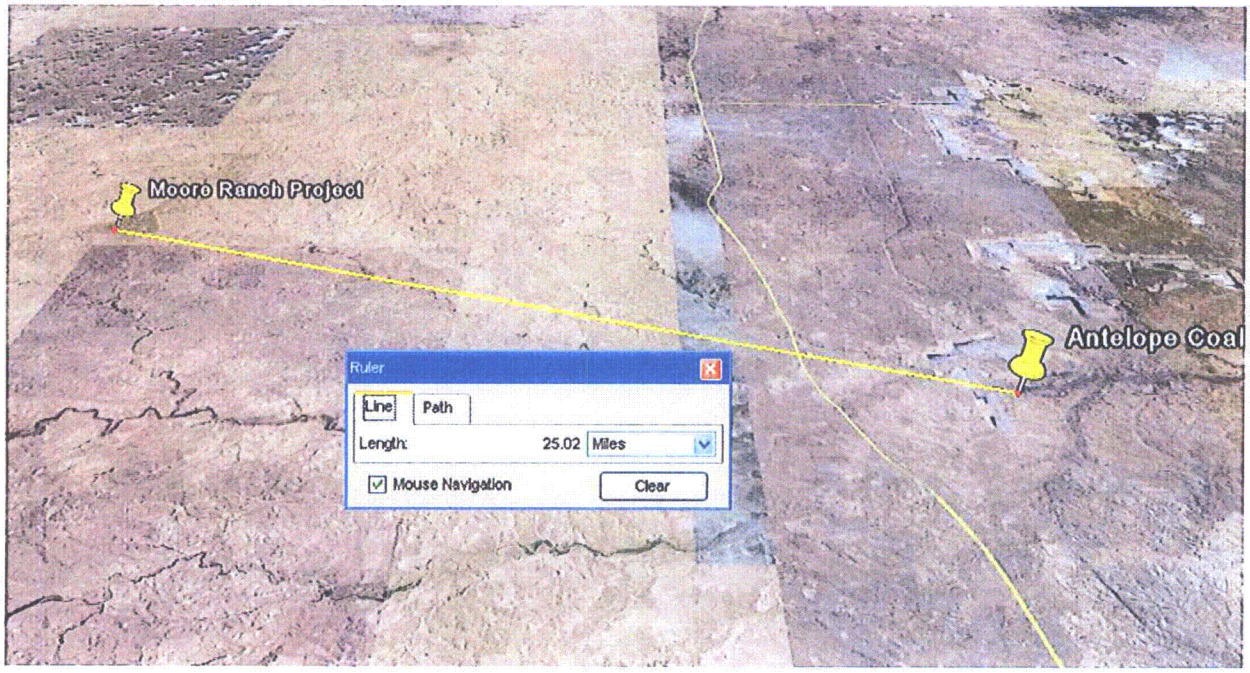


FIGURE 2.2a-4



Section 2.5 of the application was revised to include the above information.

2-2. Meteorology (Section 2.5) Cont.

b. The joint frequency data for each site (ACC and GCC) are shown in Table 2.5-9 and Table 2.5-10 of the Technical Report, respectively. However, the joint frequency data in Appendix E appears to be different from the data shown in Tables 2.5-9 and 2.5-10. Please explain the relationship between the joint frequency data from these tables (Table 2.5-9 and Table 2.5-10) and the joint frequency data in Appendix E of the Technical Report. Specifically, how was the joint frequency data generated in Appendix E and what time period does it represent? Also describe the instruments, locations and heights of the instruments, average inversion height, and annual average mixing layer heights.

Response:

The joint frequency distributions (JFD's) provided in Table 2.5-9 and Table 2.5-10 were taken from 10 years of meteorological data (1997-2006) at the ACC and GCC sites. The star distribution provided in Appendix E is from 5 years (2001-2006) of data at ACC. For all the JFD's, Pasquill stability classes were determined from the standard deviation of horizontal wind direction (sigma theta method).

Inversion and mixing heights were not presented in the original Climatology Report. The nearest upper-air data available from the National Weather Service are from Riverton, Wyoming or Rapid City, South Dakota. In both cases, the large distance from the southern PRB and the proximity to prominent mountain ranges make them ill suited to represent the Moore Ranch project site.

The Air Quality Division of the Wyoming Department of Environmental Quality (WDEQ-AQD) has provided statewide mixing heights to be used in dispersion modeling with the Industrial Source Complex (ISC3) model. These are based on the methods of Holsworth (1972) as applied to Lander, located in central Wyoming. For modeling purposes, the annual average mixing heights are assigned according to stability class as follows:

Class A	3,450 meters
Class B	2,300 meters
Class C	2,300 meters
Class D	2,300 meters
Class E	10,000 meters
Class F	10,000 meters

Stability classes E and F are given an arbitrarily high number to indicate the absence of a distinct boundary in the upper atmosphere.

In August of 2000, IML Air Science conducted Sound Detection and Ranging (SODAR) monitoring at the Black Thunder Mine, located approximately 20 miles north of the ACC site. The purpose of this monitoring was to support a comprehensive study of NO_x dispersion characteristics following overburden and coal blasting events. The SODAR instrument provided 3D wind speeds, wind directions, temperatures, temperature gradients, and other atmospheric parameters as a function of height above the ground.

The vertical range of the SODAR was 1,500 meters, with a sounding performed every 15 minutes. Each sounding resulted in a calculated "inversion height / mixing height" (the two terms are used interchangeably by the SODAR system supplier). For purposes of this response to NRC, these mixing heights were downloaded into a database and queried, with results shown in Table 2.2b-1. Morning and afternoon time intervals were taken from EPA modeling guidance.

TABLE 2.2b-1

Time Period (Filtered)	Number of Data Points	Average Mixing / Inversion Height
Morning (2 am – 6 am)	193	641 meters
Afternoon (12 pm – 4 pm)	152	1,052 meters

Since the SODAR definition of mixing height appears somewhat ambiguous, and these measurements were all from August, it is not known whether they would qualify as meteorological inputs to the MILDOS model.

Because of the extensive surface coal mining that has developed over the last 30 years, the PRB airshed is one of the most heavily monitored in the country. Coal production in the PRB grew from a few million tons in 1973 to over 400 million tons in 2006. The Clean Air Act and the Surface Mining Control and Reclamation Act of the 1970's prompted a parallel growth in ambient air quality monitoring throughout the PRB. This has led to over 100 particulate monitoring samplers and more than 20 meteorological monitoring towers, all configured to support air quality permitting, compliance and research objectives.

The monitoring programs at these sites meet the Wyoming Department of Environmental Quality requirements for land and air quality permit compliance. Methods used in collecting and validating these data adhere to EPA's "On-Site Meteorological Program Guidance For Regulatory Modeling Applications." Hourly average values for various parameters are generated by field instruments and recorded by continuous data loggers, all operated and maintained by IML Air Science. Data recovery has typically exceeded 95%. Depending on the mine, meteorological parameters logged include wind speed, wind direction, sigma theta, ambient temperature, barometric pressure, solar radiation and precipitation. All hourly data are downloaded to IML Air Science's relational database. The database software provides for quality assurance, invalidation of suspect or erroneous data, and various forms of data presentation.

Table 2.2b-1 lists the meteorological instruments employed at the Antelope (ACC) and Glenrock (GCC) mines. The coordinates and elevations of both sites are presented, along with instrument models, accuracy specifications, and instrument heights above the ground.

Section 2.5 of the application was revised to include the above information.

TABLE 2.2b-1

Antelope	10m tower	CR10X Data Logger		Lat: 43° 28' 08.92" Elev. 4,680 ft Long: -105° 20' 57.56"	
Parameter	**Instrument**	**Range**	**Accuracy**	**Threshold**	**Instrument Height**
Wind Speed	RM Young Wind Monitor AQ	0-112 mph	±0.4 mph or 1% of reading	0.9 mph	10 meters
Wind Dir	RM Young Wind Monitor AQ	0-360°	±3°	1.0 mph	10 meters
Temp	Fenwall Electronics Model 107	-35°- 50° C	±0.5° C @ given Range	--	2 meters
Precip	Met One 12" tip	Temp: -20° - 50° C	±0.5% @ 0.5 in/hr rate	--	1 meter
Bar Press	Vaisala PTB 101B	600 -1060 mb	±0.5 mb @ 20°C	--	2 meters
Glenrock	10m tower	CR10 Data Logger		Lat: 43° 03' 36" Elev. 4,910 ft Long: -105° 50' 24"	
Parameter	**Instrument**	**Range**	**Accuracy**	**Threshold**	**Instrument Height**
Wind Speed	RM Young Wind Monitor AQ	0-112 mph	±0.4 mph or 1% of reading	0.9 mph	10 meters
Wind Dir	RM Young Wind Monitor AQ	0-360°	±3°	1.0 mph	10 meters
Temp	Fenwall Electronics Model 107	-35°- 50° C	±0.5° C @ given Range	--	2 meters
Precip	Met One 8" tip	Temp: -20° - 50° C	±0.5% @ 0.5 in/hr rate	--	1 meter

2-2. Meteorology (Section 2.5) Cont.

c. Please discuss any bodies of water or special terrain features that may affect the meteorological conditions at the Moore Ranch Uranium Project site.

Response:

As mentioned above, there are no bodies of water or special terrain features that would alter the general meteorological conditions at either the Moore Ranch site or the ACC site. Nearby drainages support small, ephemeral streams. The maximum relief throughout this gently rolling terrain is a few hundred feet.

Antelope Mine

Meteorological Data Summary

1/1/1986 - 10/14/2009

Hourly Data

	Average/Total	Max	Min
Wind Speed (mph)	11.0	51.7	0.0
Sigma-Theta (°)	14.8	99.0	0.0
Temperature (F)	46.1	102.1	-39.9
Precipitation (in)	238.73	1.48	
Bar. Pressure (in Hg)	25.3	25.9	20.0

Predominant wind direction was from the W sector,
accounting for 13.7% of the possible winds

Data Recovery

Parameter	Possible (hours)	Reported (hours)	Recovery
Wind Speed	208512	183979	88.23%
Wind Direction	208512	184327	88.40%
Sigma-Theta	208512	182745	87.64%
Temperature	208512	195587	93.80%
Precipitation	208512	195093	93.56%
Bar. Pressure	208512	67550	32.40%

The Air Quality Division of the Wyoming Department of Environmental Quality (WDEQ-AQD) has provided statewide mixing heights to be used in dispersion modeling with the Industrial Source Complex (ISC3) model. These are based on the methods of Holsworth (1972) as applied to Lander, located in central Wyoming. For modeling purposes, the annual average mixing heights are assigned according to stability class as follows:

Class A	3,450 meters
Class B	2,300 meters
Class C	2,300 meters
Class D	2,300 meters
Class E	10,000 meters
Class F	10,000 meters

Stability classes E and F are given an arbitrarily high number to indicate the absence of a distinct boundary in the upper atmosphere.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 14, 2006

Leland Huffman
ISL General Manager
High Plains Uranium, Inc.
1718 Capitol Avenue
Cheyenne Wyoming, 82001

SEP 18 2006

SUBJECT: ACTION ITEMS 3, 4, AND 6 FROM AUGUST 22, 2006, MEETING WITH HIGH PLAINS URANIUM, INC.

Dear Mr. Huffman:

On August 22, 2006, U. S. Nuclear Regulatory Commission (NRC) staff and representatives of High Plains Uranium, Inc. (HPU) met to discuss issues related to HPU's planned In Situ Leach (ISL) uranium recovery license application for its Allemand-Ross Project, located in the south-central portion of the Powder River Basin of Wyoming (Meeting Summary - Agencywide Documents Access and Management System (ADAMS) Accession No. ML062420070). This correspondence covers two NRC Action Items from the August 22, 2006 meeting:

Action Item 3 - Determine whether the applicant can use non-site-specific meteorological data from weather stations located within the Powder River Basin.

Action Item 4 - Determine whether the applicant can submit partial baseline data prior to its official license application and whether such a submittal would accelerate the National Environmental Policy Act (NEPA) review process.

In addition, the HPU response to its Action Item 6 (Determine whether meteorological stations referenced in its meteorological work plan meet the definition of "recognized standard installations"), is also addressed.

Action Items 3 and 6

For Action Item 3, HPU requested that NRC staff consider whether HPU could use non-site-specific meteorological data from weather stations located within the Powder River Basin. At the NRC's request (Action Item 6), HPU submitted correspondence from IML Air Science (ADAMS Accession No. ML062540037) detailing site information, instrument data, quality assurance procedures, and regulatory references to support the validity of data collected from its meteorological stations at the Antelope and Glenrock Mines, both of which are located within the Power River Basin and are within 80-kilometers (50-miles) of the Allemand-Ross Project site. A review of meteorological station details provided by HPU indicates that the range, accuracy, and threshold values for station equipment meet or exceed system accuracy, and instrumentation specifications listed in NRC Regulatory Guide 3.63, Onsite Meteorological Measurement Program for Uranium Recovery Programs - Data Acquisition and Reporting. In addition, the Standard Operating Procedures for Meteorological Station Audit and regulatory references provided by HPU are consistent with system maintenance, servicing, and data recovery standards contained in Regulatory Guide 3.63. Based on the information provided by

HPU, the Antelope and Glenrock Mines meteorological stations meet the standards identified in Regulatory Guide 3.63 and can be recognized as "standard installations" per NUREG-1569, Standard Review Plan for In Situ Leach Uranium Extraction License Applications, Section 2.5.3, Acceptance Criteria No. 1. As such, data from the Antelope and Glenrock Mines meteorological stations may be used in place of National Weather Service Station data. However, it should be noted that it is the applicant's responsibility to substantiate that the meteorological data used for assessing impacts is "representative of expected long-term conditions at and near the site" (NUREG-1569, Section 2.5.3, Acceptance Criteria No. 3).

Action Item 4

HPU requested that NRC staff consider whether it could submit partial baseline data prior to its official license application and whether such a submittal would accelerate the NEPA review process. Because review of partial or incomplete environmental data prior to review of a complete data set would ultimately result in more staff review effort, we discourage such submittals. In terms of promoting an efficient review of technical material and timely development of a NEPA-related environmental report, submittal of a complete, cohesively-constructed license application, using NUREG-1569 as the primary guidance, would be the most productive and effective course of action.

If you have any questions concerning these matters, please contact the NRC Project Manager for the HPU site, Paul Michalak, at (301) 415-7612, or by email, to pxm2@nrc.gov.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

Sincerely,

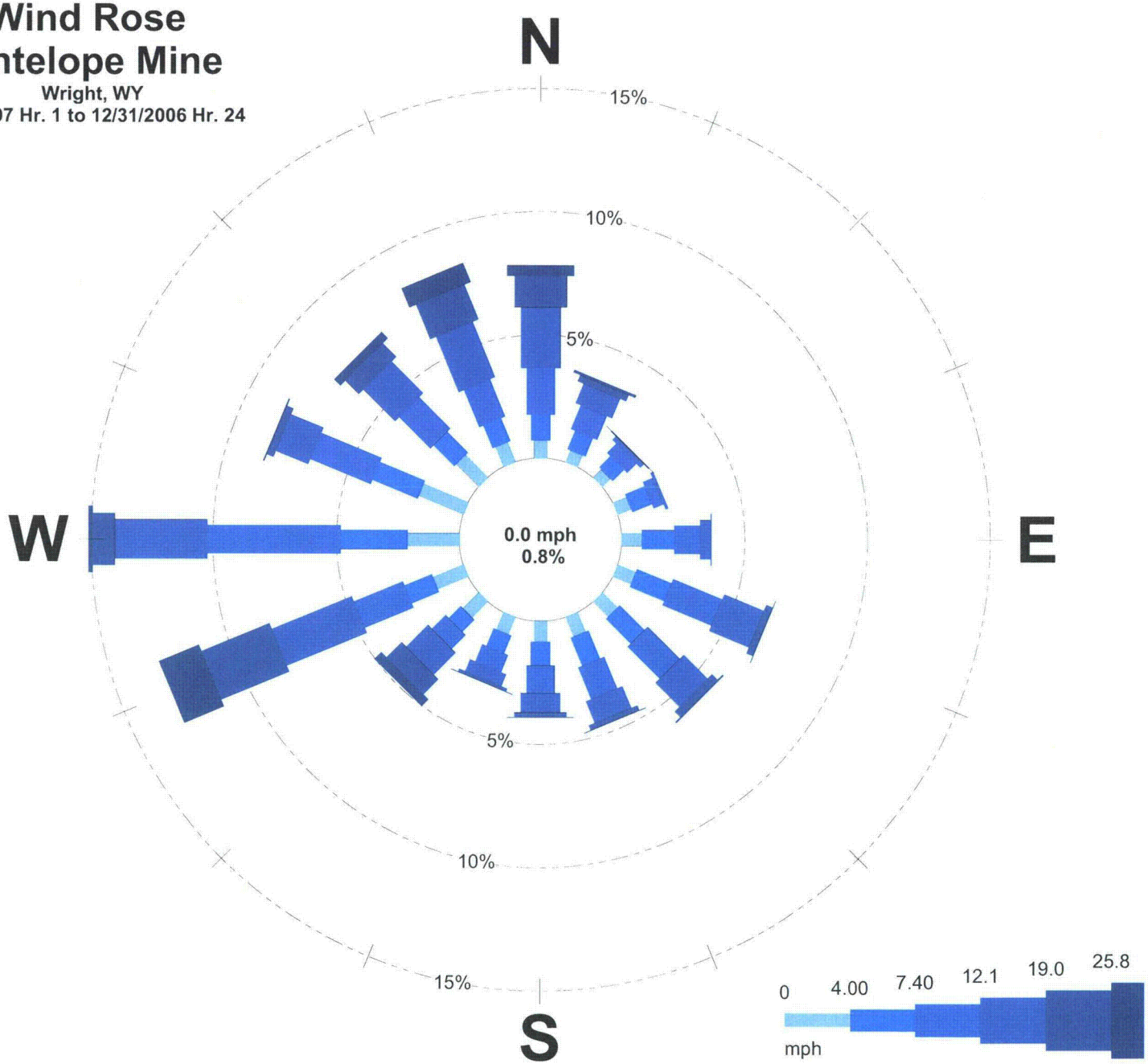
Paul Michalak

Paul Michalak
Hydrogeologist
Uranium Processing Section
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Wind Rose
Antelope Mine

Wright, WY

1/1/1997 Hr. 1 to 12/31/2006 Hr. 24



IML Air Science
a division of Inter-Mountain Laboratories, Inc.
555 Absaraka, Sheridan, WY 82801

August 25, 2006

Leland Huffman
General Manager
High Plains Uranium
1718 Capitol Ave.
Cheyenne, WY 82001

Re: Meteorological Data Plan

Dear Leland:

In response to your request, we have assembled site information, instrument data, quality assurance procedures and regulatory references to support the validity of meteorological data collected and reported by IML Air Science. As I mentioned on the phone, the data from the Antelope Mine, Glenrock Mine, and all of our monitoring sites meet EPA criteria for quality assurance and for use in atmospheric dispersion modeling. This encompasses tower siting, instrument procurement and acceptance testing, instrument calibration and audits, data validation and data reporting.

We audit all of our met stations every other quarter, as stipulated in the QA guidance. A detailed form and SOP are attached to show the procedure, the parameters audited and the audit tolerances for each parameter. The most recent met audit, typical of all of our sites, was performed for the Belle Ayr Mine (attached). Since the Antelope and Glenrock mine sites have been proposed as surrogates for your project site, I've also attached a tabular description of each of those stations.

All of the meteorological data acquired by IML Air Science are stored in a relational database. Software validation supplemented by operator inspection, assures reasonable values and continuity in the hourly average data. Data are summarized in quarterly reports, which also include data recovery statistics and diagnosis of invalidated records. Reports are read by the client as well as the state regulatory authority. In some states (including Wyoming), the regulatory authority uploads these meteorological data to the national Air Quality System (AQS) database.

We believe the level of rigor associated with collecting and validating our meteorological data is comparable, if not superior to National Weather Service standards.

Please let me know if you need further information.

Sincerely,

Ronn Smith, P.E.

Standard Operating Procedure
For
Meteorological Station Audit
SOP AIR-12

Procedural Section

1.0 Scope and Application

1.1 In 1970 the Clean Air Act (CAA) was signed into law. The CAA and its amendments provide the framework for all pertinent organizations to protect air quality. On July 18, 1997, in Federal Register: Vol. 62, No. 138, the United States Environmental Protection Agency (EPA) revised the particulate matter ambient air standards. Along with the establishment of the standard is the requirement for a national monitoring network utilizing a filter-based method adopted by EPA. The Antelope Mine is obligated to adopt the TSP and PM_{10} standards and establish a PM monitoring network.

1.2 This procedure applies to the following equipment: RM Young wind sensor, Met One 12" tipping bucket precipitation device, Fenwal 107 temperature monitor, Vaisala PTB 101B barometric pressure sensor, and Campbell Scientific CR-10X data logger, which are used in the Antelope Mine PM monitoring network.

1.3 The elements of this SOP are applicable for all sampling frequencies.

1.4 To ensure that the recorded meteorological data for wind speed, wind direction, temperature, barometric pressure, and precipitation match readings provided by known references, within acceptable limits.

2.0 Summary of Method

2.1 The Antelope Mine is responsible for the accuracy audit of their Meteorological station. The actual procedure is performed by Division field personnel or contracted.

2.2 The meteorological audit consists of checking current readings for all parameters against reference values.

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.

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 Computer skills are necessary for programming the sampler and for troubleshooting.

5.3 Familiarity with electronic and mechanical test equipment is required.

6.0 Equipment

6.1 Quartz-referenced wind speed motor, with adapters

6.2 Starting torque measurement disc and weights

6.3 NIST traceable thermometer

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 Field data sheet

6.8 Miscellaneous tools

7.0 Meteorological Station Audit Procedure

7.1 Record the date, station ID, auditor(s), description of sensors, and note

any visible anomalies in the field log book. Check that the data logger is displaying reasonable current readings.

7.2.1 Check the initial alignment of the wind direction sensor using the transit, being sure to adjust for the local declination of 12° East.

7.3 Locate the reference, aspirated thermometer near the met station's temperature sensor, allow each sensor to reach equilibrium and record both readings.

7.4 Record the "time system off line", just before lowering the tower. Remove the appropriate base mounting bolts, detach the guy wire perpendicular to the base hinge, and ***carefully*** lower the tower.

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

7.6 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.

7.7 Assess the linearity of the wind direction sensor by physically holding the anemometer at 0°, 90°, 180°, and 270°, recording the corresponding readings from the data logger.

7.8 Immerse the reference thermometer and met station temperature sensor in an ice bath. After the sensors have attained equilibrium, record the measurements from both. Repeat the procedure for a warm water bath (approximately 80°F - 100°F).

7.9 After all measurements on the tower have been taken, inspect the sensors and all cables and mounting hardware. Repair or replace any damaged components if indicated.

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

7.11 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 (0.1" 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. After the readings have been taken, clean the inlet, and perform any indicated adjustments and/or repairs can be performed and noted. 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.

7.12 Record any findings, repairs, replacements and any other anomalies in the field log book. Record the time the station was returned to normal operating condition.

References

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

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

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

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

iml Air Science
a division of Inter-Mountain Laboratories, Inc. 555 Absaraka, Sheridan, WY 82801

Meteorological Station Audit/Calibration

Network:

Date: Auditors: DAS time off-line:

Notes; system as found:

Sensors

DAS:	Temp/Asp:
Wind Speed:	Wind Direction:
Bar. Pres.:	RH:
Precipitation:	

System Audit

Wind Speed

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

Wind Direction

starting torque		
ccw:	cw:	gm-cm
initial alignment:		
reference	DAS	after adj.
360		
060		
090		
120		
180		
240		
270		
300		

Barometric Pressure

ref.	
DAS	

Relative Humidity

ref. dry bulb	ref. RH
ref. wet bulb	DAS RH

Temperature

Height: _____

reference	DAS	after adj.
aspirated ambient °F °C		
°F °C		
°F °C		

Precipitation (Weighing Bucket)

in. equiv.	Chart	Δ Chart
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

Precipitation (Tipping Bucket)

mls/weight	tips	in. equiv.

Heater working? _____

Inspection _____

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: _____

Notes: _____

End System Audit

DAS time on-line: _____

Meteorological Station Audit Summary

Met Station: Belle Ayr Mine
Date: 19-Jul-06
Audit Performed By: S.Engel & K.Jahnke--IML Air Science

Sensor	Mfr./Model	Reference Device
Wind Speed (WS):	RM Young WM AQ	quartz referenced drive motor
Wind Direction (WD):	RM Young WM AQ	transit, compass
Temperature (T):	Climatronics #2304, TS-10 motor aspirator	Hg-in-glass thermometer, or t-couple
Precipitation (Ppt.):	Met One 12" tipping bucket	lab grade burette
Barometric Pressure (BP)	CSI CS 105	aneroid barometer
Data acquisition system (DAS):	CSI CR-10x	N/A

Audit Results

		Reference	DAS Value	|Difference|	Specification	
WS (mph)		0.00	0.00	0.00	0.45	(1)
		3.44	3.44	0.00	0.62	(1)
		9.16	9.16	0.00	0.91	(1)
		34.35	34.35	0.00	2.17	(1)
		91.60	91.60	0.00	5.03	(1)
WS start torque (gm-cm)		OK	N/A	N/A	0.50	(3)
WD (degrees)		0.0	0.5	0.5	5.0	(1)
		90.0	90.1	0.1	5.0	(1)
		180.0	180.4	0.4	5.0	(1)
		270.0	270.6	0.6	5.0	(1)
Temperature (°F)	Ice water bath	30.5	30.1	0.44	0.9	(1)
	Warm water bath	66.8	66.3	0.48	0.9	(1)
	Hot water bath	102.9	102.7	0.20	0.9	(1)
Precipitation (0.04" equiv.)		73.1	74.0	0.9	7.4	(1)
		71.8	74.0	2.2	7.4	(1)
		72.4	74.0	1.6	7.4	(1)
Barometric Pressure ("Hg)		25.36	30.21	4.85	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 off-line at 1019 MST -- returned on-line at 1330 MST

New anemometer and temperature cables were installed.

METEOROLOGICAL STATION DETAILS

Antelope	10m tower	CR10X Logger		
Parameter	**Instrument**	**Range**	**Accuracy**	**Threshold**
Wind Speed	RM Young	0-112 mph	±0.4 mph or 1% of reading	0.9 mph
Wind Dir	RM Young	0-360°	±3°	1.0 mph
Temp	CS 107	-35°- 50°C	±0.5°C @ given Range	--
Precip	Met One 12" tip	Temp: -20°- 50°C	±0.5% @ 0.5 in/hr rate	--
Bar Press	Vaisalla	600 -1060 mb	±0.5 mb @ 20°C	--
Glenrock	10m tower	CR10 Logger		
Parameter	**Instrument**	**Range**	**Accuracy**	**Threshold**
Wind Speed	RM Young	0-112 mph	±0.4 mph or 1% of reading	0.9 mph
Wind Dir	RM Young	0-360°	±3°	1.0 mph
Temp	F107	-35°- 50°C	±0.5°C @ given Range	--
Precip	Met One 8" tip	Temp: -20°- 50°C	±0.5% @ 0.5 in/hr rate	--

Antelope Mine

Meteorological Data Summary

1/1/1997 - 12/31/2006

Hourly Data

	Average/Total	Max	Min
Wind Speed (mph)	11.2	50.6	0.0
Sigma-Theta (°)	16.3	82.0	0.4
Temperature (F)	47.5	102.1	-33.8
Precipitation (in)	102.34	1.48	
Bar. Pressure (in Hg)	25.3	25.9	20.0

Predominant wind direction was from the W sector,
accounting for 15.2% of the possible winds

Data Recovery

Parameter	Possible (hours)	Reported (hours)	Recovery
Wind Speed	87648	81938	93.49%
Wind Direction	87648	81951	93.50%
Sigma-Theta	87648	81951	93.50%
Temperature	87648	83702	95.50%
Precipitation	87648	83705	95.50%
Bar. Pressure	87648	43174	49.26%