

**SECOND QUARTER 2009 DATA REPORT  
FOR AMBIENT AIR MONITORING  
ENERGY FUELS RESOURCES CORPORATION  
URANIUM MILL LICENSING SUPPORT  
PIÑON RIDGE MILL  
MONTROSE COUNTY, COLORADO**

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## 1.0 INTRODUCTION

This Quarterly Report provides data required for the assessment of air quality. These data will be used for the environmental baseline study at Energy Fuels Resources Corporation (EFR) proposed Piñon Ridge Mill (the "Site") located in Montrose County, Colorado. Data were collected at five air monitoring stations (network). Three stations are located on-site, with one station upwind and one downwind of the site vicinity in order to obtain a representative block of data for assessment.

The project is under the regulation of the Colorado Department of Public Health and Environment (CDPHE) and the mill license (radioactive source materials license), will be issued and administered by CDPHE. Monitoring sites were chosen according to guidance outlined in Nuclear Regulatory Commission (NRC) Regulatory Guide (Reg. Guide) 3.63 Onsite Meteorological Measurement Program for Uranium Recovery Facilities – Data Acquisition and Reporting (NRC Reg. Guide 3.63); NRC Reg. Guide 4.14 Radiological Effluent and Environmental Monitoring at Uranium Mills (NRC Reg. Guide 4.14); and Environmental Protection Agency (EPA) Meteorological Monitoring Guidance for Regulatory Modeling Applications (MMGRMA) (EPA-454/R-99-005).

The Site is located 14 miles northwest of Naturita at 16910 Highway 90, Montrose County, Colorado. The property consists of approximately 880 acres that include the Southwest  $\frac{1}{4}$  of the Southeast  $\frac{1}{4}$  of Section 5, all of Section 8, the North  $\frac{1}{4}$  of Section 17, and the Southeast  $\frac{1}{4}$  of the Northwest  $\frac{1}{4}$  of Section 17, Township 46 North, Range 17 West, of the New Mexico Principal Meridian. See Figure 1 for the site layout.

## 2.0 PROGRAM DESCRIPTION AND MONITOR SITE DESCRIPTIONS

### 2.1 Ambient Air Monitoring Time Period

Based on NRC Reg. Guides 3.63 and 4.14, pre-operational particulate matter air monitoring must occur for at least twelve months prior to the submittal of the radiation permit application. Particulate matter  $\leq 10$  microns ( $PM_{10}$ ) samplers are located at Sites 1 and 2 and are operated under Environmental Protection Agency (EPA) sampling protocol (see Figures 1 and 2 for monitoring site locations). Tisch Hi-Vol samplers are used to monitor radionuclides at all five monitoring locations.

This report summarizes the monitoring activities conducted during the second quarter 2009. This report provides data collected between April 1 and June 31, 2009.

### 2.2 Selection of Monitoring Sites

Selection of air monitoring station locations was based on both the pre-operational and operational air monitoring criteria set forth in NRC Reg. Guide 4.14. Three monitoring locations were selected near the Site boundaries. A fourth location was selected as a background location to the northwest and a fifth location was selected at the nearest residence located to the southeast. Wind direction is predominantly from northwest and from the southeast depending on time of day due to the presence of a down-valley/up-valley flow through the area.

The five selected monitoring locations are discussed below:

Air Monitoring Site #1: This location is also referred to as Met Site #1 and is located near the northern boundary of the Site. This location includes the 10 meter (10m) meteorological tower, one of the two on-site  $PM_{10}$  monitoring locations, and an air monitor for radionuclide sampling.

Air Monitoring Site #2: This location is also referred to as Met Site #2 and is located near the eastern boundary of the Site. This location includes the 30 meter (30m) meteorological tower, one of the two on-site  $PM_{10}$  monitoring locations, and an air monitor for radionuclide sampling.

Air Monitoring Site #3: This location is also referred to as the West Site and is located near the western boundary of the Site. This location includes an air monitor for radionuclide sampling.

Air Monitoring Site #4: This location is also referred to as the Cooper Site and is located northwest of the Site. This site is assumed to be upwind. This site will be the background site following startup of operations. This location includes an air monitor for radionuclide sampling.

Air Monitoring Site #5: This location is also referred to as the Carver Site and is located southeast of the Site. This site is assumed to be a downwind site, and was chosen as the site of the nearest residence. This location includes an air monitor for radionuclide sampling.

### 2.3 Locations

The Site is located at 16910 Highway 90, Montrose County, Colorado. See Table 1 and Figures 1 and 2 for locations of the monitoring sites.

**Table 1**  
**Monitor Site Locations**

Site ID	UTM Zone 12 (NAD83)	
	Easting	Northing
Site #1 (North Site) – 10m Tower	695211.43	4237487.24
Site #2 (East Site) – 30m Tower	695930.42	4235452.56
Site #3 (West Site)	694443.09	4235724.28
Site #4 (Cooper Site) – Upwind Resident	691782.99	4239297.89
Site #5 (Carver Site) – Downwind Resident	700135.95	4232939.27

### **3.0 DATA COLLECTION AND COMPLETENESS**

According to the Prevention of Significant Deterioration (PSD) regulations, the data recovery goal for meteorological data is 90% data recovery per quarter. The PSD data recovery goal for pollutant data is 80% per quarter. The minimum annual acceptable data recovery for PM<sub>10</sub> data is 75% valid data.

#### **3.1 Meteorological Data**

Meteorological data were collected continuously at Sites #1 and #2 from April 1 through June 31, 2009 and are reported in Appendix A. EPA Air Quality System (AQS) data qualifiers were used to flag invalid data. Data qualifiers used for meteorological data this quarter include: BA – Maintenance/Routine Repairs, AQ – Collection Error and AZ – Audit.

Daily, weekly, and monthly checks were performed on meteorological equipment at each site according to standard operating procedures (SOPs) presented in the Energy Fuels Resources Corporation Uranium Mill Licensing Support Ambient Air Monitoring Plan Piñon Ridge Mill Site, 2008.

Site #1 includes the 10m tower and the following parameters are measured based on EPA MMGRMA guidance:

- wind speed, wind direction, and sigma theta
- vertical wind speed,
- temperature,
- relative humidity,
- delta temperature,
- barometric pressure,
- solar radiation,
- precipitation, and
- evaporation.

At the 10m level, wind speed, wind direction, sigma theta, vertical wind speed, and delta temperature are measured. At the 2m level, temperature, relative humidity, delta temperature, barometric pressure, and solar radiation are measured. At the ground level, precipitation and evaporation are measured.

Evaporation data is scheduled for collection between April 1 and October 31 of each year and was in service throughout the second quarter 2009.

Site #2 includes the 30m tower and the following parameters are measured based on EPA MMGRMA guidance:

- wind speed, wind direction, and sigma theta,
- vertical wind speed,
- temperature,
- relative humidity,
- delta temperature,
- barometric pressure, and
- solar radiation.

At the 30m level, wind speed, wind direction, sigma theta, vertical wind speed, and delta temperature are measured. At the 2m level, temperature, relative humidity, delta temperature, barometric pressure, and solar radiation are measured.

Sigma theta values for both sites are calculated from wind monitor readings. Wind gusts are measured at both of the sites. The measurement indicates the speed of the gust based on a 3-second average of the wind speed, along with the gust direction and time of the gust.

Data recovery was calculated for each parameter at both of the meteorological sites. As shown in Table 2, data completeness at Site 1 was 99.9 percent for all parameters, except for precipitation and evaporation which had data recovery of 99.7 and 99.5 percent, respectively. Data recovery at Site 2, also shown in Table 2, was 99.8 percent for all parameters, except 2m temperature, 30m temperature which had data recovery of 99.7 percent, and Delta Temperature which had data recovery of 99.6 percent.

All parameters at both sites exceeded the 90 percent data recovery requirement.

**Table 2  
Data Recovery for Meteorological Parameters**

<b>Meteorological Parameter</b>	<b>Data Recovery Site #1</b>	<b>Data Recovery Site #2</b>
<b>Wind Speed</b>	99.9%	99.8%
<b>Wind Direction</b>	99.9%	99.8%
<b>Sigma Theta Wind</b>	99.9%	99.8%
<b>Vertical Wind Speed EPS Avg</b>	99.9%	99.8%
<b>Vertical Wind Speed EPS Std</b>	99.9%	99.8%
<b>Vertical Wind Speed CFT Avg</b>	99.9%	99.8%
<b>Vertical Wind Speed CFT Std</b>	99.9%	99.8%
<b>2m Temperature</b>	99.9%	99.7%
<b>10m Temperature</b>	99.9%	N/A
<b>30m Temperature</b>	N/A	99.7%
<b>DeltaT Avg</b>	99.9%	99.6%
<b>Precipitation Total</b>	99.7%	N/A
<b>Relative Humidity Avg</b>	99.9%	99.8%
<b>RH Temperature Avg</b>	99.9%	99.8%
<b>Barometric Pressure</b>	99.9%	99.8%
<b>Solar Radiation Avg</b>	99.9%	99.8%
<b>Evaporation Level Avg</b>	99.5%	N/A
<b>Gust Speed</b>	99.9%	99.8%
<b>Gust Direction</b>	99.9%	99.8%
<b>Gust Time</b>	99.9%	99.8%

### 3.2 PM<sub>10</sub> Data

PM<sub>10</sub> data were collected at two of the five monitoring sites (Site 1 and Site 2) following the EPA Ambient Particulate Monitoring Sample Day Schedule for 1-in-6 day sampling. PM<sub>10</sub> filters were collected from the PM<sub>10</sub> monitors as soon as practical following the sampling day. The samples were placed in a re-sealable plastic bags immediately following collection and stored in a secured location. The samples were shipped to Inter-Mountain Laboratories (IML) on a monthly basis under standard chain-of-custody procedures. IML analyzed the samples in accordance with their standard operating procedures (SOPs). Refer to Appendices B and C for sampling sheets and IML analytical data, respectively.

The PM<sub>10</sub> sample that was scheduled to be collected on June 12, 2009 at Site 2 was not collected due to an error in programming of the PM<sub>10</sub> sampler (operator error). A make-up sample was collected on June 13, 2009 using that PM<sub>10</sub> sampler at Site 2. A letter was sent to Ms. Nancy Chick at the CDPHE Air Pollution Control Division on June 18, 2009 notifying the Division of the missed sample and the make-up sample collection.

Daily, weekly, and monthly checks were performed on the Partisol PM<sub>10</sub> monitors at each site according to SOPs presented in the Energy Fuels Resources Corporation Uranium Mill Licensing Support Ambient Air Monitoring Plan Piñon Ridge Mill Site, 2008.

Data recovery was calculated for each site and both sites had 100 percent data recovery, exceeding the 75 percent requirement for data recovery (Table 3).

**Table 3**  
**Data Recovery for PM<sub>10</sub> Samples**

	Site 1	Site 2
<b>Total Number of Samples per Quarter</b>	16	16
<b>Number of Valid Samples Collected</b>	16	16
<b>Data Recovery (percent)</b>	100	100

### 3.3 Radionuclide Data

Filters for radionuclide data analysis were collected at each of the five monitoring sites (Sites 1, 2, 3, 4, and 5). Hi-Vol monitors were run continuously on a 14-day filter exchange schedule. Filters were collected and immediately placed in sample filter envelopes and into re-sealable plastic bags and stored in a secured location. The samples were shipped to ACZ Laboratories (ACZ) at the end of the quarter under standard chain-of-custody procedures. ACZ composited the sample filters by quarter and analyzed the samples in accordance with their SOPs. Refer to Appendices B and D for sampling sheets and ACZ analytical data, respectively.

ACZ Labs reports a concentration of analyte per composited filter set. The average air flow rate was calculated for each filter exposure period based on the calibration values of the samplers

and average stagnation pressure, temperature and pressure during the filter exposure period. The formula used to calculate the average air flow is:

$$\text{Average Flow Rate (m}^3\text{/min)} = \frac{\left( \frac{P_a - P_{\text{stag}}}{P_a} - b \right) \times \sqrt{T_a + 273.15}}{m}$$

Where:

$P_a$  = Average ambient pressure (inches Hg) (averaged over individual filter exposure periods)

$T_a$  = Average ambient temperature (°C) (averaged over individual filter exposure periods)

$P_{\text{stag}}$  = Average stagnation pressure (inches Hg) (measured at sample start and end)

$b$  = Sampler calibration intercept value (unitless)

$m$  = Sampler calibration slope value (unitless)

The air sample volume for each filter was calculated based on the average flow rate and time of exposure and the total air volume for each composited sample was calculated as the sum of the air sample volume of each filter included in the composite. Refer to Appendix D for a summary of the above calculations.

Daily, weekly, and monthly checks were performed on the Tisch Hi-Vol monitors at each site according to SOPs presented in the Energy Fuels Resources Corporation Uranium Mill Licensing Support Ambient Air Monitoring Plan Piñon Ridge Mill Site, 2008.

All five sites had a data recovery that exceeded the 80 percent data recovery requirement for pollutant data (Table 4).

**Table 4  
Data Recovery for Radionuclide Samples**

	Site 1	Site 2	Site 3	Site 4	Site 5
<b>Total Run Time (hours)</b>	2180.6	2177.3	2184.4	2193.4	2189.9
<b>Actual Run Time (hours)</b>	2174.4	2165.8	2144.2	2187.5	2183.7
<b>Data Recovery (percent)</b>	99.7	99.5	98.2	99.7	99.7

#### 4.0 METEOROLOGICAL DATA ANALYSIS

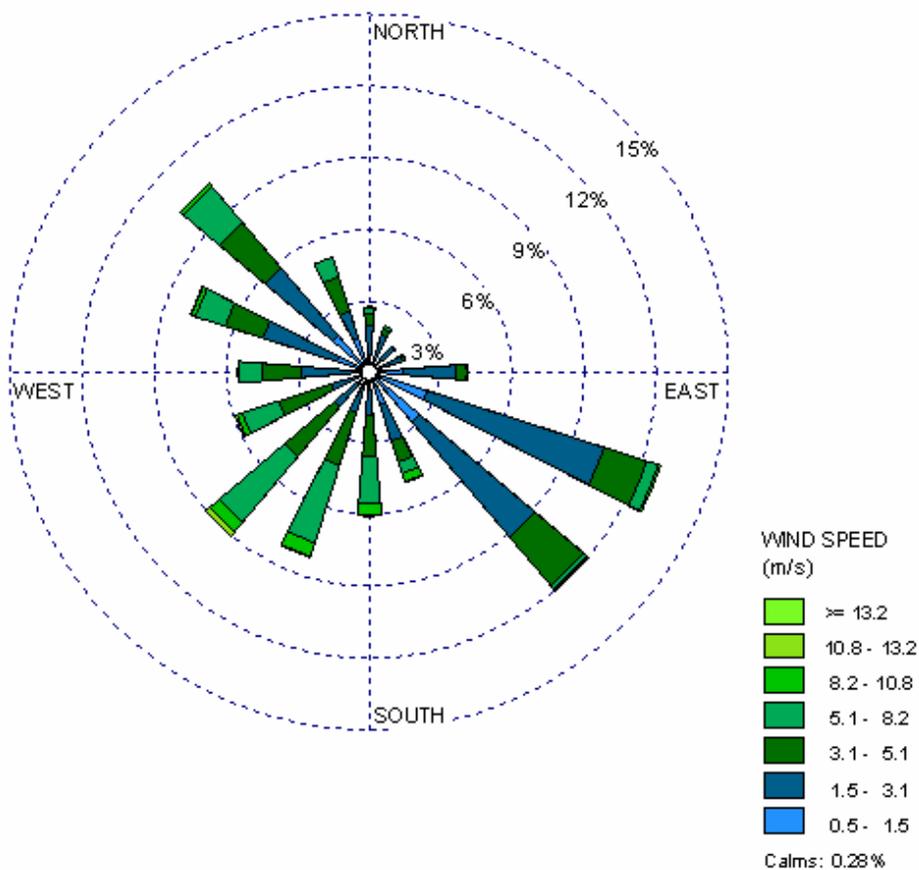
The monthly averages of meteorological parameters are summarized in Table 5.

**Table 5  
Monthly Average Meteorological Parameters**

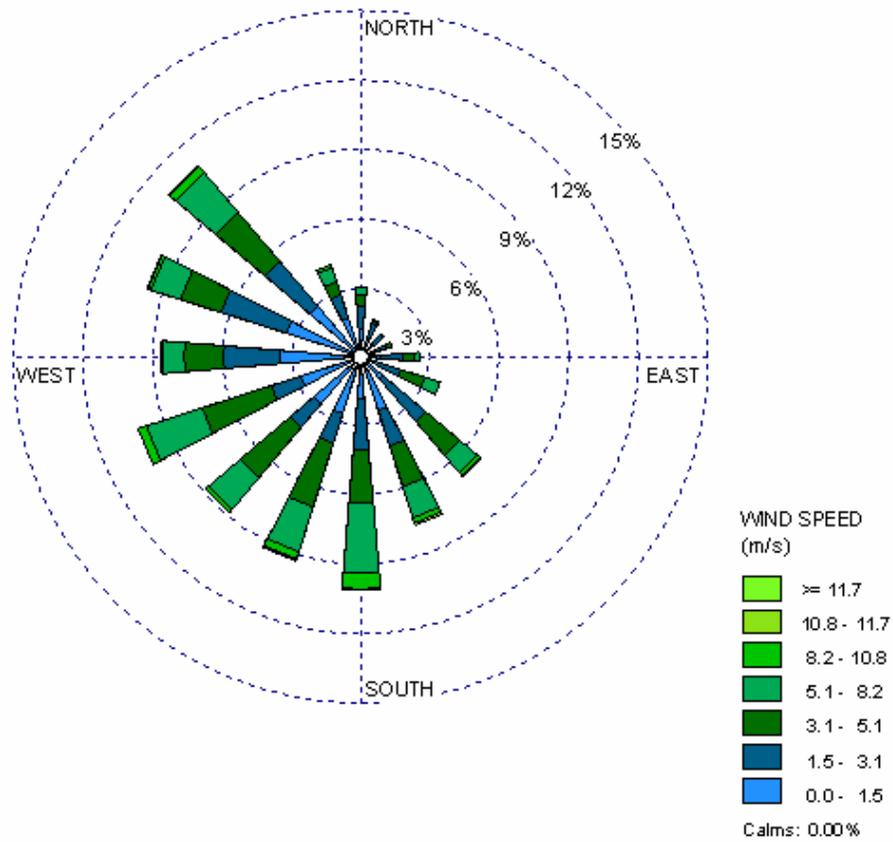
Meteorological Parameter	April		May		June	
	Site #1	Site #2	Site #1	Site #2	Site #1	Site #2
Wind Speed (m/s)	3.95	3.87	2.94	2.86	3.33	3.18
Wind Direction (deg)	214.54	236.15	206.14	253.98	188.25	216.40
Sigma Theta Wind	27.49	30.66	28.35	29.92	27.35	31.99
Vertical Wind Speed EPS (cm/s)	3.49	9.76	3.03	8.06	2.77	5.66
Vertical Wind Speed EPS Std	28.72	51.55	21.15	35.46	23.86	46.03
Vertical Wind Speed CFT (cm/s)	13.32	21.31	6.39	15.42	12.15	16.46
Vertical Wind Speed CFT Std	30.89	58.80	21.82	40.33	25.23	50.84
2m Temperature (°C)	9.81	9.85	16.91	17.40	19.28	19.71
10m Temperature (°C)	10.08	N/A	17.42	N/A	19.78	N/A
30m Temperature (°C)	N/A	10.12	N/A	17.79	N/A	19.98
DeltaT (°C)	0.28	0.27	0.51	0.39	0.50	0.27
Relative Humidity (%)	37.72	37.04	38.69	36.81	35.30	33.67
RH Temperature (°F)	50.16	50.47	63.25	64.15	67.60	68.21
Barometric Pressure (in. Hg)	24.52	24.45	24.59	24.52	24.57	24.51
Solar Radiation (W/m <sup>2</sup> )	248.77	240.31	287.45	283.15	273.43	268.96
Gust Speed (m/s)	8.42	8.55	6.19	6.27	7.13	7.40
Gust Direction (deg)	213.79	242.54	244.41	265.34	185.85	214.96
Total Precipitation (in.)	0.47	N/A	1.91	N/A	1.88	N/A
Total Evaporation (in.)	6.26	N/A	7.55	N/A	8.41	N/A
Average Daily Evaporation (in.)	0.21	N/A	0.24	N/A	0.28	N/A

The wind roses for Sites 1 and 2 are shown below. These wind roses should be considered as draft, because in order to create the wind roses, data underwent processing using the EPA AERMET software and the processed data have not gone through the final quality assurance process, which will occur after a full year of data have been collected.

As can be seen in the Site 1 wind rose below, the wind direction at the 10 m tower site (Site 1) is predominantly from the southeast, with less frequent, yet still prominent southwest and northwest components. The southeast/northwest wind directions depict the down-valley/up-valley flow through the area. The wind direction at the 30m tower site (Site 2 wind rose, below) is distributed from the northwest to the south.



**Site 1: 10m Wind Rose**



**Site 2: 30m Wind Rose**

## **5.0 QUALITY ASSURANCE PROGRAM**

### **5.1 Quarterly Calibrations**

Calibrations were performed on particulate matter equipment on April 16-19, 2009 by EFR personnel. A copy of the EFR Calibration Report is included in Appendix E. Calibrations of meteorological instruments are scheduled biannually and were not performed this quarter.

### **5.2 Independent Quarterly Audit Program**

Independent auditing on the particulate matter equipment and meteorological instruments was performed by IML on April 22, 2009. A copy of the IML Calibration and Quality Assurance Audit Report is included in Appendix F.

Acceptable audit performance limits can be found in the Energy Fuels Resources Corporation Uranium Mill Licensing Support Ambient Air Monitoring Plan Piñon Ridge Mill Site, 2008.

### **5.3 Internal Quality Control Procedures**

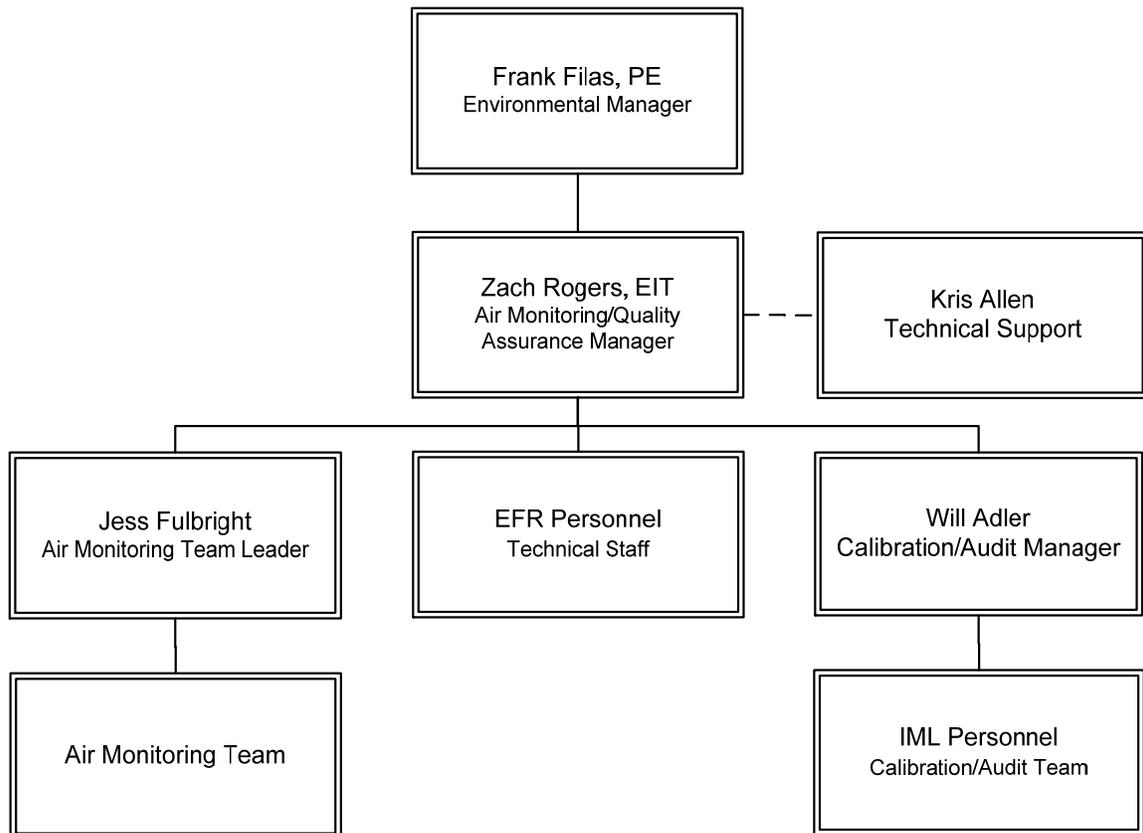
In the event of any operational errors or missed sampling events, a corrective action procedure will be implemented. The monitoring project manager for the site, as well as the monitoring project manager for Kleinfelder, will investigate the cause and effect of the incident, take corrective action, and prepare a letter to the CDPHE Air Pollution Control Division (APCD) and the Radiation Management Unit (RMU).

## 6.0 PERSONNEL

Project staff and their respective roles are detailed in Table 7. The overall project organization is shown schematically below.

Program administration, management, and quality assurance is performed by Energy Fuels Resources personnel. The Air Monitoring Team Leader will provide onsite oversight and will assist the field team with technical, operational, or other project-related issues. Meteorological equipment calibrations and audits and ambient air monitoring audits are performed by IML Air Science.

**Project Organization Chart**



**Table 7  
Roles and Responsibilities**

<b>Name</b>	<b>Project Role</b>	<b>Responsibilities</b>	<b>Experience</b>
Frank Filas, PE	Environmental Manager	Program Management	Engineering, Licensing, Operations Management
Zach Rogers, EIT	Air Monitoring/Quality Assurance Manager	Project Management, Quality Assurance	Project Management, Field Operations, Air Quality, Quality Control, Meteorology
Jess Fulbright	Air Monitoring Team Leader/ Health & Safety Officer	Field Operations Management, Sampling, Health & Safety Compliance	Field Operations, Health & Safety Compliance
EFR Personnel	Air Monitoring Team	Sampling	Field Operations
EFR Personnel	Technical Staff	Report Preparation	Technical Writing
Will Adler (IML)	Calibration/Audit Project Manager	Project Management, Field Work/Calibration/Audit	Project Management, Meteorology, Air Quality, Ambient Air Quality Modeling
IML Personnel	Calibration/Audit Team	Field Calibrations and Audits	Meteorology, Air Quality, Ambient Air Quality Modeling
Kris Allen, EIT (Kleinfelder)	Technical Support	Field Management, Air Quality Project Management	Air Quality, Field Management, Meteorology

## 7.0 STANDARDS AND REFERENCES

Energy Fuels Resources Corporation, 2008. Work Plan for Ambient Air Monitoring, Piñon Ridge Mill Site, July 18.

Environmental Protection Agency (EPA), 2000. Meteorological Monitoring Guidance for Regulatory Modeling Applications (MMGRMA) (EPA-454/R-99-005).

EPA, 2008. Quality Assurance Handbook for Air Pollution Measurements Systems, Vol. II, Part 2, USEPA, EPA-454/B-08-003, Environmental Monitoring Systems Laboratory.

EPA, 1995. Quality Assurance Handbook for Air Pollution Measurement Systems. Vol. V, Meteorological Measurements. EPA/600/R-94/038d, U.S. Environmental Protection Agency, Research Triangle Park, NC.

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

Ambient Air Monitoring Requirements for the Air Pollution Control Division of the Colorado Department of Public Health and Environment, Technical Services Program Air Pollution Control Division, April 2001.

U.S. Nuclear Regulatory Commission Regulatory Guide, Office of Standards Development, Regulatory Guide 4.14 – Radiological Effluent and Environmental Monitoring at Uranium Mills, Revision 1, April 1980.

U.S. Nuclear Regulatory Commission Regulatory Guide, Office of Standards Development, Regulatory Guide 3.8 – Preparation of Environmental Reports for Uranium Mills, Revision 2, October 1982.

U.S. Nuclear Regulatory Commission Regulatory Guide, Office of Nuclear Regulatory Research, Regulatory Guide 3.63 – Onsite Meteorological Measurement Program For Uranium Recovery Facilities – Data Acquisition and Reporting, March 1988.