Whirlwind Uranium Mine Construction Approval
40 C.F.R. Part 61, Subpart B
Background Information for Construction Approval

EPA Region 8 reviewed the Application for Construction Approval submitted by Energy Fuels Resources Corporation ("Energy Fuels") to EPA pursuant to 40 C.F.R. § 61.07 "Application for approval of construction or modification," entitled "Application for Approval of Construction; Whirlwind Mine; Mesa County; Colorado (Revised March 2011)" (the "Application"). The Application, submitted on March 7, 2011, is for the proposed operation of the Whirlwind Uranium Mine (the "Mine"). The Application states the Mine is expected to produce up to 50,000 tons per year of ore and over 100,000 tons over the lifetime of the mine. Additional documents relied upon in the review of the Application for construction of the tailings impoundments include the "Decision Record, Finding of No Significant Impact, and Final Environmental Assessment for the Whirlwind Mine Uranium Mining Project" produced by the Bureau of Land Management (BLM).[1]

The mine will straddle the Colorado and Utah State line. EPA's approval is for Phase I and Phase II and only applies to the portion of the Mine in Colorado. The State of Utah has authority for the portion of the Mine in Utah, since the State of Utah, Utah Department of Environmental Quality (UDEQ) since UDEQ has been delegated authority for 40 C.F.R. Part 61, Subpart B (40 Fed. Reg. 13912 (March 15, 1995)).

Facility Location

The Whirlwind Mine underground uranium mine is located at:

30100 5/10 Road,

Gateway, Colorado 81522

Specifically, the uranium mine Colorado claims lie in:

Section 31, T51N, R19W; Section 6, T50N, R19W;

Sections 25, 26, 35, and 36 of T51N, R20W; and

Sections 1, 2, 11 and 12 of T50N, R20W, New Mexico Principal Meridian

[1]http://www.blm.gov/pgdata/etc/medialib/blm/co/field_offices/grand_junction_field/PDF.Par.16552.File.dat/WhirlwinMineEAfinal.pdf.

Company Contact

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Regulatory Authority

EPA Region 8's authority over the Mine is derived from the Clean Air Act ("CAA"), as amended at 42 U.S.C. § 7401 *et seq*. The radon discharge from the mine is regulated pursuant to 40 C.F.R. Part 61, National Emission Standards for Hazardous Air Pollutants ("NESHAP"), Subpart A – General Provisions ("Subpart A"); and Subpart B – National Emission Standards for Radon Emissions from Underground Uranium Mines ("Subpart B").

Subpart B applies to "the owner or operator of an active underground uranium mine which: (a) Has mined, will mine or is designed to mine over 90,720 megagrams (Mg) (100,000 tons) of ore during the life of the mine; or (b) Has had or will have an annual ore production rate greater than 9,072 Mg (10,000 tons), unless it can be demonstrated to EPA that the mine will not exceed total ore production of 90,720 Mg (100,000 tons) during the life of the mine." (40 C.F.R. § 61.20).

Subpart B requires that the "Emissions of radon-222 to the ambient air from an underground uranium mine shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/y." (40 C.F.R. § 61.22). In addition to the requirements of Subpart B, the requirements in 40 Subpart A apply to Subpart B regulated facilities. Subpart A requires owners or operators to submit to EPA an application for approval for either construction or modification of Subpart B regulated facilities before the construction or modification is planned to commence (40 C.F.R. § 61.07). Energy Fuels submitted the Mine Application for Construction Approval in accordance with Subpart A, 40 C.F.R. § 61.07.

Mine Operations and Proposed Facilities for Approval

Under 40 C.F.R. Part 61, Subpart B, the radon discharge from the mine vents is limited by limiting the radiation exposure of the most exposed resident to 10 millirem per year (mrem/yr) effective dose equivalent. COMPLY-R is the code used by Energy Fuels, as required by 40 C.F.R. § 61.23, to model the dose to the public in mrem/yr. The dose to the public is modeled in COMPLY-R by entering input data including the curie discharge rate of radon from release points (i.e., vents) and meteorological data. Modeling conducted by the Company projects that they will reach the 10 mrem/yr public dose regulatory limit in the sixth year of operation. This projection is based on:

a. The use of the conservative default input parameters incorporated in the COMPLY-R program;
b. The use of the *Draft Background Information Document, Proposed Standards for*

Radon-222 Emissions to Air from Underground Uranium Mining (EPA 520/1-84/002/2) equation for estimating radon discharges as a function of the tonnage of ore produced which is approximately 500,000 tons over a 10 year period;

c. No implementation of control methods, such as bulkheading mined out ore bodies.

To avoid exceeding the dose limit, the Construction Approval limits the total Curie (Ci) discharge for radon to 1,100 Ci annually from this facility. This annual discharge limit was determined using COMPLY-R and corresponds to a dose of 10 mrem/yr to the nearest member of the public. The owner or operator proposes to collect site-specific data to justify any future request to increase the Curie discharge limit, showing that they will be in compliance with the 10 mrem/yr standard. Prior to adopting a new radon discharge limit, the supporting documents based on site-specific data must be submitted to the Administrator for review and approval. The detailed derivation of the Ci discharge limit is provided in Attachment 1 to this document and was taken from the Energy Fuels Application. The proposed locations of the vents are provided in Attachment 2. In order to prevent an exceedance of the 10 mrem/yr standard, if radon measurements exceed 75% of the discharge limit (i.e., 75% of the 10 mrem/yr standard) Energy Fuels must implement the appropriate corrective action(s) outlined in Section II.C of the Construction Approval and further described in the Energy Fuels Application.

Energy Fuels may account for the occupancy time of a receptor when calculating the dose by using EPA's *Guidance on Implementing the Radionuclide NESHAPS* (1991). If Energy Fuels elects to model a reduced occupancy time for exposure to the nearest resident, they shall submit to EPA for review and approval a plan detailing how the reduced occupancy time is verified. The plan must be approved by EPA prior to it being used in the annual report required by 40 C.F.R. § 61.24.

Effective Date of Approval

EPA's approval of the construction of the Whirlwind Mine shall be effective immediately upon receipt of the signed Approval to Construct by the Applicant.

Paperwork Reduction Act

Any requirements established by this Approval for the gathering and reporting of information are not subject to review by the Office of Management and Budget (OMB) under the Paperwork Reduction Act, because this Approval is not an "information collection request" within the meaning of 44 U.S.C. §§ 3502(4), 3502(11), 3507, 3512 and 3518. Furthermore, this Approval and any information-gathering and reporting requirements established by this Approval are exempt from OMB review under the Paperwork Reduction Act because it is directed to fewer than ten persons, 44 U.S.C. §§ 3502(4) and 3502(11); 5 C.F.R. § 1320.5(a).

Environmental Justice Considerations

On February 11, 1994, the President issued Executive Order 12898, entitled "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." The Executive Order calls on each federal agency to make environmental justice (EJ) a part of its mission by "identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations."

This Subpart B Approval applies only to air quality impacts resulting directly from operation of the Mine. As these impacts will be minimized by compliance with the requirements of Subpart B, the proposed approval will have minimal environmental impacts. EPA Region 8's Environmental Justice office was consulted. No Environmental Justice actions are necessary for this Approval due to the fact that the Glade Park-Gateway Census Division District, where the Whirlwind Mine is located, is below the Colorado median percentage of persons in poverty. Also, there is no community within one mile of the Whirlwind Mine.

Tribal Interests

Based on our research and on previous communications by the BLM, we are confident that the facility will not affect properties of religious or cultural significance to any Indian tribe. As stated in the BLM Environmental Assessment "The cultural resource investigations performed by Alpine Archaeological Consultants, Inc. and the literature reviews conducted by the BLM revealed no information that suggests that the project area holds special significance for Native Americans for traditional or religious purposes. Consultation with the Ute Indian Tribe of the Uintah and Ouray Reservation, Southern Ute Indian Tribe, and the Ute Mountain Ute Tribe consisted of information letters and maps sent to the Councils and their cultural departments. A follow-up phone call offering an invitation to consult further was met with no comments from these tribes. Additionally, no evidence suggests that the project would alter or limit any access if there were traditional uses that are not known to the agency."[2] EPA sent courtesy copies of the Approval to the Environmental Director of the Ute Mountain Ute and Southern Ute Indian Tribes and the Environmental Coordinator of the Ute Indian Tribe.

Adjustment to Facility's Application for Approval of Construction

Energy Fuels submitted their initial Construction Approval Application to EPA on August 10, 2010. On October 8, 2010 EPA issued an Intent to Deny letter in accordance with 40 C.F.R. § 61.08(a). The intent to deny was based on the fact that the initial emissions estimates were based on radon measurements taken during a time of non-operation (i.e., no ore production). The initial emission estimates did not consider all operating conditions at the mine. EPA provided Energy Fuels reference to the AP-42 emissions factor for radon-222 emissions from underground mines as well as the *Draft Background Information Document, Proposed Standards for Radon-222 Emissions to Air from Underground Uranium Mining* (EPA 520/1-84/002/2) so that the emissions could be

[2] http://www.blm.gov/pgdata/etc/medialib/blm/co/field_offices/grand_junction_field/PDF.Par.16552.File.dat/WhirlwinMineEAfinal.pdf, Page 3-13

recalculated. Energy Fuels submitted a revised application on December 2, 2010 where they used the AP-42 factor to estimate emissions. Upon review of the application it was determined that the emission factors provided to Energy Fuels did not result in calculated emissions representative of anticipated operations. A revised application was submitted by Energy Fuels on March 7, 2011 and it is the review of this application that the approval is based. The detailed emission estimates can be found in the Energy Fuels March 7, 2011 Application.

Administrative Record

EPA has compiled and prepared an index to the Administrative Record.

Attachment 1

Derivation of the Annual Radon Total Activity Discharge Limit for

The Whirlwind Mine

Taken from the Application for the Whirlwind Mine

4.0 RADON-222 EMISSION AND DOSE ESTIMATES

Future radon-222 emissions from the Whirlwind Mine and associated doses that could be received by proximate residents are estimated in this section based on data collected to date from other mines, future mining plans, and modeling using EPA's COMPLY-R code. The modeling results indicate that the potential radon dose that could be received by the nearest member of the public would be less than the 10 mrem/yr regulatory limit for the first five years of mine development and production assuming very conservative input factors. Estimated doses are expected to be well within the regulatory limits through the ten-year life of the mine when site-specific wind rose data and actual emissions data are available for input into the COMPLY-R code.

4.1 Baseline Emission Calculation

Energy Fuels conducted radon-222 and air flow measurements at the Whirlwind Mine from September 2008 through December 2009. During the time from September through November 2008, the mine workings were being rehabilitated. In late November 2008, the mine went on standby; however, it continued to be ventilated on a periodic basis for inspections and dewatering operations. The collected measurements were used to calculate radon-222 emissions from the Whirlwind portal and estimate, using the COMPLY-R code, the effective radon-222 dose received at the nearest public receptor. These findings were provided to the EPA in Energy Fuels' letters of April 1, 2009 and February 22, 2010 (see Appendix A). A summary of the collected radon-222 concentration data, ventilation rate and calculated radon-222 emissions is provided in Table 1 on the following page.

The average of the monthly radon-222 emissions from September to November 2008 (0.225 Curies per month [Ci/mo]) was used to calculate an annual radon-222 emission rate of 2.70 Ci/yr for current mining conditions when mine operations resume. These three months of data were used because they had similar ventilation rates (41,000 cubic feet per minute [cfm]) to those proposed for Phase I mine production operations and the hours of ventilation (171 to 207 hours per month) were sufficient to establish steady-state conditions. The remaining months had significantly lower ventilation rates (5,700 cfm to 11,400 cfm) and hours of operation (17 to 77 hours per month), and correspondingly lower radon-222 emissions (0.003 to 0.081 Ci per month).

Although this data provides an estimate of the radon-222 released from the mine workings when no production is occurring, it does not take into account the radon-222 that is released during the blasting, loading and transporting of ore within the mine.

Table 1
Historical Radon-222 Emissions

Month/Year	Ventilated Air Volume (Million Liter)	Radon-222 Concentration (pCi/L)	Radon-222 Emission (Ci)
September 2008	13,200	18.5	0.244
October 2008	14,400	16.4	0.236
November 2008	11,900		0.195
December 2008	310		0.005
January 2009	410	24.0	0.010
February 2009	640		0.015
March 2009	830		0.020
April 2009	540	85.5	0.046
May 2009	950		0.081
June 2009	750		0.064
July 2009	90	120.9	0.011
August 2009	320		0.039
September 2009	190		0.023
October 2009	150	30.0	0.005
November 2009	200		0.006
December 2009	89		0.003

ρCi/L = picoCuries per liter
Ci = Curies

4.2 Estimated Future Emissions

Emission rates from future mining operations (Phases I and II) were estimated based on cumulative production rates, although it is recognized that radon-222 emissions are highly variable and dependent upon many interrelated factors including ventilation rate, ore grade, production rate, age of mine, size of active workings, mining practices, and several other variables (EPA 1984). An emission factor of 0.0044 Ci/yr per cumulative ton of ore mined (EPA 1985) was used to estimate radon-222 emissions from the Whirlwind Mine. The estimated annual radon-222 emissions are summarized in Table 2, based on the planned production from the Whirlwind Mine over the 10-year mine life.

Table 2
Estimated Annual Radon-222 Emissions

Description	Unit	Year 1	Year 2	Year 3	Year 4	Year 5
Annual Ore Production	t/yr	11,000	50,000	50,000	50,000	50,000
Cumulative Ore Production	ton	11,000	61,000	111,000	161,000	211,000
Annual Release	Ci/yr	48	268	488	708	928

Description	Unit	Year 6	Year 7	Year 8	Year 9	Year 10
Annual Ore Production	t/yr	50,000	50,000	50,000	50,000	50,000
Cumulative Ore Production	ton	261,000	311,000	361,00	411,000	461,000
Annual Release	Ci/yr	1,148	1,368	1,588	1,808	2,028

4.2.1 Phase I - Development

Phase I of mining the Whirlwind Mine consists of developing drifts to the Packrat Mine and exhaust vent shaft C1. This development, which is expected to take 1 year, will establish a secondary escapeway, provide for more efficient ventilation, and open up sufficient areas for production mining in Phase II. During Phase I, the production of the mine will be low as only ore that is encountered coincidentally with drift development will be mined. Energy Fuels estimates that the mine will produce an average of approximately 20 tpd of ore during Phase I. Once the drift to the Packrat Mine is completed (estimated time of 9 months), further drifts to the west may be developed and/or production may begin in the "A" ore zone. Maximum production in the "A" ore zone is estimated to be 100 tpd. The drift to exhaust shaft C1 is expected to take up to 1 year to complete. If only development drifts are advanced during Phase I, production is expected to be approximately 5,000 tons per year (20 tpd * 250 working days/yr). If ore is mined in the "A" ore zone during the last 3 months of Phase I, an additional 6,000 tons of ore may be mined for a total of 11,000 tons of ore in Year 1. This equates to 48 Ci/yr of emissions in Year 1 (12 Ci in Months 1-9 and 36 Ci in Months 10-12) based on the emission factor of 0.0044 Ci/yr/ton_{cum}. During Phase I, air will be exhausted from the Whirlwind portal prior to breakthrough to the Packrat Mine and then from the Packrat portal following breakthrough.

Following initial breakthrough to the Packrat Mine, the stagnant air in the Packrat workings will be ventilated out. Because the Packrat Mine is only naturally ventilated (i.e., low-flow rate), radon-222 has accumulated in the mine's extensive drifts and stopes.

The best available measurement of radon-222 levels in the Packrat drift is 26 Working Levels, taken near the entrance of the mine. MSHA regulations prohibit personnel from going deeper into the mine before ventilation is established. However, radon-222 in bulk-headed areas of operating mines has been reported to reach levels from 30,000 to 300,000 ρCi/L (EPA 1985).

The accumulated radon-222 in the Packrat Mine was calculated to be approximately 100 Ci based on the entire mined out area of the Packrat workings (1,025,800 SF), an average height of 11 feet, and an average radon-222 concentration of 300,000 ρCi/L (see calculation below). This is a one-time emission source because temporary and then permanent seals will be used to isolate the Packrat ventilation drift from the remainder of the historic workings as the ventilation system is advanced. The mine area used to make this calculation includes the current extent of the mined out workings, not just the ventilation drift. An additional 100 Ci were added to Phase I emissions to conservatively account for ventilation of the stagnant air.

Radon (Ci) = Volume (L) x Radon Activity (ρCi/L) / 1 x 10^{12} ρCi/Ci
= 319,000,000 L x 300,000 ρCi/L / 1 x 10^{12} ρCi/Ci
= 95.7 Ci ~ 100 Ci

Volume (L) = Area (SF) x Height (ft) x 28.3 L/CF
= 1,025,800 SF x 11 ft x 28.3 L/CF
= 319,000,000 L

4.2.2 Phase II - Production

Following year 1, production will ramp up to 200 tpd for an annual production rate of approximately 50,000 tons per year (tpy) and ventilation will be exhausted from both the Packrat portal and the C1 exhaust vent (see Figure 6). At 50,000 tpy, the estimated radon-222 emissions increase by 220 Ci/yr each year and peak at approximately 2,000 Ci/yr in Year 10. Bulkheading of the Packrat workings and inactive stopes will significantly reduce those emissions. An EPA published document, "Radionuclides, Background Information Document for Final Rules, Volume II" (EPA 1984) indicates that bulkheading has been estimated to reduce radon-222 emissions by 14 to 60 percent. The document indicates that extensive bulkheading, as is proposed for the Whirlwind Mine, can be expected to reduce radon emissions by 35 percent. Accounting for this 35 percent reduction, the annual radon-222 emissions of the Whirlwind Mine are expected to be approximately 1,300 Ci/yr in Year 10. This reduction was not accounted for in the

total radon emissions or COMPLY-R modeling (see Section 4.3); accordingly, the calculated doses to the nearest residents are considered to be conservatively high.

4.3 COMPLY-R Input Data

Estimated radon-222 doses to the nearest resident were computed using the COMPLY-R computer code. The COMPLY-R code is a screening level program as it makes several conservative assumptions (EPA 1989b) and does not take into account elevation differences or topography. These factors can significantly reduce the actual radiation dose received by a receptor, especially in the highly variable terrain present in the vicinity of the Whirlwind Mine. The COMPLY-R code estimates the dose to the receptor(s) based on the locations of the receptor(s) and emissions point(s), meteorological data, radon-222 source data, and physical characteristics of the ventilation system.

4.3.1 Receptor and Emission Point Locations

Figure 8 shows the locations of the emission points and the flow rate of vented exhaust air during the two primary phases in mine development. The figure also shows the location of the nearest resident (i.e. the nearest public receptor). The nearest resident at this time (defined as Receptor 1) is a part-time resident who occupies a camp trailer on a private parcel approximately 835 meters northwest of the Whirlwind Portal during the warmer months (up to 6 months per year). Currently, the nearest full-time resident (Receptor 2) is located approximately 2.5 miles (4,000 meters) southwest of the Whirlwind Mine portal. The COMPLY-R code was utilized to estimate the resultant dose to the nearest part-time resident for current conditions and during each mining phase assuming 50 percent residency. In addition, the resultant dose to the nearest full-time resident was modeled assuming 100 percent residence time.

4.3.2 Meteorological Data

Because wind rose data (direction, frequency and average speed) specific to the site is not available, the COMPLY-R code default wind direction and speed was used to estimate doses. This produces a very conservative estimate as it assumes a wind frequency of 25 percent in each of the sixteen compass-point directions (i.e., that the predominant wind direction is directly from the source to the nearest resident). Wind frequency in the predominant wind direction is typically 10 to 15 percent (EPA 1989b). Furthermore, the predominant wind direction in the vicinity of the Packrat Portal is within the walls of Lumsden Canyon and not directed at the nearest receptor.

4.3.3 Radon Emissions

The radon emissions used to estimate the radon-222 doses at the nearest public receptor were derived as described in Section 4.2. The estimated emissions are presented in Table 2, above.

4.3.4 Ventilation Characteristics

Physical characteristics of the mine ventilation system include the design of the vents, ventilation flow rate, and the relative temperature of ventilated air to ambient air. The design of the vents includes release height, verticality, obstructions, and diameter. All of these design parameters can be adjusted to further reduce the dose to the nearest public receptor and are weighed against inefficiencies and costs in mine construction and operation. The assumptions used for the COMPLY-R code computations are release heights of two meters, vertical orientation, no rain cap or other obstructions, and 6-foot and 8-foot exit diameters for the Packrat portal and C1 vent shaft, respectively. The ventilation flow rate varies from 40,000 cfm to 100,000 cfm in Phase I to 200,000 cfm in Phase II. These are considered to be minimum flow rates and may be higher as necessary to reduce DPM concentrations in the mine. Higher flow rates were run with COMPLY-R code and found to cause lower doses to receptors (see Section 5.5), presumably due to the resulting higher ventilation exit velocities. Therefore, a minimum overall ventilation rate of 200,000 cfm is considered to be a conservative value. Default values for temperature of ventilated air and ambient air were used. Actual temperatures may be input but are expected to have little effect on the dose based on model runs.

4.4 Dose Estimates

Doses from radon-222 were run for Phase I and Phase II of mine development and for abnormal circumstances. The dose estimates to Receptor 1 (nearest part-time resident) were adjusted for a residence time of 50 percent, except where noted, and the dose estimates to Receptor 2 (the nearest full-time resident) are not adjusted.

4.4.1 Phase I Dose Estimate

Phase I was run in three parts as follows:

- Nine months of ventilation exhaust at the Whirlwind portal (prior to breakthrough to the Packrat Mine);

- Three months of ventilation exhaust out of the Packrat portal (following breakthrough); and
- Ventilation of stagnant air with 100 Ci of radon-222 (see section 4.2.1) out of the Packrat portal following breakthrough. This value is not adjusted for residency time for Receptor 1 as it is estimated to occur over a 2-month period that may occur during a period of residence at Receptor 1.

The estimated doses calculated for Receptors 1 and 2 are summarized in Table 3 for Year 1 of mine operations. Refer to Appendix B for the COMPLY-R code output.

Table 3
Phase-I COMPLY-R Dose

Description	Rn-222 Emission (Ci)	Ventilation Flow Rate (cfm)	Time Period (months)	Dose to Receptor 1 (mrem)	Dose to Receptor 2 (mrem)
Part 1 - Whirlwind Portal Ventilation	12	40,000	1-9	0.4	0.1
Part 2 - Packrat Portal Ventilation	36	100,000	10-12	1.1	0.2
Part 3 - Packrat Workings Ventilation	100	100,000	10-11	6.0	0.5
Total	**148**	N/A	**Year 1**	**7.5**	**0.8**

4.4.2 Phase II Dose Estimate

Phase II of mine development includes all years subsequent to Year 1 as the mine ramps up to full production of approximately 50,000 tons of ore per year. Based on the total annual radon-222 emissions presented in Table 2, the total annual estimated dose increases linearly to 18.5 mrem/yr for Receptor 1 and 11.8 mrem/yr for Receptor 2 by Year 10 (see Appendix B for the COMPLY-R code output). Estimated doses to Receptor 1 were multiplied by 50 percent to account for residence time. Refer to a summary of the estimated annual doses to each receptor in Table 4, below.

Table 4
Annual Dose Estimates

Receptor	Units	Year 2	Year 3	Year 4	Year 5	Year 6
Receptor 1	mrem/yr	2.5	4.5	6.6	8.6	*10.2*
Receptor 2	mrem/yr	1.6	2.9	4.2	5.5	6.5

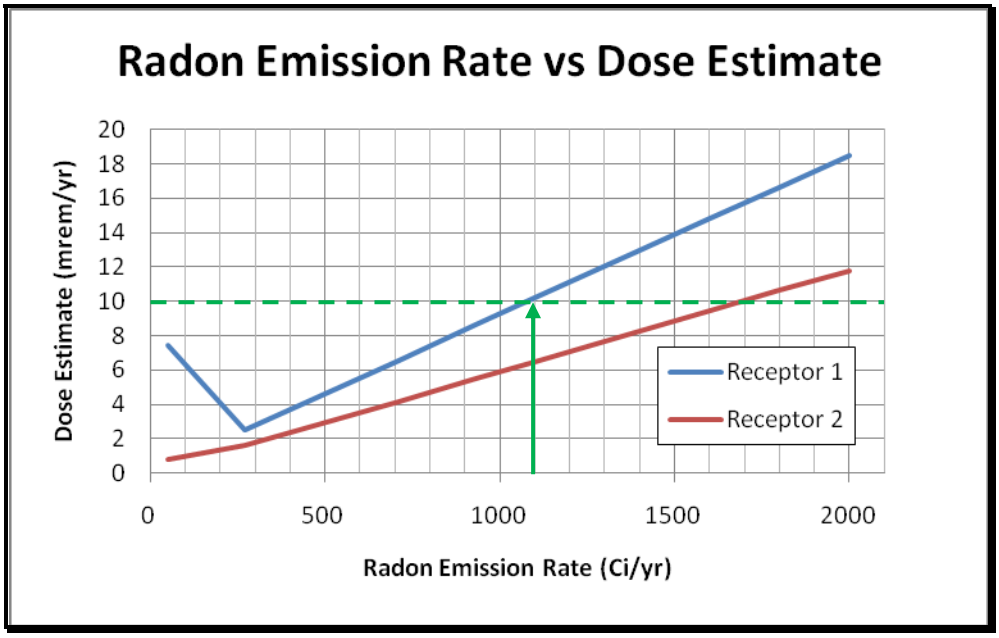
Receptor	Units	Year 7	Year 8	Year 9	Year 10
Receptor 1	mrem/yr	*13.0*	*14.8*	*16.7*	*18.5*
Receptor 2	mrem/yr	8.3	9.4	*10.6*	*11.8*

Note: Values in *italics* exceed the regulatory limit

It should be noted that while the dose to Receptor 1 exceeds the regulatory limit starting in Year 6, the estimated doses are expected to be much lower when site-specific wind rose data is available to input into the COMPLY-R code. COMPLY-R modeling with wind rose data from the Grand Junction Airport, the nearest National Weather Service (NWS) meteorological station, indicates that estimated doses will be reduced by approximately 60 percent or more with inclusion of these inputs.

In addition, several other conservative factors are integrated into the COMPLY-R code and were assumed in estimating the input values. Energy Fuels believes that this estimate is a worst-case scenario and does not expect the actual doses to be at this level. Factors that are anticipated to significantly reduce the exposure rate to the nearest resident include extensive bulkheading planned for the mine which are expected to reduce radon emissions from the mine by 14 to 60 percent (EPA 1984).

An action limit for radon-222 emissions will be developed that corresponds to a total estimated dose of 10 mrem/yr. This action limit will be dependent on the actual input factors in the COMPLY-R code. Based on the data used for this estimate, the initial annual radon emission action limit will be 1,100 Ci. The action limit is prorated based on the radon emissions input and dose estimate output of a COMPLY-R model. For the calculation below, the action limit is based on the radon emission rate in Year 10 (2,000 Ci/yr) and the dose estimate for Year 10 (18.5 mrem/yr). This is show graphically and in the calculation below.



Action Limit = RL (mrem/yr) x E (Ci/yr) / DE (mrem/yr)
= 10 mrem/yr x 2,000 Ci/yr / 18.5 mrem/yr
= 1,100 Ci/yr

Where:
RL = Regulatory Limit (10 mrem/yr)
E = Radon-222 Emission Rate used in COMPLY-R modeling
DE = Dose estimate to receptor from COMPLY-R modeling

The action limit will be adjusted prior to and during mine operations to represent actual conditions such as wind speed and direction, physical properties of exhaust vents and ventilation characteristics.

Radon-222 emissions from the mine will be evaluated on a weekly basis during operations. If the radon-222 emissions are on track to exceed the action limit, modifications will be made to reduce emissions below the action level and/or reduce the total estimated dose, in effect increasing the action level (see Section 5.5).

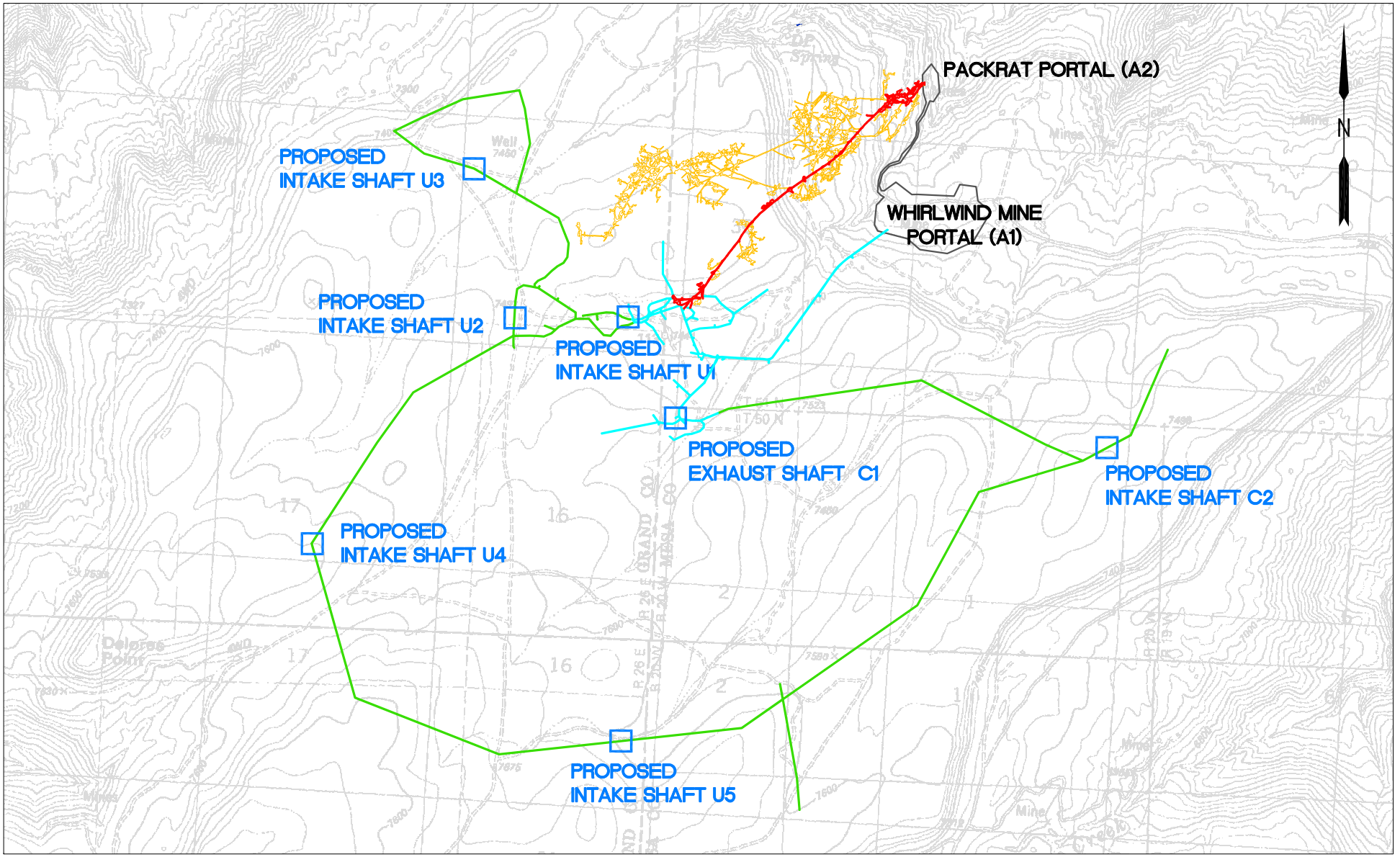
4.5 Abnormal Circumstances

Abnormal circumstances may occur in the mine such as placement of the mine on standby or ceasing of ventilation due to planned maintenance or mechanical failure. As evidenced by the radon-222 emission records in Table 1 for the Whirlwind Mine, reducing the ventilation rate or ventilation time reduces the total radon-222 emitted. This

Attachment 2

Location of the Proposed Vents

(Figure 7 from the Application)



LEGEND

- SURFACE FACILITIES AREAS
- CURRENT, PHASE I AND PHASE II DRIFTS
- PHASE III DRIFTS
- PACKRAT VENTILATION DRIFT
- PACKRAT MINE WORKINGS
- VENT SHAFT

0 2000' 4000'

Energy Fuels Resources Corporation

FIGURE 7

WHIRLWIND MINE VENTILATION PLAN
PHASE II - FULL BUILD-OUT

Scale	Created	Drawn by
1" = 2000'	December 1, 2010	ZTR

WW Mine ventilation drifts 113010.dwg