MINE OPERATIONS PLAN

PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

Submitted To
Colorado Department of Public Health and Environment
Radiation Management Program
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

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Units of Measure and Abbreviations

%	Percent
BLM	U.S. Department of Interior – Bureau of Land Management
CDOT	Colorado Department of Transportation
CFR	Code of Federal Regulations
CMLRA	Colorado Mined Land Reclamation Act of 1976
cy	cubic yard
DMO	Designated Mining Operation
DOE	U.S. Department of Energy

DOGM	Utah Division of Oil, Gas and Mining
DRMS	Colorado Division of Reclamation, Mining and Safety
EA	Environmental Assessment
Energy Fuels	Energy Fuels Resources Corporation
EIS	Environmental Impact Statement
ft	foot or feet
H:V	Horizontal to Vertical
LHD	Loading-hauling-dumping
MSHA	Mine Safety and Health Administration
NEPA	National Environmental Policy Act
TES	Threatened, endangered, and sensitive
tpd	tons per day
U_3O_8	Uranium Oxide
UDOT	Utah Department of Transportation
UMLRA	Utah Mined Land Reclamation Act of 1975
$U0_2$	Uraninite (pitchblende)
USDOT	U.S. Department of Transportation
USFS	U.S. Department of Agriculture – Forest Service
$USiO_4OH$	Coffinite
VOOH	Montroseite

1.0 Introduction

1.1 Mine Locations and Resources

The Piñon Ridge Mill site, owned by Energy Fuels Resources Corporation (Energy Fuels), is located in Montrose County, Colorado between the towns of Bedrock and Naturita, as shown on Figure 1.1, Colorado and Utah Mine and Exploration Properties. This figure also shows the location of Energy Fuels mine and exploration properties in the region, which extend over three counties in Colorado (Mesa, Montrose, and San Miguel Counties) and three counties in Utah (San Juan, Grand, and Emery Counties). Energy Fuels plans to supply ore to the mill, over its estimated 40-year operating life, from its mines and mines operated by other mining companies in the area. The mines will be predominantly underground operations and will range in size from small mines producing 25 tons per day (tpd) of ore to larger mines producing up to approximately 300 tpd of ore. Many of the mines are expected to operate for numerous years; however, some mines with limited resources will operate for only a short time.

Energy Fuels has identified 3.1 million tons of mineable uranium/vanadium resources at ten of its properties listed in Table 1.1, Energy Fuels Mine and Exploration Properties. These properties have the potential to supply all of the mill feed for 17 years at the mill's 500 tpd processing rate. Energy Fuels also estimates that there are an additional 5.7 million tons of uranium/vanadium resources at approximately 50 properties controlled by other mining companies in the region. The properties controlled by other mining companies are generally located in the same areas as Energy Fuels mine and exploration properties with the highest concentration of mines occurring in Montrose County. The 5.7 million ton estimate does not include uranium mines operated by Denison Mines (USA) Corporation (Denison), as ore from these mines is shipped to the White Mesa Mill in Blanding, Utah. The resource estimate also does not include mines in the area for which Energy Fuels does not have any verifiable information.

Energy Fuels is also conducting exploration at numerous properties through out the area in an effort to expand its resource base. The exploration program is being conducted at the 10 mine properties with identified resources listed in Table 1.1 and the 11 exploration targets also listed in Table 1.1. Both the mine and exploration properties are shown on Figure 1.1.

Initially, approximately 75 percent (%) of the mill feed will come from Energy Fuels mine operations and 25% from other mining operations in the region. This supply ratio may change over time depending on a number of considerations, including availability of resources, ore grade, uranium price, and mine permitting. Energy Fuels will initially provide ore to the mill from the fully permitted Energy Queen and Whirlwind mines and from one or two smaller Energy Fuels mines that will be permitted and developed prior to mill startup. The Energy Queen and Whirlwind mines are projected to produce 62,500 and 50,000 tons of ore per year, respectively, which is equivalent to 64% of the 175,000 tons of ore that will be milled each year. As discussed above, approximately 25% of the ore is expected to come from mine operations in the area that are owned and operated by others, many of which are permitted or are in the process of being permitted. Energy Fuels has had discussions with a number of these mine operators; however, contracts will not be executed until the permitting and financing for the mill are completed.

The source of mill feed will change over the life of the mill as mines are mined out and others are developed and come on line. At any one time, there will be a number of mines or mine properties in various stages of regulatory permitting, development, production, and reclamation. The number of mines necessary to supply the annual ore requirement of 175,000 tons will vary over the life of the mill; however, in general, the mill will be supplied by two to four larger mines supplemented by three to five smaller operations. The larger mines will supply between 2,500 and 6,000 tons of ore per month. The smaller mines will supply from 500 to 2,500 tons of ore per month.

Mine production rates vary based on the amount of ore currently defined by drilling in the deposit, and in the case of existing mines that have production capability remaining, by the amount of mining that had previously taken place. The mines and mining areas that Energy Fuels has evaluated have ore resources ranging from 10,000 tons to over 1,000,000 tons.

As the mine production rates vary based on the factors discussed previously, so will the mine operating lives. Several of the larger mines will have mine lives in excess of 15 years. The smaller mines, which have ore resources of 10,000 tons, will likely only operate for several years before being closed and reclaimed.

1.2 Regional Geology

The uranium-rich Colorado Plateau province covers nearly 130,000 square miles in the Four Corners region as shown on Figure 1.2, Principal Uranium Deposits & Major Structures of the Colorado Plateau. The Whirlwind Mine, Energy Queen Mine and most of the other properties currently held by Energy Fuels lie in the Canyon Lands Section in the central and east-central part of the Colorado Plateau in Utah and

Colorado. Rocks exposed in this part of the Plateau range in age from Precambrian through Quaternary; Mesozoic rocks predominate. The lower Paleozoic systems are thin and deeply buried. The strata are mostly flat lying except near salt diapirs and laccolithic intrusions where steep dips and numerous faults occur. Mesas and canyons characterize the area.

The lithology of the region consists of basement rocks including Proterozoic metamorphic rocks and igneous intrusions. The area was relatively stable and usually near sea level throughout the Paleozoic and Mesozoic Eras. During this time, uplifting, subsidence, and tilting resulted in the deposition of flat-lying sedimentary rocks, predominantly consisting of evaporites, limestones, marine clastic sediments, eolian sandstones, and fluvial detritus.

Major uranium deposits of the east-central Colorado Plateau principally occur in either of two paleo-fluvial sequences. The older sequence occurred at or near the base of the upper Triassic Chinle Formation. The younger sequence occurs in the Morrison Formation of late Jurassic age. The majority of the ore feed to the mill will originate from the Salt Wash member of the Morrison Formation; however, uranium deposits in the Chinle Formation and the underlying Cutler Formation in eastern Utah may also comprise some of the mill feed. While uranium occurs throughout the Colorado Plateau, there are numerous belts and districts where the uranium deposits are larger and more closely spaced than others. In addition to uranium, many of the Morrison Formation deposits contain considerable quantities of vanadium. Generally, the uranium deposits of the Chinle and Cutler Formations contain very little vanadium and contain more calcite, which results in higher acid consumption during milling. All of these deposits are located in sandstones with similar chemical characteristics, as discussed below.

1.2.1 Chinle and Cutler Deposits

Uranium deposits principally occur where the basal Chinle Formation is composed of channel sandstone and conglomerate that scoured into the underlying sediments. The channel system in southern Utah is referred to as the Shinarump Member. Farther north in eastern Utah, a younger channel system, known as the Moss Back unit, occurs in the basal member of the Chinle Formation.

Deposition of the Chinle Formation followed a period of tilting and erosion, and formed an angular unconformity with the underlying Permian aged Cutler Formation. Good uranium deposits occur in both the Chinle and Cutler Formations, where channel sandstones of the Chinle are in contact with sandstones of the Cutler Formation.

1.2.2 Salt Wash Deposits

The Salt Wash Member of the Morrison Formation consists of fluvial, fine-grained sandstones and mudstones deposited by meandering river systems across an aggrading, partly eroded plain with varying subsidence rates. The source area for much of the Morrison Formation was a magmatic arc highland to the southwest. The majority of the uranium production has come from the upper sandstones of the Salt Wash Member known as the Top Rim. The Brushy Basin Member of the Morrison Formation, which is located above the Salt Wash Member, was deposited on a large mud flat associated with lacustrine and fluvial environments. Sediments of the Brushy Basin Member originated from volcanic activity to the west. The Brushy Basin Member consists predominantly of mudstone.

1.2.3 Uranium and Vanadium Minerals

The primary uranium mineral is uraninite (pitchblende) (UO_2). Coffinite ($USiO_4OH$) also occurs, in minor amounts. Vanadium occurs as Montroseite (VOOH) as well as in vanadium clays and hydromicas. Where secondary oxidation has occurred, numerous vanadium and uranium oxides and uranium vanadates occur.

1.3 Types of Mines

Both surface and underground mining methods are used in the Colorado Plateau area to recover uranium and vanadium. However, underground mining is much more common in this region.

1.3.1 Underground Mines

Underground mining is the typical mining method utilized in the Colorado Plateau region. The underground process is utilized wherein the material of value (i.e., ore) is removed through a process that leaves the host rock in place. The process involves exploration, planning and permitting, mine development, shipping of the ore to the mill, and reclamation at the end of the mine life.

Most of the exploration is conducted using drill rigs; although given the small and variable nature of the uranium deposits, the drilling is typically not as extensive as that used to identify large deposits of precious or base metals. Once a viable deposit has been identified, engineering personnel design the underground mine and surface facilities. The design work is closely coordinated with the environmental staff to minimize environmental impacts. The environmental staff is also responsible for performing baseline studies and submitting the required permit applications to local, state, and federal regulatory agencies.

Mine development typically occurs by accessing the ore body or vein through a shaft, drift, adit, decline, or incline depending on the orientation of the ore body and its relation to the surrounding surface topography. The ore and waste, as necessary, is then removed by various mining methods. Different methods are utilized depending on the deposit characteristics. These characteristics include deposit type, host rock characteristics, grade, deposit size, deposit geometry, environmental factors, safety/regulatory factors, labor/political considerations, and economics. Some common underground mining methods utilized within the Colorado Plateau include random room and pillar, shrinkage stoping, and conventional cut and fill with slusher and jackleg. Random room and pillar mining using diesel equipment is the most common underground mining method in the region.

The ore is removed to the surface by small haul trucks, rail, or through headframe/hoist/skip arrangements. The ore is stored on the surface in a stockpile or storage bin. The ore is then loaded into highway haul trucks and shipped to local mills for extraction of the uranium and vanadium. Once mining of the deposit is complete, the mine workings are reclaimed in accordance with permit requirements.

1.3.2 Surface Mines

Surface mining, as the name implies, starts at the natural ground surface, and proceeds downward to the ore. Surface mining methods are utilized when the ore is at or near the surface. Surface mining is not extensively used in the Colorado Plateau region due to the small size of most surface deposits and because the majority of these surface deposits were mined prior to 1980. In general, surface mining tends to be less expensive than underground mining.

The mining process involves exploration, planning and permitting, mine development, removal of the uranium ore, shipping of the ore to the mill, and reclamation after the ore reserves have been exhausted. Some typical surface mining methods are open pit, strip mining, quarrying, auger mining, dredging and hydraulic mining. Most surface mines on the Colorado Plateau are open pit operations. A modified method of surface mining used in uranium extraction, but more common in oil and gas extraction, involves in situ leaching. In situ mining is uncommon on the Colorado Plateau, as the ore deposits in this region are typically not suitable for this type of extraction method.

1.4 Regulatory Requirements

Mining and mineral exploration activities in the United States are subject to multiple levels of regulatory oversight. In order to develop a producing mine, operators are required to meet technical and financial requirements and must acquire numerous regulatory permits from federal, state, and local government agencies. The mine and reclamation permits administered by the Colorado Division of Reclamation, Mining and Safety (DRMS) and the Utah Division of Oil, Gas and Mining (DOGM) are the primary permits required to operate a mine in the states of Colorado and Utah, respectively. Details of the various permits required at a local, state, and federal level are provided below and summarized in Table 1.2, Applicable Permits for Uranium Mines.

1.4.1 Local Permitting Requirements

A Special or Conditional Use Permit Application is typically required by the local municipality (county or city) where the mine is located. This application requests approval for the proposed land use and is essentially a zoning determination by the municipality. The municipality typically adds conditions to these permits to minimize the impacts on county/city residents and infrastructure. This may include road maintenance requirements, noise and dust suppression, lighting requirements, and hourly or daily operating limits. Municipalities also typically require building and septic system permits, access road designs, and control of noxious weeds.

1.4.2 State Permitting Requirements

The Colorado Mined Land Reclamation Act of 1976 (CMLRA) requires that any person planning to conduct prospecting or mining operations in Colorado file for a mine and reclamation permit with DRMS. In Utah, DOGM is responsible for administering the Utah Mined Land Reclamation Act (UMLRA) of 1975. Both agencies have similar rules and permitting processes. In Colorado, uranium mines with less than 10 acres of surface disturbance file a 110d permit application while mines with greater than 10 acres of surface disturbance file a 112d permit. In Utah, mines with five or less acres of surface disturbance file as small mining operations and those with greater than five acres of surface disturbance file as large mining operations. In general, the larger mine facilities are required to provide more detailed mining and reclamation plans than the smaller-sized operations. Colorado amended the CMLRA in 2008 to require uranium mines to file as designated mining operations (DMO). DMOs are required to prepare detailed Environmental Protection Plans and are subject to more frequent inspections by DRMS. Utah does not have a designated mining classification in their rules. Both Colorado and Utah require that a mine operator post a reclamation bond for the estimated cost of reclaiming the mine prior to issuing a permit.

In addition to the state mine and reclamation permit, mine operations are usually required to obtain state permits for air emissions, stormwater discharge, mine water treatment and discharge, and water wells. If the project is located partially or entirely on State Lands, the state land agency must also approve the project. Projects adjacent to state highways are required to obtain access permits from the state Department of Transportation. Table 1.2 provides a summary of the state permits along with the names of the administering agencies in Colorado and Utah.

1.4.3 Federal Permits

A permit must be acquired from the land management agency if the project is located partially or entirely on public lands administered by federal agencies. These agencies most often include the U.S. Department of Interior – Bureau of Land Management (BLM), U.S. Department of Agriculture – Forest Service (USFS), and the U.S. Department of Energy (DOE). Both the BLM and USFS require the submittal of a "Plan of Operations." The Plan of Operations is similar in content to the state mine and reclamation applications, but also includes additional information on the project's impact on natural and socioeconomic resources including historic and pre-historic sites, vegetation, wildlife, streams and wetlands, roads, and local communities. The DOE requires the mine operator to submit a "Mining Plan" that is similar in content to a BLM Plan of Operations. The Mining Plan is reviewed jointly by the DOE and BLM; however, the DOE is the lead agency and is responsible for conducting the impact analysis required under the National Environmental Policy Act (NEPA) and for issuing project approvals. All three land-managing agencies conduct periodic inspections of the mine sites under their jurisdiction.

If a federal land management agency or any other federal agency requires a permit for the project, the project must be evaluated in accordance with NEPA. For most mines, this requires the development and approval of either an Environmental Assessment (EA) or an Environmental Impact Statement (EIS) by the federal agencies. Resource studies are also typically done for socioeconomic impacts, cultural resources, wetlands, and threatened, endangered, and sensitive (TES) plants and wildlife to support the NEPA evaluation process.

Another federal permit that is often required at mine sites is a 404 permit with the U.S. Army Corp of Engineers for work within wetlands or waters of the United States (e.g., drainages, streams, rivers). Most other federal environmental laws and rules, such as those administered by the U.S. Environmental Protection Agency, have been adopted by states, and are administered by state agencies. In addition to the environmental regulations discussed above, the mine is also required to meet all the federal safety requirements established by the Mine Safety and Health Act of 1977.

The act established the Mine Safety and Health Administration (MSHA), which enforces Title 30 of the Code of Federal Regulations. This code specifically addresses safety rules in the mining industry. Compliance with these regulations includes mine inspections by MSHA and submittal of plans and health and safety information.

2.0 Underground Mines

This section provides additional detail regarding underground uranium mines including access, ventilation, mining methods, mining equipment, and surface facilities and infrastructure. Waste management and mine reclamation are discussed later in Section 4.0, Waste Management and Reclamation.

2.1 Mine Access and Ventilation

Underground mine sites in the region are, in most cases, accessed by established county roads. Smaller two-track exploration roads and access roads to power drops and ventilation shafts may also need to be constructed from time to time. Access into the underground mines is established by various means depending on the property ownership, depth and orientation of the mine ore body, and various other factors.

The primary access to the underground workings is established via a decline, incline, or adit (i.e., horizontal tunnel) in cases where the ore body is relatively shallow and other conditions provide the opportunity to create these types of access. These access types are usually constructed by drilling and blasting the rock and then removing the broken rock with underground loaders and haul trucks. The waste rock is hauled to the surface to the mine waste disposal area.

Sinking a vertical or angled shaft is another common method of accessing ore bodies, especially those that are located at greater depth. The shaft is excavated to the depth of the ore body and a headframe, hoist, mancage, and skip provide the means for moving personnel, materials, equipment, and ore/waste in and out of the mine. Shafts can be constructed using a large drill rig if there is existing access underground from which the drill cuttings can be removed; otherwise, shafts are constructed using drilling and blasting methods with the waste rock being removed by a hoist system.

Once the mine access is established, a series of underground drifts (i.e., tunnels) are constructed to create access to the ore body, establish ventilation, and to allow haulage of ore and waste to the shaft or out to the surface. The drift system must include a secondary escape access via either a second portal or another shaft to the surface. If another shaft is used, it also typically functions as a ventilation shaft that provides fresh air to the miners.

Mine ventilation is necessary to provide fresh air for the miners and to exhaust deleterious gases and particulates. Large fans are installed throughout the mine and on the surface to move air through the mine. Gases removed include exhaust gases from the vehicles as well as radon. Particulates removed include diesel particulate material and dust. Using air doors, bulkheads, auxiliary fans, and vent tubing, airflow is drawn into the mine workings where needed. Air is exhausted through vent holes or portals. This system supplies sufficient air for all working faces where miners are present. Working stopes are ventilated using auxiliary fans mounted upstream of their entrances. Ventilation borehole diameters range from 3 feet (ft) up to 14 ft.

2.2 Mining Methods and Equipment

Underground mining in the Colorado Plateau is typically accomplished through accessing the mine workings through either a portal or shaft. The ore tends to occur in “pancake veins” where the ore is close to horizontal in orientation. The random room and pillar mining technique is well suited to the thin and irregular ore deposits of the Uravan Mineral Belt because of its inherent flexibility and selectivity. In the random room and pillar method, flat to moderately dipping stopes are mined in a fashion that follows the ore and minimizes the excavation of waste. Pillars of differing sizes and shapes are left in random intervals and locations. In this method, ore recovery can be improved by preferentially placing pillars in waste. This differs from regular or classical room and pillar methods, whereby pillars are regularly spaced and have consistent sizes and shapes.

Room and pillar methods allow for the efficient recovery of ore and the minimization of waste and dilution by the use of highly selective mining methods. Using small, maneuverable, low-profile diesel-powered rubber-tired equipment in conjunction with “split-shooting” blasting techniques, ore can be mined with precision. Jackleg drills are the primary drilling equipment in the stopes. Like all labor-intensive operations, the room and pillar method is dependent on the skill of the stoping crew. A good crew can excavate a two-ft thick ore zone, with minimal dilution. While random room and pillar methods are less efficient than conventional methods in terms of productivity, the additional cost is more than offset by the improved grade.

Split-shooting is a blasting technique used to selectively mine thin seams of ore. It is a two-stage process. First, the ore is drilled, blasted and mucked. After the ore has been removed, the waste is then drilled, blasted and mucked to create space for advancing the mining equipment. The split-shooting method is more costly than conventional stoping because of the extra step of waste removal and attendant increase in cycle time. However, the selectivity of mining ore separately from waste provides a higher-grade product.

Historically, uranium mining in the Colorado Plateau was performed using jackleg drills, slushers and train-haulage. Train haulage was limited to near flat accessways. To reach the ore, miners were required to drive raises up to the ore and employ slusher-type equipment to move the ore. A slusher consists of a scraper pulled by wire ropes over a series of rotating drums. With the advent of diesel-powered haulage equipment, productivity was significantly improved. No longer were long, flat train haulages, or raises needed. Ore could be accessed directly from steeper inclines.

The mining cycle consists of drilling the ore and waste, blasting the rock with explosives, excavating the ore and waste, and hauling the excavated material to the surface or to the underground loading facilities that allow the material to be hoisted to the surface. Loading is typically accomplished with small, one (1) to three (3) cubic yard (cy), low-profile diesel-powered loaders. The loaders load low-profile diesel-powered underground trucks with capacities that range from five (5) to 15 tons. The drilling is accomplished with jackleg drills and/or drill jumbos.

Other activities associated with the mining process include mine maintenance, roof support, and utility work. The mine typically has a lube/fuel vehicle, mine lifts for access to the mine back (ceiling), utility vehicles for transportation of miners and materials, and surface support equipment. The mine typically employs a forklift or a front-end loader with lift attachment. Additionally, many mines have a small dozer for work on the mine dump and a motor grader for road upkeep and snow removal. Drills, maintenance equipment, and some pumps are powered by air; therefore, an air compressor is located either on the surface or underground. The equipment fleet varies by the size and production capability of the mine. In addition to the main ventilation fan, there are usually several small auxiliary fans and pumps for mine production support.

Table 2.1, Typical Equipment List, identifies the major equipment required for a medium to large size underground uranium mine producing approximately 50,000 tons of ore per year.

2.3 Surface Facilities and Infrastructure

Surface facilities at underground uranium mines have a relatively small footprint ranging in size from about 5 acres for a small mine up to about 30 acres for a larger mine. Topsoil and/or growth media is stripped from areas to be disturbed and is stockpiled on site for future reclamation purposes. Surface facilities include a small shop, office trailer, and an employee parking lot. Most underground mines also have a change house with showers and lockers for mine personnel. Cargo container boxes and/or semi-tractor trailers are typically used for storage. Gasoline and diesel fuel are stored on site in several surface tanks provided with secondary containment.

A raw water storage tank and potable water tank may also be located on the surface. In wet mines, raw water for drilling and other uses is usually stored underground in sumps. Explosives and primer magazines are located on the surface during initial development and sometimes remain in place during the life of the mine. However, underground magazines become more common as the mine expands in size. The surface facilities also have an electrical substation and, in cases where line power is not supplied, portable generators are utilized. An electric or diesel-powered compressor provides compressed air to the mine. Telephone service is provided by a landline or satellite communications systems.

The single largest structure at most underground mines is the waste rock disposal area or mine dump. Operation and reclamation of these facilities is discussed in Section 4.0, Waste Management and Reclamation.

An ore pad or ore bins are typically located near the portal or shaft. The surface area encompassed by an ore pad normally ranges from approximately 0.5 to 2 acres. Typically, high-grade and low-grade ores are blended to achieve a relatively uniform grade for shipping to the mill. If an ore pad is used, a front-end loader is present on site to load the ore transport trucks. If bins are used, the trucks load directly from the bottom of the bins.

The surface facilities also include surface water drainage controls that route stormwater runoff from undisturbed areas around the mine facilities and route mine water runoff to engineered retention structures. Wet mines have water treatment facilities to treat water that exceeds regulatory standards for water discharge.

The surface facilities supply compressed air, water, and power to the underground mine. Each mine usually has a surface storage area or lay down area for storing supplies, including ventilation tubing, air and water piping supplies, roof bolts, and other hardware such as spare fans, equipment, pumps, and spare parts. The mine has either a septic system or portable waste facilities on site. Additionally, if a headframe is utilized to remove ore and waste from the mine, a front-end loader and/or a truck are utilized on surface to transport ore to an ore pad and waste rock to the mine dump.

3.0 Surface Mines

This section provides additional detail regarding surface uranium mines including access, mining methods, mining equipment, and surface facilities and infrastructure. Waste management and mine reclamation are discussed in Section 4.0, Waste Management and Reclamation.

3.1 Mine Access

Surface mines are usually accessed via existing county roads. Wide haulage roads within the pit and waste dump areas allow for movement of ore and waste rock out of the pit. Smaller on-site roads provide access to the surface facilities and exploration drilling.

3.2 Mining Methods and Equipment

Surface mines incorporate open-pit mining methods to remove waste rock and ore using dozers, trucks, loaders, excavators, and shovels. The mining equipment selection is dictated by the geology, geometry, soils/rock conditions, the actual size of the deposit, and the production requirements. Any topsoil or growth media covering the overburden is removed to a designated storage area for use in future reclamation. Topsoil is also removed from the waste dump area prior to placement of waste rock.

Surface water diversions control stormwater runoff by channeling flow from undisturbed areas around the mine facilities. Stormwater runoff and resulting sediment from disturbed areas is collected in stormwater ponds.

Drilling and blasting is performed as necessary to break the overburden and waste rock into manageable sized pieces that can be loaded and hauled to the waste dump. Surface mines on the Colorado Plateau tend to be small open pits; therefore, once the overburden is removed, the ore zone is exposed and mined. If the ore consists of competent rock, it is drilled and blasted. Less competent rock can sometimes be broken by ripping with a dozer. The broken ore is loaded into a truck and transported either to an ore pad or to the mill. Ore can be hauled directly from the pit to the mill if the mine is located close enough or if the mine geometry allows direct loading of highway haul trucks. If an ore pad is utilized, ore is loaded from the ore pad into a highway truck and shipped to the mill.

Typical surface mining equipment used on the Colorado Plateau includes a surface drill, dozer, motor grader, front-end loader, excavator or shovel, haul trucks sized to match the loading equipment, and a water truck. Support equipment includes a lube/fuel truck, forklift, boom truck, maintenance vehicles, wheel-mounted compressor, small generator, pickup trucks, welders, portable light sets, and pumps.

3.3 Facilities and Infrastructure

The facilities at a surface mine typically consist of a shop/office facility, storage tanks for fuels and lubricants, and a substation for electric power required for the shop and facilities. A change house or dry may also be present. The mine has water storage capability for water supply and dust suppression, and telephone or satellite communications on site. If the mine uses explosives for blasting, there are powder and primer magazines located on site.

As discussed above, an ore pad may be constructed to temporarily store ore until it can be transported to the mill. As with the underground mines, the waste dump is typically the largest single facility on site and is placed close to the pit to reduce haulage distances. Additional information on waste dumps is provided in Section 4.0, Waste Management and Reclamation.

The surface facilities also include the stormwater control structures including ponds, culverts, surface water diversions and drainage ditches. Each mine site has a large parking area for the mobile equipment and mine vehicles and a parking area for employee vehicles.

4.0 Waste Management and Reclamation

This section provides an overview of the waste management practices at uranium mines including disposal of waste rock, treatment and discharge of mine water, and recycling of used oil and solvents. Standard mine closure and reclamation practices are also discussed.

4.1 Waste Rock Disposal

Waste rock is generated through surface and underground mining as the ore is segregated from the host and/or cover rock. The waste rock is removed from the mine and placed in a designated waste rock disposal area, commonly referred to as the waste dump. Historically, waste dumps were placed close to the mine portal, shaft, or open pit to minimize haulage without regard to the environmental impacts. In many cases, this resulted in placement of waste within drainages or on the steep sides of canyons where the dumps polluted water and could not be easily reclaimed. Although proximity to the mining area is still a major consideration for siting waste dumps, modern mines are designed so that the waste rock is placed outside of drainages and in flatter areas where surface water runoff can be controlled and the facility can be reclaimed appropriately.

Prior to the placement of the waste rock, the dump area is cleared and grubbed. Salvageable topsoil and/or growth media is removed and stockpiled for later use during reclamation. Waste rock is placed in the designated storage areas in lifts. The material is dumped on the flat dump area and then pushed with a dozer to create angle-of-repose side slopes and a level top surface. Compaction occurs as the rubber-tire trucks operate on the waste dump, creating a low permeability top surface. Safety benches and drainage benches are also incorporated into the design of the waste dump.

The haul road on top of the dump is sprayed with water and/or treated with a soil binding agent such as magnesium chloride to reduce fugitive dust emissions. In some cases, concurrent reclamation is also performed on portions of the dump that have reached their final configuration. Water diversion ditches are typically placed around the waste dumps to prevent off-site runoff from entering the disposal area and contacting the waste rock. Internal runoff from the waste dumps is contained within berms, ditches, and/or sedimentation ponds.

4.2 Mine Water Treatment

If groundwater enters an underground uranium mine or open pit at rates exceeding what the mine can use, the excess water is discharged to a nearby stream or drainage. Mine water at uranium mines on the Colorado Plateau may contain radionuclides and/or metals in concentrations above surface water discharge standards. In these cases, the water is treated to comply with state standards prior to discharge. Mine discharge can only commence following regulatory approval of the treatment process and discharge requirements. State regulatory agencies require a monitoring program designating the sampling tests, frequency, and reporting requirements.

There are various methods for mine water treatment, including membrane treatment, filtering, reverse osmosis, evaporation, resin column removal, and chemical precipitation. The treatment method is determined based on effectiveness and relative cost. Precipitation with barium chloride is a common method used at many uranium mines to remove radium and uranium from the water. The barium combines with the sulfate in the water to form barium sulfate, which then co-precipitates with the radium and uranium.

The specific water treatment facilities vary at each site. Lined ponds or tanks are used for storing the mine water and the water is pumped or fed by gravity through the treatment facility for treatment with the appropriate process. The treated water is analyzed for water quality parameters and subsequently released to the receiving environment in accordance with regulatory criteria. The quality of discharge water must meet state requirements to maintain compliance. In some locations, there are designated beneficial uses of the receiving water, which may include agriculture.

The waste generated from most water treatment plants at uranium mines is relatively low in volume because the constituents being removed are present in very low concentrations, typically parts per billion. As this material accumulates, it is processed or disposed of in accordance with applicable regulations. If the uranium content is high enough, it may be shipped to a mill for uranium recovery. Wastes with low contaminant concentrations are generally disposed of on-site in accordance with the approved reclamation plan. Treatment wastes with elevated contaminant concentrations may require disposal at an appropriate, approved landfill.

4.3 Recycling of Used Oils, Antifreeze, and Solvents

Used oil from maintenance activities is stored on-site in a used oil tank or 55-gallon drums depending on the size of the mine. Smaller and more remote mines generally use 55-gallon drums that can be transported to a recycling facility by pickup or flatbed truck. Larger mines commonly utilize a used oil tank, which is periodically emptied by a vendor using a tanker truck and vacuum line.

Used antifreeze is commonly transferred to 55-gallon drums or smaller containers and then transported to a recycling facility. Solvent stations are also used in some mine shops. These stations typically consist of a sink attached on top of a 35-gallon drum of solvent. The solvent is pumped into the sink for cleaning parts and then drains back into the drum after use. When the solvent becomes saturated with dirt and grease, the drum is replaced with a new drum of solvent. The used solvent is then transported to a recycling facility.

Used oil, antifreeze, and solvents are provided with secondary containment when stored on site in accordance with federal and state regulations.

4.4 Closure and Reclamation

Each mining operation has a reclamation plan that has been approved by the State and, if located on public land, the land management agency. Reclamation bonds are posted to ensure that financial mechanisms are in place to cover the costs associated with closure and reclamation in the event the owner becomes unable to do so. Mines can be placed in various stages of closure based on economics, regulatory requirements regarding closure, and the length of time that regulations allow for temporary cessation of mining. There are prescribed compliance requirements for each stage of closure.

Mine reclamation includes decontamination, demolition and removal or burial of mine structures, regrading of waste rock dumps and other disturbed areas, placement of topsoil and/or growth media, and seeding. Additionally, underground mine workings are sealed and high walls in open pits are reduced and/or blocked off from public access. These reclamation activities are summarized below.

- Decontamination: The ore pad and water treatment areas may contain elevated levels of radiation. These radioactive materials, which can be identified with gamma survey instruments, are typically excavated or otherwise removed and then either placed back in the mine workings or shipped to a mill for uranium recovery.
- Demolition: The mine structures, including foundations and concrete pads, are removed or demolished. Concrete and other inert material is broken up and buried on site. Other materials are either recycled or hauled to an appropriate landfill. Many of the smaller to medium-sized mines use trailers

and other portable equipment during operations, which can be easily mobilized off-site.

- Sealing of Mine Openings: Underground portals and shafts are, in most cases, sealed using concrete and steel bulkheads to prevent access by the public. After sealing, they are covered with soil and revegetated. In some instances, the underground openings are covered with metal bat gates. These gates are locked to prevent trespass, but have numerous openings, which allow bats to access and nest in the mine.
- Open pit mines vary substantially in configuration and reclamation varies considerably from one site to another. Common reclamation practices include blasting down and regrading high walls, backfilling to achieve positive drainage, and reclaiming and/or blocking access roads. Many open pits that have intercepted the water table have been successfully reclaimed as ponds or small lakes.
- Regrading and Ripping: The mine waste dump, ore pads, former building and water treatment areas, roads, and other mine features are graded to restore drainage through the site and create a more natural appearing topography that blends with the surrounding areas. Maximum slopes are typically limited to three horizontal to one vertical (3H:1V) or less steep to minimize erosion. Drainages may require riprap or other protection in steeper areas. Heavily compacted areas such as roads, storage pads, and the top of the waste dump are ripped to loosen the soil for subsequent placement of topsoil and/or growth media and seeding. On steeper areas, ripping is done along the topographic contour to minimize preferential erosion paths.
- Topsoil/Growth Media Placement and Seeding: Topsoil and/or growth media salvaged during mine development is used to cover the regraded areas. The soil is placed loose, then tilled and seeded. Extremely steep areas can be "pocked" using a hydraulic excavator. Pocking consists of making a series of depressions on the slope where water can collect and seed can more successfully germinate. A seed mixture suited to the area is used and is often based on recommendations by the Natural Resources Conservation Service. Federal land management agencies typically prefer seed mixes consisting of a variety of species native to the area. Seeding can be accomplished using a drill seeder or hydroseeder. Smaller, steeper, or rockier areas may be seeded using manual broadcast methods. Mulching with a weed-free hay or straw is also common. The mulch can be

spayed with a tackifier or manually crimped into the soil. Fertilizer is sometimes applied, but at relatively low rates given the semiarid nature of the Colorado Plateau. If available, trees, limbs, and large rocks may be spread over the reclaimed area to create a more natural appearance. Boulders are also useful in blocking future vehicle access that could damage the revegetated areas.

Mine reclamation is monitored by state and/or federal authorities as required. Reclamation performance standards must be met prior to release of owner liability. This tends to be a period of three to five years or longer following completion of reclamation activities.

5.0 Staffing Requirements

The Piñon Ridge Mill site will require mill feed from both Energy Fuels mines and mines owned and operated by other companies. The staffing level estimates for Energy Fuels mines, other company mines, and the truck haulage contractors are summarized below.

Energy Fuels will establish a mine management and support team, which will be based at the administration facility located at the mill site. Activities for the Energy Fuels mines and the supply contracts for other non-Energy Fuels mines will be coordinated from the administration facility. Table 5.1, Mine-Related Staffing Estimates, lists the projected staffing for both the Energy Fuels mine operations and other mine operations that could supply the balance of the mill feed. The staffing levels are based on Energy Fuels supplying 75% of the mill feed and other mining companies supplying 25% of the mill feed. A mine staffing level of 210 personnel is estimated for the combined staffs of Energy Fuels and other mining companies. The mining activities also include the delivery of 175,000 tons of ore per year to the mill site. Transportation of ore is provided by haulage contractors. Energy Fuels estimates that the haulage contractors will provide an additional 18 positions. Therefore, the total estimated mine-related staffing requirement is 228 personnel.

6.0 Ore Haulage

6.1 Ore Haulage Routes

The majority of uranium ore transported to the Piñon Ridge Mill Facility will arrive on Colorado State Highway 90, from either east or the west of the mill site. Additionally, some portion of the ore may come to the mill site directly from Monogram Mesa through the Cotter Corporation property located directly southeast of the mill site. Figure 1.1 shows the primary ore haulage routes from the mines to the Piñon Ridge Mill Facility.

Ore delivered from the west will primarily come from several mines in an area located just south and east of La Sal, Utah. Additional tonnage will come from the north on U.S. Highway 191 from its junction with I-70 and from the south on Highway 191 from mines located south of Monticello, Utah.

The route east of the mill will be used to deliver ore mined from the Monogram Mesa and Long Park areas via existing Montrose County roads connecting to Highway 90 roughly five miles east of the mill. Ore will be transported to Vancorum from the north via Colorado Highway 141 and then west via Highway 90 to the mill site. Ore from the north will be trucked from the mines to Highway 141 on existing Montrose County and Mesa County roads. Ore from the south will come through Naturita via Highway 141 and U.S. Highway 491. These highways are fed by numerous county roads located in both Colorado and Utah.

To better estimate potential traffic impacts associated with ore haulage, Energy Fuels developed a 40-year mill feed source of 7 million tons based on the ore resources currently identified on 10 of its properties plus 31 mines operated by others in the same region. The other mine properties were selected based on the general distribution of mine properties in the area with those mines closer to the mill given higher priority due to lower haulage costs. Mines with existing DRMS or DOGM permits were also accorded a higher priority. Denison mines were excluded from the analysis, as they ship their ore to the White Mesa Mill. Table 6.1, Potential Mill Feed Sources, provides a summary of the 10 Energy Fuels mine properties and the 31 selected mine properties operated by other companies. The 41 properties selected for the analysis represent approximately half the mine properties in the area with known resources.

Figure 6.1, Potential Sources of Ore Feed to the Mill, shows the location and distribution of the 41 mine properties used in the traffic analysis. Table 6.2, Piñon Ridge Mill Feed Zones, lists the direction from which mill feed will be delivered to the mill site as a percentage of the annual mill feed requirement (i.e., seven million tons). Appendix A, Traffic Impact Analysis, provides additional details regarding locations of ore feed sources, haul routes, and projected trip counts.

6.2 Department of Transportation Haulage Requirements

The U.S. Department of Transportation (USDOT) is the primary regulatory authority for uranium ore haulage. To allow for efficient interstate commerce, the Colorado Department of Transportation (CDOT) and the Utah Department of Transportation (UDOT) have adopted the USDOT regulations in their entirety. USDOT regulations for transport of radioactive materials are codified in Title 49 of the Code of Federal Regulations (CFR). Appendix B, Ore Transportation Plan, describes Energy Fuels procedures and methods for shipping uranium ore from a mine site to an off-site mill. A brief summary of the plan follows.

The uranium ore shipped will typically average 0.15 to 0.25 percent uranium oxide (U_3O_8). At these levels, uranium ore is regulated as a Class 7 radioactive material under the hazardous material regulations. Uranium ores and concentrates of uranium ores, because of their low specific activity are generally exempt from most packaging, marking, labeling, and placarding requirements of other Class 7 radioactive elements.

The ore is loaded into highway haul trucks with a front-end loader, taking precautions to avoid spillage and inhalation of dust during loading. Precautions are also taken to meet the road weight limit requirements and to minimize tracking of materials onto roadways.

Prior to hauling, the load is covered and each transport vehicle is surveyed for leakage and radiation. Shipping papers must be fully completed and in the possession of the driver. Records of the inspections and radiation scans for each shipment are maintained on site. The transport carrier is responsible for compliance with all applicable laws and adhering to established procedures and protocols during the transport of the ore from the mine to the mill.

Emergency response information is immediately available to all persons who transport or handle uranium ore. The transportation contractor is responsible for implementing the plan in the event of an accident that results in the spillage of uranium ore onto a public road.

Mining and carrier personnel are trained for the proper loading and transporting of uranium ore. The training includes basic radiation concepts, dust and contamination control, vehicle scanning requirements, exclusive use transport provisions, and emergency response contact and response information. Training records are documented and maintained on site.

Report Tables

Table 1.1
Energy Fuels Mine and Exploration Properties

Energy Fuels Mine Properties (3.1 Million Tons of Uranium and Vanadium Ore Resources)			
No.	**Name**	**County/State**	**Geographic Location**
1	Whirlwind Mine	Mesa, CO	Beaver Mesa
2	Torbyn Mine	Mesa, CO	Tenderfoot Mesa
3	New Verde Mine (C-G-26 and HC Group)	Mesa, CO	Calamity Mesa
4	C-G-27 Property	Mesa, CO	Outlaw Mesa
5	C-AM-19A Property	Montrose, CO	Atkinson Mesa
6	C-AM-20 Property	Montrose, CO	Atkinson Mesa
7	Farmer Girl Mine	Montrose, CO	Martin Mesa
8	Wilhunt Property	San Miguel, CO	Gyp Ridge
9	Energy Queen Mine	San Juan, UT	La Sal
10	Green River Properties	Emery, UT	San Rafael Swell
Energy Fuels Exploration Properties			
No.	**Name**	**County/State**	**Geographic Location**
1	Club Mesa and C-CM-24	Montrose, CO	Club Mesa
2	Cliffdweller	San Miguel, CO	Gypsum Valley
3	GVS	San Miguel, CO	Gyp Ridge
4	C-SR-16A	San Miguel, CO	Egnar
5	Spud Patch (Lynx joint venture)	San Miguel, CO	Egnar
6	Utah State Leases	San Juan, UT	Bean Fields (Sage Plain)
7	DAR Claims (Lynx joint venture)	San Juan, UT	Lisbon Valley
8	Redd Lease	San Juan, UT	La Sal
9	Hop Creek (Lynx joint venture)	San Juan, UT	La Sal Creek
10	Arths Pasture	Grand, UT	Seven Mile
11	Ethan Group	Grand, UT	Yellow Cat

Table 1.2
Applicable Permits for Uranium Mines

Local Agency		Permit Type
Colorado	**Utah**	
Mesa County Montrose County San Miguel County	San Juan County Grand County Emery County	Special Use/Conditional Use Permit Access Permit Septic System Permit Building Permit Road Maintenance Agreement
State Agency		**Permit Type**
Colorado	**Utah**	
Colorado Division of Reclamation, Mining and Safety	Utah Division of Oil, Gas and Mining	Mine Permit and Reclamation Contract
Colorado Water Quality Control Division	Utah Division of Water Quality	Surface Water and Stormwater Discharge Permits Well Permits
Colorado Division of Water Resources	Utah Division of Water Rights	Water Rights
Colorado Air Pollution Control Division	Utah Division of Air Quality	Air Emissions Permits
Federal Agency		**Permit Type**
Bureau of Land Management		Approval of Plan of Operations
U.S. Forest Service		Approval of Plan of Operations
Department of Energy		Approval of Mine Plan
U.S. Army Corps of Engineers		404 Permit

Notes:
1) This list is intended to provide an overview of key regulatory requirements that would govern project implementation.
2) Additional approvals, permits, reporting and authorizing actions may be necessary.

Table 2.1
Typical Equipment List

Underground Equipment	Quantity
Diesel LHD's, 1.5- and 3-cy capacity	2 – 3
Diesel Mine Trucks, 5- and 12-ton capacity	7
Development Drill, Jumbo	1
Production Drills, Jacklegs	8 – 10
Exploration Drills, Longhole	1 – 2
Diesel Boss Buggies and Utility Vehicles	8
Surface Equipment	**Quantity**
Front End Loader, 2- to 3-cy capacity	1
Backhoe/Skid Loader or Excavator	1
Highway Haul Trucks, 22- to 24-ton capacity (provided by haulage contractors)	2 – 8
Bulldozer	1
Motor Grader	1
Flat-Bed Truck, 1-ton capacity	1
Pick-up Truck, ¾-ton capacity (4wd)	2

Table 5.1

Mine-Related Staffing Estimates

Energy Fuels Mining Staffing	
Employment Type	**Quantity**
Management / Support	18
Field Supervision	6
Field Labor	134
Subtotal	**158**
Non Energy Fuels Staffing	
Employment Type	**Quantity**
Management / Support	4
Field Supervision	2
Field Labor	46
Subtotal	**52**
Total Staffing	**210**

Table 6.1 Potential Mill Feed Sources[1]					
Energy Fuels Properties (3.1 Million Tons of Uranium and Vanadium Ore Resources)					
No.	**Name**	**County/State**	**Geographic Location**	**Permitted[2]**	**Distance from Mill (miles)[3]**
1	Whirlwind Mine	Mesa, CO	Beaver Mesa	Yes	65
2	Torbyn Mine	Mesa, CO	Tenderfoot Mesa	No	68
3	New Verde Mine (C-G-26 and HC Group)	Mesa, CO	Calamity Mesa	No	58
4	C-G-27 Property	Mesa, CO	Outlaw Mesa	No	54
5	C-AM-19A Property	Montrose, CO	Atkinson Mesa	No	31
6	C-AM-20 Property	Montrose, CO	Atkinson Mesa	No	30
7	Farmer Girl Mine	Montrose, CO	Martin Mesa	No	29
8	Wilhunt Property	San Miguel, CO	Gyp Ridge	No	45
9	Energy Queen Mine	San Juan, UT	La Sal	Yes	39
10	Green River Properties	Emery, UT	San Rafael Swell	No	134
Other Mine Properties (3.9 Million Tons of Uranium and Vanadium Ore Resources)					
No.	**Mine Name[4]**	**County/State**	**Geographic Location**	**Permitted[2]**	**Distance from Mill (miles)[3]**
1	Cone	Mesa, CO	John Brown Mesa	No	65
2	October (ore pile)	Mesa, CO	John Brown Mesa	Yes	69
3	Monogram JoDandy	Montrose, CO	Monogram Mesa	Yes	5
4	Monogram Mines	Montrose, CO	Monogram Mesa	Yes	9
5	Last Chance #3 & #4	Montrose, CO	Davis Mesa	Yes	10
6	Blue Streak	Montrose, CO	Bull Canyon	No	15
7	Return	Montrose, CO	Carpenter Flats	No	35
8	Tramp	Montrose, CO	Club Mesa	Yes	34
9	Club Mesa	Montrose, CO	Club Mesa	No	42
10	Sunbeam	Montrose, CO	Long Park	No	17
11	C-LP-21	Montrose, CO	Long Park	Yes	14
12	C-JD-5	Montrose, CO	Monogram Mesa	Yes	4
13	JD-6	Montrose, CO	Monogram Mesa	Yes	6
14	C-JD-7	Montrose, CO	Monogram Mesa	Yes	5

Table 6.1 (continued)

Potential Mill Feed Sources[1]

Other Mine Properties (3.9 Million Tons of Uranium and Vanadium Ore Resources) (continued)					
No.	**Mine Name[4]**	**County/State**	**Geographic Location**	**Permitted[2]**	**Distance from Mill (miles)[3]**
15	JD-7 Pit	Montrose, CO	Monogram Mesa	Yes	2
16	C-JD-8	Montrose, CO	Monogram Mesa	Yes	7
17	JD-9	Montrose, CO	Bull Canyon	Yes	18
18	SM-18/Wright Group	Montrose, CO	Spring Creek Mesa	Yes	27
19	CM-25	Montrose, CO	Club Mesa	No	30
20	J-Bird	Montrose, CO	Wray Mesa	Yes	32
21	Centennial	San Miguel, CO	Mineral Mountain	Yes	57
22	Burros/Ellison/Hawkeye	San Miguel, CO	Slick Rock	Yes	46
23	Dermo-Snyder	San Miguel, CO	Bean Fields	Yes	71
24	SR-13A	San Miguel, CO	Slick Rock	Yes	46
25	Ike No. 1 (SR-11)	San Miguel, CO	Slick Rock	Yes	81
26	Calliham	San Juan, UT	Bean Fields	No	75
27	Wilson-Silver Bell	San Juan, UT	Bean Fields	No	82
28	La Sal II	San Juan, UT	Big Indian	No	46
29	Velvet	San Juan, UT	South Lisbon Valley	Yes	79
30	Daneros	San Juan, UT	Red Canyon	Yes	177
31	#3 Decline (Big G)	Emery, UT	San Rafael Swell	No	131

Notes:
1) These 41 mine properties were used for the traffic analysis.
2) Permitted refers to whether or not the operation has a mine permit with either the Colorado Division of Reclamation, Mining and Safety or the Utah Division of Oil, Gas and Mining. The mines that do not have this permit typically have exploration or prospecting permits in place.
3) Distance from the mill is calculated based on travel over roads.
4) This list of mine properties does not include mines operated by Denison, as these mines ship ore to the White Mesa Mill.

Table 6.2

Piñon Ridge Mill Feed Zones

Location of Feed Zones	Percentage of Annual Mill Feed
West of Mill	42
Near Mill	17
East of Mill	41
Total	**100**

Report Figures

Appendix A

Traffic Impact Analysis

Appendix B

Ore Transportation Plan