WYW168184

PLAN OF OPERATIONS
SHEEP MOUNTAIN PROJECT
FREMONT COUNTY, WYOMING

Submitted to

BUREAU OF LAND MANAGEMENT

1335 Main Street

Lander, Wyoming 82520

www.blm.gov/wy/st/en/field_offices/Lander.html

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OCTOBER 2015 (Revision 4)

PREAMBLE

PLAN DISTRIBUTION

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NOTE: Appendix D is provided in loose-leaf three-ring binders (Volumes 2 through 9). Appendix D-3 is filed in a separate three-ring binder marked Confidential.

UNITS OF MEASURE AND ABBREVIATIONS

µR/hr	microroentgens per hour
%	percentage, percent
$	U.S. dollar
ALARA	as low as reasonably achievable
AML	WDEQ, Abandoned Mine Land Division
AMSL	above mean sea level
ANFO	ammonium nitrate and fuel oil
AQD	WDEQ, Air Quality Division
$BaCl_2$	barium chloride
BKS	BKS Environmental Associates, Inc.
BLM	U.S. Department of Interior, Bureau of Land Management
BO	Bosler soil map unit
BRS	BRS Engineering, Inc.
CAT	Caterpillar (Equipment)
CFR	Code of Federal Regulations
cfs	cubic feet per second
CU	Cushool soil map unit
CY	cubic yards
D	disturbance
dBA	decibels
DN	Drilling Notification
DOE	U.S. Department of Energy

UNITS OF MEASURE AND ABBREVIATIONS (CONTINUED)

DOT	U.S. Department of Transportation
EAI	Engineering Analytics, Inc.
EDM	electronic distance measurement
EIS	Environmental Impact Statement
Energy Fuels	Energy Fuels Resources (USA) Inc.
EPA	U.S. Environmental Protection Agency
eU_3O_8	radiometric equivalent U_3O_8
EXREFA	Extended Reference Area
ft	foot, feet
gpd	gallons per day
gpm	gallons per minute
H:V	Horizontal to Vertical
HAPs	Hazardous Air Pollutants
HDPE	high density polyethylene
HMA	Horse Management Area
hr (or HR)	hour(s)
H_2SO_4	sulfuric acid
in	inch, inches
IX	ion exchange
lbs	pounds
LF	linear foot
LHD	Load, Haul and Dump Underground Equipment (a.k.a., Scooptram)
LOM	Life of Mine

UNITS OF MEASURE AND ABBREVIATIONS (CONTINUED)

LQD	WDEQ, Land Quality Division
LWS	Lytle Water Solutions, LLC
M	million, e.g. $
mrem/yr	millirem per year
MSHA	U.S. Department of Labor, Mine Safety & Health Administration
Mt	million tons
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
NORM	Natural Occurring Radioactive Materials
N-P-K	nitrogen-phosphorus-potassium
NRC	U.S. Nuclear Regulatory Commission
NRCS	U.S. Department of Agriculture, Natural Resource Conservation Service
NRHP	National Register of Historic Places
ON	Onason soil map unit
ON-RV	Onason/Reclaimed Varient soil map unit
Pb-210	lead 210
pcf	pounds per cubic foot
pCi/g	picocuries per gram
Plan	Plan of Operations
plant	Process Plant
PLS	pure live seed
PLS	pregnant leach solution

UNITS OF MEASURE AND ABBREVIATIONS (CONTINUED)

PM	Particulate Matter
PM-2.5	Particulate matter less than or equal to 2.5 micometers in diameter
PM-10	Particulate matter less than or equal to 10 micrometers in diameter
PMP	Probable Maximum Precipitation
Po-210	polonium 210
PPE	Personal Protective Equipment
Project	Sheep Mountain Project
Ra-226	radium 226
RAI	Request for Additional Information
Real West	Real West Natural Resource Consulting
RMP	Resource Management Plan (BLM)
Rn-222	radon 222
RO	Rock River soil map unit
RSO	Radiation Safety Officer
SDS	Safety Data Sheet
SEO	State Engineer's Office
SF	square foot
SHPO	State Historic Preservation Office
SMCRA	Surface Mining Control and Reclamation Act
SOP	Standard Operating Procedure
SO_4	sulfate
spoils	Overburden, interburden/waste material (i.e., unmineralized, or sometimes mineralized material that is not economical to process)
SWPPP	Storm Water Pollution Prevention Plan

UNITS OF MEASURE AND ABBREVIATIONS (CONTINUED)

SX	solvent extraction
TBD	to be determined
TENORM	Technically Enhanced Natural Occurring Radioactive Materials
Th-230	thorium 230
Titan	Titan Uranium USA, Inc.
TSS	total suspended solids
U_3O_8	Uranium Oxide
UIC	Underground Injection Control
USFWS	U.S. Fish and Wildlife Service
WDEQ	Wyoming Department of Environmental Quality
WGFD	Wyoming Game and Fish Department
WQD	WDEQ, Water Quality Division
WYPDES	Wyoming Pollutant Discharge Elimination System
XRF	X-ray fluorescence
Yellowcake	Uranium Oxide

1.0 PART 1 – BACKGROUND INFORMATION

This updated Plan of Operations ("Plan") has been prepared for the U.S. Department of Interior, Bureau of Land Management ("BLM"), in accordance with the regulations at 43 CFR 3809.401(b). In June 2011, Titan Uranium USA, Inc. ("Titan") submitted a Plan (BRS, 2011) to the BLM for the Sheep Mountain Uranium Project ("Project"). Subsequently, Energy Fuels Resources (USA) Inc. ("Energy Fuels") updated and revised the Plan in July 2012 (BRS, 2012b) and August 2013 (BRS and Energy Fuels, 2013). Herein, the Plan has been revised for consistency with the Major Revision to the Mining Permit (No. 381C), which was approved by the Wyoming Department of Environmental Quality ("WDEQ") Land Quality Division ("LQD") in July 2015 (WDEQ/LQD, 2015). As a prerequisite to approving or not approving the Project's Plan, the BLM must evaluate the environmental effects of the proposed action and prepare an Environmental Impact Statement ("EIS") in accordance with the National Environmental Policy Act ("NEPA"). The BLM issued the Draft EIS in January 2015 (BLM, 2015), and anticipates submittal of the Final EIS in early to mid-2016.

1.1 Operator Information

Project Name:	Sheep Mountain Project
Operator:	Energy Fuels Resources (USA) Inc.
Address:	225 Union Blvd., Suite 600
	Lakewood, Colorado 80228
Phone Number:	303-974-2140
Tax I.D. Number:	***CONFIDENTIAL***
Point of Contact:	Scott Bakken, Director, Permitting & Environmental Affairs

1.2 Project Location

The Project is located approximately eight road miles south of Jeffrey City, Wyoming, in Fremont County, Township 28 North, Range 92 West, in portions of Sections 16, 17, 20, 21, 22, 27, 28, 29, 32 and 33. Access to the Project site is via Crooks Gap Road (Fremont County Road No. 23) south from Jeffrey City or north from Wamsutter, Wyoming. This area lies approximately 62 road miles southeast of Riverton, Wyoming and approximately 105 road miles west of Casper, Wyoming in the Crooks Gap Mining District, an area of historical uranium mining development, the earliest of which dates back to the 1950s (refer to **Appendix D-2**, History of the Area). Little to no actual mining activity has taken place in the area since the late 1980s. Refer to **Map 1-1** (Project Location) and **Map 1-2** (Project Access).

1.3 Mineral and Surface Ownership

The Project is situated entirely within an active Permit Area (WDEQ Permit to Mine No. 381C) or Permit Area Boundary, which includes approximately 3,611 surface acres (approximately 5.6 square miles) of mixed ownership including 2,316 acres of Federal surface lands, 772 acres under State ownership, and 523 acres of fee lands. The Project area encompasses approximately 2,838 acres of Federal mineral estate, 637 acres of State mineral estate, and 136 acres of private mineral ownership.

Refer to **Appendix A** (Property Ownership), **Appendix B** (Adjacent and Nearby Ownership), and **Appendix C** (Legal Description of Permit Area) for detailed information on the property ownership and permit boundary area.

1.4 Project Summary

The Project consists of two distinct and independent mining areas, the Congo Pit and the Sheep Underground. The Project is designed to extract approximately 1.1 million to 2.0 million pounds of uranium per year from identified ore deposits using conventional open pit and modified room and pillar underground mining methods over the anticipated mine life. The currently planned open pit mine life is eight years, with an additional five years allotted for mine closure and reclamation. The planned underground mine life is 11 years based on currently identified mineral reserves. Mineral processing to produce uranium oxide ("U_3O_8" or "yellowcake") will occur either at an existing off-site mill (refer to **Map 1-2**), or on-site via development of a proposed processing facility using heap leach methods under jurisdiction of the U.S. Nuclear Regulatory Commission ("NRC"), or the Agreement State[1].

Open pit operations will commence upon full regulatory approval and following construction of the surface facilities. In the case of on-site processing, the processing facility will also be constructed upon full regulatory approval. Underground development and rehabilitation will be deferred for up to five years following commencement of open pit operations depending on financing and market conditions. In addition to mining and processing activities, Energy Fuels will continue to explore for, and identify, additional mineral resources and reserves on the Project site. Energy Fuels will perform interim reclamation of resulting surface disturbance throughout the mine life and final reclamation at the cessation of operations. Ultimately, the affected mine land will be restored to its approved, post-mining beneficial use (refer to **Appendix D-1**, Land Use). If constructed, the on-site processing facility, which is proposed to include heap leaching, is anticipated to continue for a period of time after the mines close, with reclamation commencing once processing operations are no longer economical.

[1] The State of Wyoming is currently working to become an Agreement State with the NRC. An Agreement State is a state that has signed an agreement with the NRC authorizing the state to regulate certain uses of radioactive materials within the state.

The existing site conditions and the construction, operation and reclamation phases of the Project are described in more detail in the following sections.

1.4.1 Existing Conditions

The Sheep Mountain area was extensively mined for uranium from the mid-1950s through the mid-1980s, but only limited site activity has occurred since that time due to a depressed uranium market. As shown on **Figure 1-1** (Sheep Mountain Existing Conditions), the Sheep I and Sheep II shafts and associated waste rock (i.e., "spoils") piles and access roads are still in place, although the head frames, hoists, and related facilities have been removed. The Sheep I and Sheep II vertical shafts are 1,909 feet ("ft") and 1,417 ft deep, respectively. Two declines and a small shop and dry (change house) are located within the area of the proposed NRC License Area. The twin declines slope downward at a 12.7 percent ("%") grade toward the top of the orebody; however, they do not extend all the way to the orebody. These existing declines would be sealed and the two buildings removed prior to construction of an on-site mineral processing facility.

Other existing mine features of note include the partially-backfilled and reclaimed Paydirt Pit and the adjoining reclaimed drainage in the northwestern portion of the Project area, and the McIntosh Pit Lake in the southwestern portion of the Project area. Thousands of linear feet of historical drill roads and pads and several smaller reclaimed mine facilities are also present within and surrounding the Project area. Underground mine workings are extensive in the Project area, especially within the more shallow deposits on the north end of the site. The deeper mine workings are currently flooded.

1.4.2 Construction Phase

Prior to the start of operations, an administration office, shop, warehouse, and guard house will be built on the west end of the site near the entrance to the Project. Ore mined from the open pit and underground operations will be blended and sized (crushed/screened) at the Ore Pad. The blended ore will then be trucked off site for mineral processing or transported to an on-site processing facility via an enclosed overland conveyor system.

For on-site ore processing, a processing facility consisting of a 40-acre heap leach pad and adjacent process plant will be constructed in the southwest corner of the site, north of the existing McIntosh Pit Lake. The heap leach facility would consist of a constructed pad covered with multiple synthetic liners. The heap leach pad would drain to lined solution ponds. The process plant would consist of either a solvent extraction ("SX") or an ion exchange ("IX") system and a precipitation and packaging system. Prior to the start of underground development, a mine shop and dry (i.e., change house) will be added in the Paydirt Pit area near the portal to the new double-entry decline. **Figure 1-2** (Sheep Mountain During Operations) shows the locations of the proposed mine buildings, overland conveyor, heap leach

pad, and process plant. Approximately 87 acres of surface area would be disturbed in constructing the heap leach facility and process plant. The majority of the area has been previously disturbed (new disturbance is approximately 28 acres). Access roads and utilities for the mine and processing facility are either existing, or will generally be constructed internally within the proposed disturbance areas for the mine and processing facility.

1.4.3 Operations Phase

The uranium deposit dips from north to south, meaning that the ore is located relatively close to the surface on the north side of the site and becomes progressively deeper to the south. The shallow ore on the north end can be mined economically using open-pit surface mining methods at the Congo Pit. This will be done using scrapers, hydraulic excavators, and haul trucks. The ore will be hauled to the Paydirt area where it will be stockpiled on the Ore Pad for later transport to an on-site heap leach facility, or off site for processing. Spoils material will be temporarily stockpiled on the surface during the initial phases of mining, and sequentially backfilled within previously mined portions of the Congo Pit during later mining phases. To the extent practical, underground mine spoils will remain underground. Excess mine spoils from the underground operation will be backfilled and reclaimed with the Congo Pit spoils material. **Figure 1-2** shows the locations of the Congo Pit and temporary spoils piles.

The deeper ore in the southern portion of the site will be accessed by the aforementioned existing shafts plus two new declines that will be driven in a southeasterly direction from the Paydirt area to the bottom of the ore deposit. These declines will be 5,470 ft in length with a downward slope of 10%. Underground mining will consist of drilling, blasting, and mucking (i.e., excavating the ore) using standard underground mining equipment. The mined ore and a portion of the waste will be hauled by low-profile trucks and loaders to a conveyor located in one of the new declines where it will be transported to the surface. The ore will be stockpiled for transport to an on-site heap leach facility or to an off-site processing facility, while the waste rock will be placed as backfill in the Ore Pad area and Congo Pit. The Ore Pad will be used to stockpile ore from the underground and surface mining operations, and to accommodate a mine shop and dry/administration building for the underground operations, and portable trailers with meeting/lunch rooms and bathrooms for the open pit operations.

Ore will be processed on-site in a heap leach facility and/or transported to an off-site mill for processing. Ore processed on-site would be transported by overland conveyor from the Ore Pad to the processing facility where it will be stacked on the heap leach pad using a radial stacker. The ore is leached by applying a sulfuric acid solution over the top of the heap using low-flow emitters. The acid percolates through the stacked ore, dissolving uranium and other metals into solution. The metal-laden solution, referred to as pregnant leach solution ("PLS"), is then collected in lined ponds below the pad and pumped to the extraction circuit of the plant. The uranium is selectively removed from the PLS using an

organic or resin collector. It is then further concentrated using a stripping solution and sent to the precipitation and packaging system where a yellow uranium oxide product, better known as yellowcake, is produced. The yellowcake is packaged in 55-gallon, U.S. Department of Transportation ("DOT") approved drums and shipped out of state via truck to a conversion plant, which is the first step in converting the yellowcake into fuel rods for nuclear power plants. The process plant would also include a warehouse and shop, laboratory, offices, and dry.

1.4.4 Reclamation Phase

Generally, final reclamation activities include placing stockpiled spoils material into the mined-out open pit, properly plugging and abandoning ventilation shafts and access tunnels, regrading the land surface to approximate pre-mine contours, placing topsoil, and seeding the disturbed surface with native plant species approved by the appropriate regulatory agencies. At the cessation of open pit mining operations, Energy Fuels will return stockpiled spoils material to the Congo Pit and place topsoil over the disturbed areas prior to seeding for revegetation. To the extent practical, the underground mine spoils will remain underground and will be reclaimed within the underground workings. Any excess spoils from the underground mine will be reclaimed with the spoils from the Congo Pit. **Figure 1-3** (Sheep Mountain Reclamation) illustrates proposed reclamation of the site.

Decommissioning and reclamation of the heap leach facility and process plant would be conducted under the jurisdiction of the NRC. Equipment from the plant that can be cleaned to meet NRC release standards will be removed from the site. The remainder of the plant structure and equipment will be shredded or broken into smaller pieces and buried in the heap. The heap will be regraded and an engineered cover placed over the pad and ponds. Drainages will be rock armored, where necessary, and disturbed surface areas will be regraded, covered with topsoil, and revegetated where practical, or armored with rockfill. The reclamation plan will be designed to provide for long-term stability under the maximum probable precipitation event, earthquakes, and other extreme conditions.

Once disturbed areas have been regraded and reclaimed in accordance with the approved Reclamation Plan (refer to **Section 5.0**), Energy Fuels will continue to monitor vegetation, site stability, and groundwater quality until it can demonstrate that it has successfully reclaimed the affected land such that the post-mine land use is supported. Until then, the Project will be subject to review by regulatory agencies and a reclamation bond will remain in place. Upon approving final reclamation of the Project, the appropriate regulatory agencies will release the reclamation bond. In the case of an on-site processing facility, Energy Fuels will continue to monitor the site until the NRC approves a transfer of the land and title to the U.S. Department of Energy ("DOE") through their legacy program for long-term care and maintenance.

The State of Wyoming's Abandoned Mine Land Program is responsible for reclaiming lands disturbed prior to the passage of the Surface Mining Control and Reclamation Act ("SMCRA"), and not bonded for reclamation. The most significant mine-related disturbance at the Project site, with respect to Abandoned Mine Land ("AML") eligibility, is the McIntosh Pit. The McIntosh Pit is part of Mine Permit 381C, which was grandfathered, as the operation existed prior to implementation of the Environmental Quality Act. The reclamation requirements and consequent bond obligations for the pit have passed through successive mineral owners, and is now the responsibility of Energy Fuels. A reclamation plan has been developed by AML (refer to **Section 2.4.6**) for improved reclamation of the McIntosh Pit. Further, Energy Fuels released the portion of the Project's reclamation bond that was designated for reclamation of the McIntosh mine spoils to AML to assist with their reclamation of the pit (**Section 5.0**).

AML has previously reclaimed other pre-law areas of the Project site, including the Paydirt Pit and the Seismic Shaft. Additional areas of pre-law mine-related disturbance exist on site, including exploratory adits, small spoils piles, exploration cuts, and roads. AML has inventoried these areas, but they remain a low priority for reclamation under the current program. Energy Fuels has no outstanding reclamation responsibility for these pre-law disturbances.

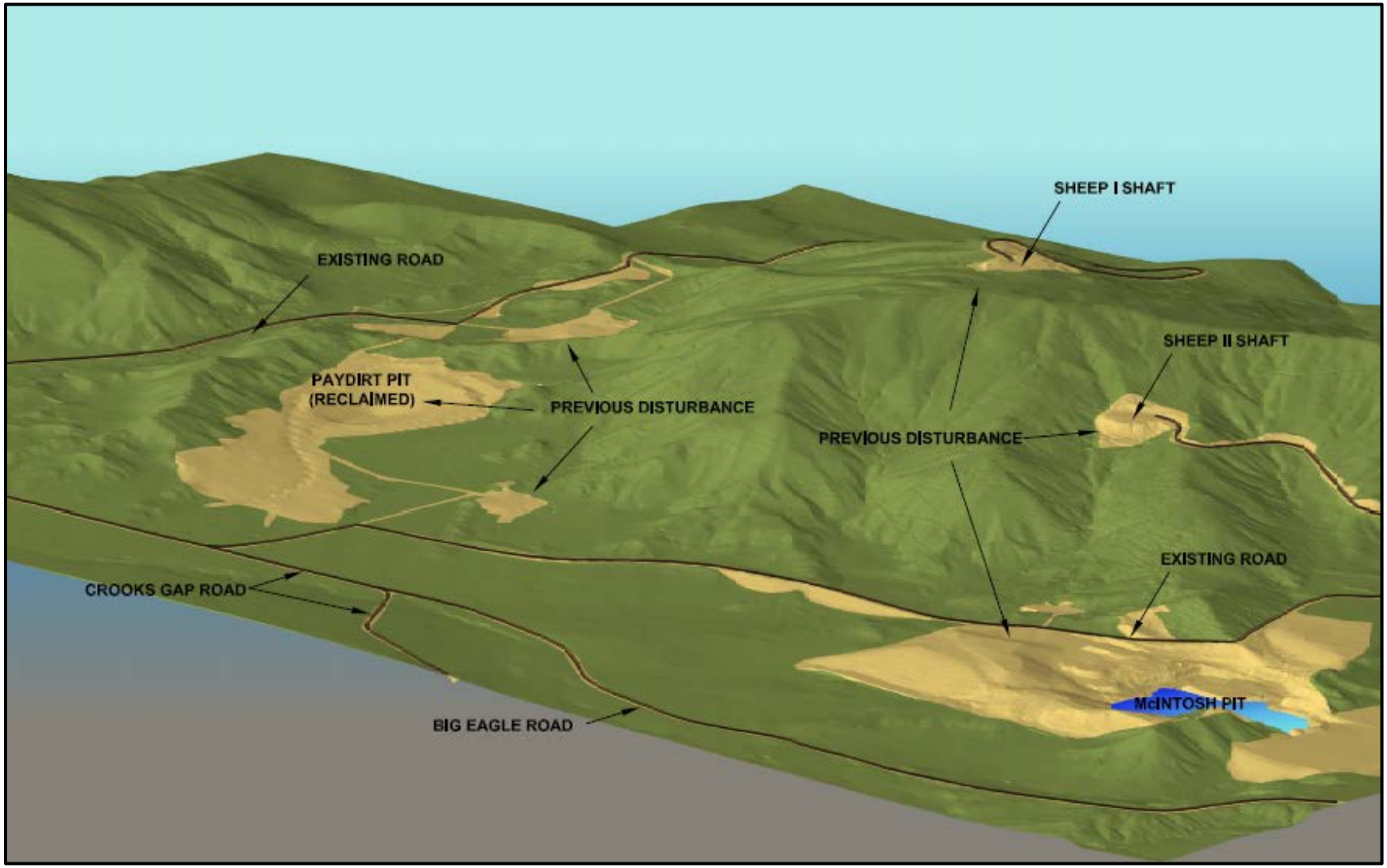


Figure 1-1. Sheep Mountain Existing Conditions (BRS, 2012b).

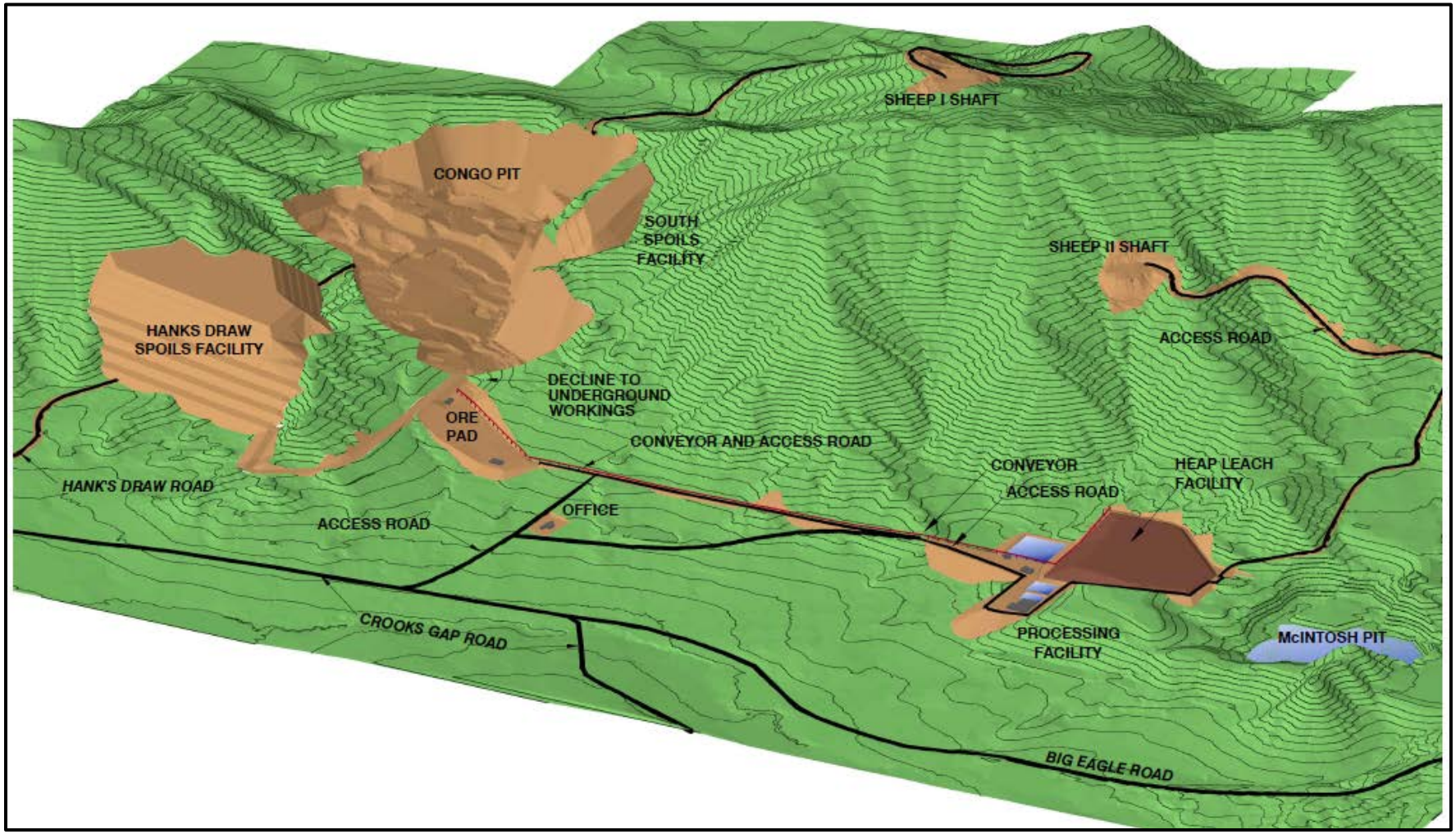


Figure 1-2. Sheep Mountain During Operations (With On-Site Processing).

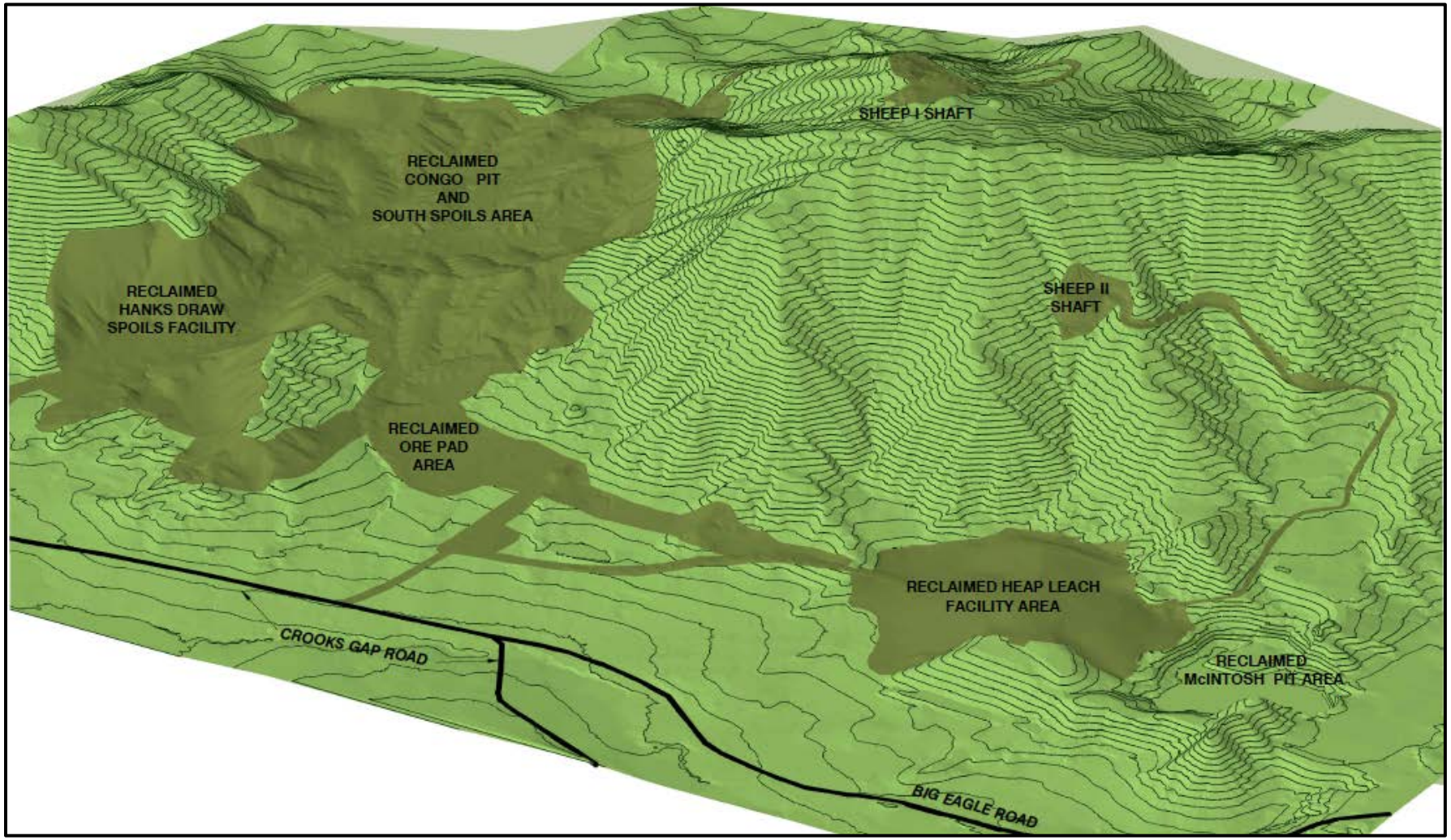


Figure 1-3. Sheep Mountain Reclamation (With On-Site Processing).

1.5 Project Permitting

Mining at the Project site began in the 1950s (refer to **Appendix D-2**, History of the Area). The first mine reclamation requirements in Wyoming were implemented in 1969 through the Open Cut Reclamation Act. Subsequently, in 1973, the Wyoming Environmental Quality Act was enacted, and in 1975, the first Rules and Regulations were promulgated under the 1973 Act. Thus, mine operations at the site were first licensed under the 1969 Open Cut and Reclamation Act and later permitted under the Wyoming Environmental Quality Act, with the issuance of the Mining Permit (WDEQ Permit to Mine No. 381C) to Western Nuclear in 1975. Over the years, the Mining Permit has been amended several times, and has remained in force and in good standing through a succession of owners, up to and including the transfer of the Mining Permit to Titan in 2009, subsequent name change to Energy Fuels Wyoming, Inc. in 2012, and transfer to Energy Fuels Resources (USA) Inc. in 2014. Additionally, the LQD approved a Major Revision to the Mining Permit (Energy Fuels, 2014a) in July 2015 to expand the surface and underground mining (WDEQ/LQD, 2015).

Following is a description of the permits and approvals required for full regulatory authorization of the Project. **Table 1-1** (Regulatory Permitting Requirements) lists specific permits required and the status of each. **Table 1-2** (Other Regulatory Requirements) lists other regulated aspects of the Project.

Table 1-1. Regulatory Permitting Requirements.

Permit	Government Agency	Regulated Aspect	Current Status
Mining Permit	WDEQ, LQD	Mining and Reclamation Plans	Permit No. 381C in good standing; Major Revision to Mine Permit approved 8 July 2015 (WDEQ/LQD, 2015).
Radioactive Source Materials License	NRC	All media, including air, water, soil, radiation, waste disposal	Energy Fuels may elect to prepare a License Application, which includes an Environmental Report and a Technical Report; EIS pending.
Approval of Plan of Operations, Federal Land Use	BLM	Surface Management of Public Lands (Federal)	Original Plan of Operations submitted in 2011, and subsequently revised; filed under case file WYW168184; Draft EIS published January 2015 (BLM, 2015); Final EIS pending.
Air Quality Permits	WDEQ, Air Quality Division	Air Quality	Air Quality Permit No. P0015550 to construct the mine granted in July 2015.
Storm Water Discharge Permit	WDEQ, Water Quality Division	Storm Water Runoff	Authorization to Discharge (No. WYR000285 effective 11 January 2013) under WYPDES General Permit WYR00-0000 (issued 19 October 2012 and expiring 31 August 2017).
Wyoming Pollutant Discharge Elimination System (WYPDES) Permit	WDEQ, Water Quality Division	Treated Mine Water	Draft WYPDES discharge permit (No. WY0095702) issued by WQD in August 2015.

Permit	Government Agency	Regulated Aspect	Current Status
Underground Injection Control (UIC) Permit	WDEQ, Water Quality Division	Mine Water (Treated, if Required)	In the future, Energy Fuels may apply for a UIC permit for operational flexibility.
Water Well Permits	State Engineer's Office	Well Installation	Though the State Engineer's Office no longer requires permits for monitoring wells, Energy Fuels has transferred the names of the existing monitoring well permits.
Water Rights	State Engineer's Office	Water Use and Consumption	Energy Fuels has water rights to appropriate groundwater for dewatering of the Sheep I Shaft and Sheep II Shaft. Energy Fuels submitted a water right application for dewatering of the Congo Pit in May 2015.
Potable Water System	EPA Region 8 WDEQ, Water Quality Division,	Drinking Water	Applications will be submitted at a later date.
Building Permits	Fremont County Planning Department	Building Design & Construction	Applications will be submitted at a later date.
Septic System Permit	Fremont County Planning Department	Septic Design & Construction	Applications will be submitted at a later date.

Table 1-2. Other Regulatory Requirements.

Government Agency	Regulated Aspect
U.S. Mine Safety and Health Administration and the NRC	Worker health and safety
U.S. Department of Transportation	Transportation of ore, process chemicals and processed yellowcake
U.S. Environmental Protection Agency	Regulation of radon emissions, spills or other containment issues
Wyoming Game and Fish Department	Protection of threatened, endangered and sensitive species
Wyoming State Historic Preservation Office	Protection of historic and prehistoric cultural resources
WDEQ, Solid and Hazardous Waste Division	Regulation of the use and disposal of solvents used in maintenance

1.5.1 Local Permits

A project development permit and building permits require approval by the Fremont Board of County Commissioners. Applications for these permits will be made after the permitting process with the State and Federal agencies is more advanced.

1.5.2 State of Wyoming Permits

New permits, amendments to existing permits, and various authorizations are required from state agencies as discussed below:

- **WDEQ, Land Quality Division (LQD):** Energy Fuels has existing permits to conduct exploration drilling, and to mine and reclaim the Congo Pit and the Sheep Underground mine. A revision to the existing Mining Permit was approved by LQD in July 2015 to expand the size of the open pit and underground operations (WDEQ/LQD, 2015). The proposed mineral processing facility and associated NRC License Area is excluded from the Mining Permit. Details regarding the current active permit with LQD follow:
  - Active Mining Permit: WDEQ Permit to Mine No. 381C
  - Mining Permit Number 381C approved 8/15/1975 – Western Nuclear Inc.
    - Amendment A-1 approved 12/2/1975 affected the permit area
    - Amendment A-2 approved 5/30/1978 affected the permit area
    - Amendment A-3 approved 6/29/1978 affected the permit area
    - Amendment A-4 approved 9/25/1981 removed the Split Rock Mill from the permit
    - Amendment A-5 approved 3/28/1983 affected the permit area
    - Transferred to U.S. Energy Corp. (then Crested Corp.) on 6/14/1988
    - Transferred to Uranium One on 6/25/2007
    - Transferred to Titan on 10/1/2009
    - Titan name changed to Energy Fuels Wyoming Inc. on 3/9/2012
    - Transferred from Energy Fuels Wyoming Inc. to Energy Fuels Resources (USA) Inc. on 3/17/2014
    - Major Revision to Mine Permit (Energy Fuels, 2014a) approved 8 July 2015 (WDEQ/LQD, 2015)
- **WDEQ, Air Quality Division ("AQD"):** Energy Fuels is required to obtain a construction permit from AQD for fugitive dust and other air emissions caused by mining and processing operations. The Air Quality Permit was granted in July 2015 for the surface and underground mining operations.
- **WDEQ, Water Quality Division ("WQD"):** Energy Fuels has a general storm water permit for the site and a Storm Water Pollution Prevention Plan ("SWPPP") in place. The SWPPP has been updated to encompass both the current conditions, as well as the new facilities and mining activities based on the Year 1 mine plan. Although the permit is issued by WQD, personnel from LQD are responsible for regulatory oversight of storm water discharges at mine operations. Energy Fuels anticipates the need for discharging mine dewatering water from the Project as excess water will be generated. Energy Fuels submitted an application to discharge treated mine water under the Wyoming Pollutant Discharge Elimination System ("WYPDES") Program, and the WQD issued a draft permit in August 2015. In the future, Energy Fuels may submit an

application for an Underground Injection Control ("UIC") permit to provide operational flexibility for management of excess water.

- **State Engineers Office ("SEO"):** As part of the permitting process, Energy Fuels is updating (where necessary) existing water rights, small dam permits, and water well permits. Furthermore, Energy Fuels has obtained new water rights associated with dewatering of the underground mine shafts (refer to **Appendix D-6**, Hydrology), and has applied for a water right for dewatering of the Congo Pit.

- **Wyoming Game and Fish Department ("WGFD"):** With the permission of the WGFD, water and fish samples were obtained from the isolated, man-made pond located south of the proposed NRC License Area (*Note: This pond has been called by several different names throughout this document, including Fish Pond, Western Nuclear Pond, and McIntosh No. 2 Reservoir*). These samples were analyzed for radionuclides to establish background levels for the NRC License Application. Fish samples were not taken from Crooks Creek because of the limited fish population in this creek. Specific permits from the WGFD are not needed based on the environmental baseline studies and surveys conducted to-date. WGFD has reviewed and commented on the BLM's Draft EIS in accordance with cooperative agreements between the two state agencies.

- **State Historic Preservation Office ("SHPO"):** The Permit Area has been surveyed for cultural resources and, at present, no enrolled National Register of Historic Places ("NRHP") cultural properties have been identified within the Permit Area Boundary (refer to **Appendix D-3** for more information). Several historic NRHP sites are located near the property, but the SHPO has ruled that the visual setting for these sites (i.e., the mining backdrop) is not a contributing factor to their eligibility.

- **Abandoned Mine Land Division (AML):** The AML commenced reclamation of the McIntosh Pit in July 2014. Though originally designated only for reclamation of the mine spoils associated with the McIntosh Pit (and not the pit itself), a portion of Energy Fuels' reclamation bond was released for AML's reclamation of the McIntosh Pit. Energy Fuels will also work cooperatively with the AML in providing access and coordinating activities on site. The McIntosh Pit is located entirely on private lands.

1.5.3 Federal Permits

In addition to approval from the BLM, the Project will require a Radioactive Source Materials License with the NRC (if on-site processing is pursued) and several permits with the U.S. Environmental Protection Agency ("EPA"), Region 8, as discussed below:

- **Nuclear Regulatory Commission (NRC):** Energy Fuels plans to submit a Radioactive Source Materials License application consisting of a Technical Report and an Environmental Report to the NRC for the proposed mineral processing facility. These documents will be reviewed on parallel paths by the NRC, which will issue Requests for Additional Information ("RAIs") when additional detail is required. Once the reports are deemed acceptable, the NRC will prepare an EIS and License Decision.

- **U.S. Environmental Protection Agency (EPA):** Energy Fuels plans to submit construction applications for radon emissions to the EPA for the Sheep Underground mine and the proposed processing facility in accordance with the National Emission Standards for Hazardous Air Pollutants ("NESHAPs"). Under the Clean Air Act, the modeled incremental radon dose to the nearest general public receptor (typically the closest residence) from an underground uranium mine must be maintained below 10 millirem per year ("mrem/yr"). New regulations for radon emissions from uranium processing areas have been proposed by the EPA, which could impact the processing facility design. The Sheep Underground mine application will not be submitted until later, as the underground portion of the Project will be deferred for one to five years after the start of the Project. EPA Region 8 is also responsible for reviewing and approving plans for the potable water systems at the mine buildings and at the processing facility, as well as the WYPDES discharge permit.

No known threatened, endangered, or sensitive wildlife species are present on site that would require consultation with the U.S. Fish and Wildlife Service ("USFWS") under the Endangered Species Act (refer to **Appendix D-9**, Wildlife). No threatened or endangered plant species or species habitats were found within the Project area (refer to **Appendix D-8**, Vegetation Inventory). However, two of the eleven BLM sensitive plant species have potential habitat within the Project area, the impact of which the BLM is assessing as part of the agency's EIS. These include the Limber Pine (habitat and individuals found within the Project area and proposed disturbance) and Rocky Mountain twinpod (only potential habitat was found).

1.6 Project Schedule

The Project schedule is dependent on several factors including permitting and licensing, as well as the uranium market and available financing. The Project will be constructed under a staggered development schedule. The surface mine (Congo Pit) would be developed sequentially to accommodate the desired mine production and allow for internal backfilling. Development of the underground mine would be deferred for up to 5 years after surface mining commences. If a processing facility is built in the Project area, its construction is expected to begin 6 months prior to development of the Congo Pit; however, Energy Fuels could elect to initially process ore off-site and construct the on-site ore processing facility at a later date. If Sheep Mountain ore is processed at an off-site mill, construction and rehabilitation activities are expected to begin three months prior to development of the Congo Pit.

Based on currently identified resources, the Congo Pit would operate for approximately 8 years, and the Sheep Underground Mine would have a mine life of approximately 11 years. Ore processing would continue for a number of years after the mines are closed. Reclamation of the mines and associated facilities would commence immediately after mine closure, and reclamation of the processing facility would commence as soon as processing is completed. The overall project life is anticipated to be 20

years from initial construction to final reclamation. The project schedule is not anticipated to change due to off-site processing.

After closure and reclamation are complete, monitoring of mine reclamation and water quality will continue until the LQD and BLM determine that the reclaimed areas meet the standards for full release. Monitoring of the reclaimed processing facility area will continue until the NRC, in consultation with the DOE, determine that this area meets the standards for transferring the property to the DOE for long-term care and maintenance. The post-reclamation monitoring period is expected to extend over a minimum of three years for the reclaimed mine areas and a minimum of five years for the reclaimed processing facility area.

1.7 Project Benefits

According to the current BLM Resource Management Plan ("RMP"), the Project is located within an area designated for industrial development and is easily accessible from Fremont County Road 23 (the Crooks Gap Road), which the RMP designates as an industrial access corridor. Development and operation of the Project will result in the efficient extraction of a valuable mineral resource.

1.7.1 Economic Benefits

Economic benefits of the Project include regional and local economic development, increased employment, and increased tax revenues. The Project will employ a mix of full-time personnel and temporary contractors throughout the life of the operation. During mining operations, approximately 210 full-time employees plus approximately 40 contractors will be required. It is likely that the majority of workers will live in Jeffrey City, Riverton and Lander, Wyoming, with the remainder possibly commuting from Rawlins and Casper, Wyoming.

1.7.2 Mine Reclamation Benefits

While there will be short-term environmental impacts from the proposed mining activities, lands disturbed or re-affected by the operation will ultimately be reclaimed to current standards. Re-affected areas would include historical drill roads and pads, mineshafts and vents, and mine subsidence disturbance.

1.7.3 Reduced Radiological Levels

Although not required by regulation for the mining areas, as a reclamation goal, Energy Fuels has proposed to limit radium-226 concentrations in the near surface soils/overburden to a maximum limit of 20 picocuries per gram ("pCi/g"), which equates to a gamma radiation level of approximately 70 microroentgens per hour ("µR/hr"); refer to **Appendix D-11** (Radiological Assessment). Where local conditions and factors such as the availability of cover and topsoil material affect the ability to meet this

goal, Energy Fuels will employ principals of "as low as reasonably achievable" ("ALARA"). Achieving this goal will lower surface radiological levels within the majority of the proposed disturbance areas including the Congo Pit, associated spoils facility areas, and the mineral processing area, which in many cases currently exceed 70 µR/hr.

1.7.4 Groundwater Hydrology

Water from dewatering of the Congo Pit and the Sheep Underground mine is anticipated to exceed the rates of consumption for mining (e.g., dust suppression) and on-site mineral processing operations, with the amount of excess dependent on whether or not an on-site processing facility is constructed. Energy Fuels plans to permit, construct and operate an on-site water treatment facility to enable discharge of excess water to Crooks Creek via a WYPDES discharge permit.

1.7.5 Surface Water

The reclaimed Paydirt Pit is a closed depression with a perimeter surface drainage diversion, lacking a surface outlet. Planned operations will partially backfill the reclaimed Paydirt Pit depression, reconnecting the surface drainage. Surface water runoff will be routed through the existing surface drainage channel constructed by AML during reclamation of the Paydirt Pit. This drainage channel is also anticipated to be used for discharge of excess treated water via the WYPDES discharge permit.

1.7.6 Land Use

Currently, the Project site is characterized as rural grassland with varied topography. In addition to mineral exploration and development, non-mining land uses include oil and gas production, stock grazing, crop production, transportation, recreation, and wildlife habitat (refer to **Appendix D-1**, Land Use).

Ultimately, the affected land will be restored to its approved, post-mining beneficial land use. While the post-mining land use will not change from the pre-mining use, historical surface disturbance within the mined area will be reclaimed. This will include regrading the surface to approximate pre-mine contours (where practical), replacing topsoil, and revegetating the disturbed surface with native plant species approved by the BLM and LQD. Reclamation conditions stipulated by the Mining Permit include, but are not limited to, establishment of vegetation, stabilization of the site with respect to erosion, and demonstration through monitoring that the groundwater system has returned to its pre-mine class of use. Revegetated areas will be compared to pre-established reference areas to measure the success of revegetation and to verify that the reclaimed lands have been returned to its pre-mine land use.

2.0 PART 2 – EXISTING SITE CONDITIONS

As discussed in **Appendix D-2** (History of the Area), the Sheep Mountain area was extensively mined for uranium from the late 1950s through the mid-1980s, but only limited site activity has occurred since that time due to a depressed uranium market. **Map 2-1** (Project Overview) provides an overview of the Project area for reference purposes. The "Permit Boundary" shown on **Map 2-1** represents the "Permit Area" currently approved and bonded for mining operations by the Wyoming Land Quality Division (LQD). The terms "Project area" and "Project site" (or "site") are synonymous with Permit Area when used in this Plan. The following subsections discuss specific noteworthy matters regarding existing site conditions.

2.1 Surface Disturbance

Table 2-1 (Estimates of Proposed Surface Disturbance) provides a summary, itemized by facility type, of the estimated surface area to be disturbed during construction, operation, and reclamation of the Project as currently designed. **Map 2-2** (Surface Disturbance) shows the maximum limits of the planned surface disturbance. This map also shows areas of existing and historic disturbance. Of the total estimated 929 acres associated with the combined mining and processing areas, approximately 356.5 acres would be new disturbance, while 572.5 acres was previous disturbed (i.e., 62% of the proposed disturbance area has been previously disturbed). If ore produced at the Sheep Mountain mine is transported off-site for processing, the resulting site disturbance is estimated at only 723 acres. The majority of new disturbance is associated with the Congo Pit, the Hanks Draw Spoils Facility, and the proposed on-site processing plant.

Table 2-1. Estimates of Proposed Surface Disturbance.

Project Component	Total Proposed Disturbance (Acres)
Open Pit Operation	
Congo Pit	316
Spoils Facilities	222
Ore Pad Area	60
Open Pit Operation Subtotal	*598*
Underground Operation (no new disturbance)	
Ventilation Shafts	26
Declines (Portal Area)	0 (included in Ore Pad Area)
Underground Operation Subtotal	*26*
Ancillary Facilities	
Buildings	9
Roads (includes haul roads and overland conveyor)	90
Ancillary Facilities Subtotal	*99*
Processing Facility	
Processing Facility	206
Processing Facility Subtotal	*206*
Total Proposed Disturbance	*929*

Phased surface disturbance will occur over several years based on the uranium production rate, economic conditions, and the availability of mine construction equipment and personnel. Energy Fuels will perform land disturbance activities and interim reclamation activities sequentially to minimize the amount of surface disturbance at any one time.

2.2 Exploration Drilling

Uranium was discovered in Crooks Gap in 1953 and numerous (thousands of) drill holes have been completed at the Project site since that time. **Map 2-3** (Congo Drillhole Map) shows the location of the historic drill hole collars, location of collars of holes drilled from 2009 to 2011, and monitoring wells located within and adjacent to the projected Congo Pit limits. Most of the historic drill holes and associated access roads and pads completed prior to enactment of the Wyoming Environmental Quality Act and associated rules and regulations in the mid-1970s have not been reclaimed. Surface disturbance

caused by exploration activities conducted since then has been reclaimed, which includes 140 drill holes completed over the 2009 to 2011 period.

Extensive historic drilling is associated with the Sheep Underground mine and the Sun-MC deposit (located between the McIntosh Pit and the Sheep Underground mine). **Map 2-4** (Sheep Underground Drillhole Map) and **Map 2-5** (Sun-MC Drillhole Map) present the locations of these drill holes. Numerous old drill roads and drill pads are present in these areas, as most of the drilling activity occurred prior to the implementation of Wyoming's mine reclamation program. No recent exploration activity has occurred in these areas.

2.3 Historical Mining

Western Nuclear conducted mining operations at the site beginning in 1956 with the first ore shipped in 1957 to the company's Split Rock Mill located in Jeffrey City, Wyoming. Earlier operations in the 1950s and 1960s included the Seismic open pit and underground mines, the Reserve underground mine, the Paydirt open pit and underground mines, and the Golden Goose underground mine. Other smaller operations active during this period included the Snoball, Heald, Congo, and Incline mines. Early mining operations, which were not operated by Western Nuclear, shipped extracted ore to the Susquehanna Western Mill located near Riverton, Wyoming. In the early to mid-1970s, the McIntosh open pit mine and the Golden Goose II and Sheep Mountain underground mines were started. **Map 2-6** (Historical Mine Workings) shows the extent of historic open pit and underground mining conducted at the Project site.

2.4 Reclaimed Areas

Over this long history of mining and related mine land reclamation, various portions of the Project have been operated and reclaimed under varying regulatory environments and to varying reclamation standards. **Map 2-7** (Reclamation History) illustrates the previously disturbed areas that have been reclaimed during each era and those that are currently bonded for reclamation.

Table 2-2 (Reclamation History, Reclaimed Areas) and **Table 2-3** (Reclamation History, Bonded Areas) accompany **Map 2-7**, and provide the associated acreages for each operating entity over the years along with a listing of the areas that have been bonded.

Table 2-2. Reclamation History, Reclaimed Areas.

Operating Entity	Disturbance Era	Reclamation Era	Acres
Reclaimed Areas			
Abandoned Mine Land	Pre 1977 (SMCRA)	1990-2009	215.2
Abandoned Mine Land	Pre 1977 (SMCRA)	2014-present	Note 1
Titan / Energy Fuels Wyoming, Inc.	Post 1973	2009-present	38.4
U.S. Energy Corp.	Post 1973	2003-2006	71.5
Western Nuclear Inc.	Post 1973	1979-1988	29.5
Western Nuclear Inc.	Pre 1973	Pre 1973	213.3
Total Reclaimed Area			*567.9*

Note:
1. AML is currently in the process of reclaiming the McIntosh Pit. The originally proposed AML reclamation area was 302 acres, though the current area comprises 262 acres. The McIntosh Pit reclamation area has not been included in the "Total Reclaimed Area", as reclamation is pending.

Table 2-3. Reclamation History, Bonded Areas.

Facility Area	Disturbance Era	Bond Status	Acres
Bonded Areas			
Sheep I Road	1975	Bonded	36.4
Sheep I Shaft	1975	Bonded	15.6
Sheep II Road	1975	Bonded	38.0
Sheep II Shaft (Note 1)	1978	Bonded	10.5
McIntosh Pit Spoils Pile (Note 2)	1973	Bonded	24.0
Big Sheep Decline	1993	Bonded	3.9
Power Line Right-of-Way	2011	Bonded	7.0
Total Bonded Area			*135.4*

Notes:
2. The Sheep II spoils pile (5.1 acres of the total) was reclaimed in 2011; bond release is pending.
3. Energy Fuels contributed a portion of the bond to the McIntosh Pit reclamation effort, with a remaining area of 24.0 acres outside of the AML project boundary.

AML has reclaimed much of the prelaw surface mining disturbance including the Paydirt Pit and the Seismic Shaft areas. The only remaining historic mine disturbance that AML plans to reclaim is the McIntosh Pit, reclamation of which commenced in mid-2014.

The areas currently bonded for reclamation include the two existing access roads into the site (acreage included in Sheep I Road and Sheep II Road), portions of the spoils piles associated with the McIntosh Pit, the roads to the Sheep I and II shafts, the Sheep I and II shafts and associated spoils piles, and the Sheep Decline area. The Sheep II spoils pile (5.1 acres) was reclaimed in 2011, but is still bonded with LQD for revegetation. Details regarding current mine reclamation commitments follow.

2.4.1 Existing Sheep Declines

This site work will include installing bulkheads at the portals, demolition of the adjacent small shop and dry, site regrading, replacement of topsoil and revegetation. Reclamation will be completed once the declines are no longer needed for access or ventilation.

2.4.2 Sheep I Cap

This site work, which included the installation of a permanent surface cap over the Sheep I Shaft, was completed in 2011. The cap includes access ports for monitoring and dewatering.

2.4.3 Access Roads

Portions of the existing access roads will be reclaimed and/or will be incorporated into the proposed disturbance area once mine operations commence, as follows:

- **Sheep I Road** (three segments totaling 36.4 acres):
  - Segment 1, Hanks Draw from Fremont County Road 23 to the pit (12.5 acres): The proposed Hanks Draw Spoils Facility will cover a portion of this road. The remaining road will be removed and reclaimed once it is no longer needed to support exploration and mining activities.
  - Segment 2, the portion affected by the Congo Pit (7.3 acres): Reclamation of this portion of the road is included with the pit. A new access road will be constructed along the south side of the Congo Pit for continuous access to the Sheep I Shaft, while internal access roads across the pit area will be maintained during operations (as feasible) and will be relocated as needed during pit operations.
  - Segment 3, the portion from the pit to the Sheep I Shaft (16.6 acres): This portion of the road will remain until the end of mining and final reclamation.
- **Sheep II Road** (four segments totaling 38.0 acres):
  - Segment 1, from the county road to the Project access control gate (3.1 acres): This portion of the road will need to remain until the end of mining and final reclamation.

- Segment 2, from the Project access control gate, south to the proposed NRC License Area (11.8 acres): Like Segment 1, this portion of the existing road will remain until the end of mining and final reclamation.
- Segment 3, existing road through the proposed NRC License Area (10.2 acres): Internal access roads through the processing facility area will be maintained and relocated as needed during operations, with reclamation of this segment to be included in the mineral processing facility reclamation (at a later date).
- Segment 4, from the proposed NRC License Area to the Sheep II shaft (12.9 acres): This portion of the road will need to remain until the end of mining and reclamation.

2.4.4 McIntosh Shop Area

In 2011, the mine shops were demolished and all material removed. In concert with this activity, although not required by the Mining Permit, the on-site solid waste facility was excavated and removed. Salable scrap metal was salvaged and other solid waste was properly disposed of off-site at the Fremont County solid waste facility.

2.4.5 Sheep I and II Shaft Areas

The currently-approved reclamation plan requires regrading and reclaiming the mine spoils in place after capping the mineshafts. The proposed mine plan will maintain the shafts for dewatering, mine ventilation, and emergency ingress and egress. Under the new proposed plan, a large portion of the existing mine spoils, including all of the low-grade ore stockpiles, will be removed from the surface while some mine spoils will be reclaimed in-place to allow regrading to replicate original contours to the extent practical, i.e., to achieve a stable reclamation configuration. However, final reclamation will not be completed until mining is complete at the Sheep Underground mine. In 2011, mine spoils from the Sheep II Shaft area were backfilled in the northern portion of the McIntosh Pit. Mine spoils at the Sheep I Shaft will be backfilled in the Congo Pit when a suitable backfill area is established. Stockpiled ore will be processed at the proposed on-site uranium processing facility, or off-site at another existing mill.

2.4.6 McIntosh Pit

The approved Reclamation Plan for the McIntosh Pit required Energy Fuels to reduce half of the existing highwall (northern and western sides) for access and allowed the remaining highwalls and groundwater impoundment to remain as a reclamation reservoir. AML determined that reclamation of the McIntosh Pit was eligible for its program, with the exception of the areas on the north side of the pit, which had a bond obligation. The bond obligation in that area was discharged through a cooperative agreement between Energy Fuels, AML and LQD. A portion of the north highwall was partially backfilled by Titan in 2011 using mine spoils removed from the Sheep II Shaft area. The remaining highwall reduction obligation, previously held by Energy Fuels, is being met by backfilling with material during AML's reclamation of the McIntosh Pit.

After considering several options, AML and its consultant, BRS Engineering, Inc. ("BRS"), have developed a design for the McIntosh reclamation project (BRS, 2013a and 2013b; BRS, 2014). Reclamation of the McIntosh Pit includes eliminating hazards posed by highwalls, steep piles and embankments by a combination of pit backfill, slope reduction, and site grading. The selected reclamation option is illustrated in **Figure 2-1** (Selected Option for McIntosh Pit Reclamation).

The most significant hazards on the McIntosh Pit reclamation project are the pit highwalls, e.g., the west highwall has significant tension cracks indicating potential highwall instability. Reduction of the highwalls will be accomplished by backfilling the pit with previously mined spoils material and cutting and filling the highwall areas to create a stable final reclamation surface.

Backfilling the pit to an elevation approximating the current water level will provide for a more stable hydrologic configuration, as well as provide opportunities for flow through drainage (while retaining an impoundment), and the creation of a dendritic drainage pattern. Eliminating exaggerated vertical relief at the site would also provide opportunities to construct a more natural and desirable geomorphic design. The reclamation design directs drainage to the location south of the pit, where the spoils would be removed from Quaking Asp Draw, and the combined drainage would discharge off site into Crooks Creek.

The spoils blocking Quaking Asp drainage have created a surface water impoundment known as the McIntosh No. 2 Reservoir (a.k.a., Western Nuclear Pond or Fish Pond). This pond currently collects surface water drainage from approximately 2,286 acres, allowing it to maintain a pool year round except in the most prolonged drought conditions. The pond supports aquatic life and is stocked by WGFD, providing recreational opportunities for anglers and a water source for livestock. Maintaining and enhancing this feature is a key aspect of the design for reclamation of the McIntosh Pit.

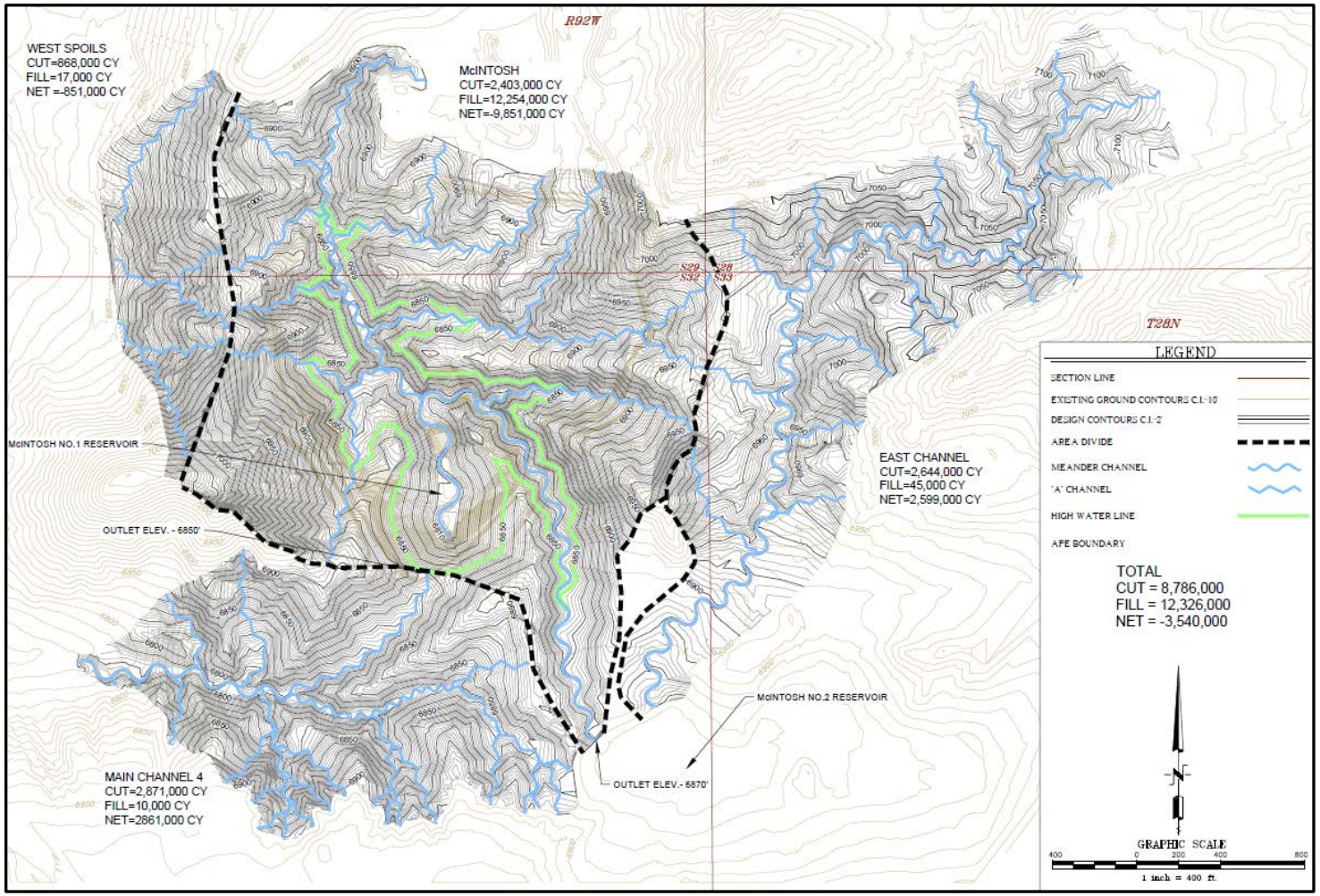


Figure 2-1. Selected Option for McIntosh Pit Reclamation (BRS, 2014).

2.5 Radiological Levels

Appendix D-11 (Radiological Assessment) of this Plan provides measurement of the current surface radiological levels. Current baseline radiological surveys, including gamma surveys correlated to equivalent radium-226 in soils, show elevated background levels of both Natural Occurring Radioactive Materials ("NORM") and Technically Enhanced Natural Occurring Radioactive Materials ("TENORM"). These elevated background levels are related to the local geologic setting and outcropping of mineralized material, and to the historical mining and mine reclamation activities.

2.6 Exploration and Historical Disturbances

Mineral exploration, historical underground shafts and vents, and mine subsidence have affected the existing land surface within the Congo Pit limits (both State and BLM lands). Although the mine plan (Energy Fuels, 2014a) depicts this area as new disturbance, historical exploration and mine development has affected the land surface.

2.7 Groundwater Hydrological Conditions

As documented in **Appendix D-6** (Hydrology), despite the long history of mining, much of which preceded modern regulations, existing groundwater quality does not show significant degradation from mining activity. In the vicinity of the McIntosh Pit, the pit lake and five surrounding wells (i.e., PZ-1 through PZ-5) have been monitored for water level and water quality since 1988. This includes the period from 1990 to October 2000 when the Sheep Underground mine was being continuously dewatered and the water was discharged into the McIntosh Pit. While the dewatering affected water levels in the pit, it did not affect water levels in the monitoring wells. Water quality in both the pit and monitoring wells remained stable and consistent. The only exception was a slight but general rise in radium-226 and uranium concentrations in the McIntosh Pit (Energy Fuels, 2013).

2.8 Mineral Processing Facility

Energy Fuels proposes to license, construct and operate an on-site uranium processing facility regulated by the NRC. The land affected by the proposed processing facility will be excluded from the Permit Area Boundary, which is regulated by LQD, once licensing is complete with the NRC. The mineral processing facility will be located predominantly on previously disturbed lands owned by Energy Fuels, with the final closure cover extending partially onto lands managed by the BLM. Energy Fuels has initiated a request to the BLM for a land swap to facilitate the transfer of these surface lands to the DOE for long-term care and maintenance following future closure of the facility.

2.9 Protection of Other Resources

As discussed in **Appendix D-1** (Land Use), uranium mining and exploration has been a dominant use of the land contained within the Project's mine permit boundary since the 1950s. If additional economic uranium resources are identified within the mine permit boundary, Energy Fuels will submit a revision of the Mine Plan to LQD that addresses additional expansion of the Congo Pit and/or Sheep Underground.

Mineral resources other than uranium have not been identified on-site, and, if present, are not of sufficient quantity to be considered economical for development. Although oil and gas development is prevalent in the vicinity of the Project, such development is not present on-site, as only one dry and abandoned oil well is present within the mine permit boundary.

With regard to protection of water resources in the area, the site is located within a limited surface water and groundwater basin. Groundwater discharge off-site is limited as the site essentially forms a closed basin due to the configuration and outcropping of the Cody Shale aquitard. Groundwater rights within the mine permit boundary are largely controlled by Energy Fuels, and dewatering within the site is anticipated to have limited influence off-site, as demonstrated by the results of groundwater modeling presented in **Appendix D-6** (Hydrology). Proposed mining activities will have a limited effect on the southern portion of the mine permit boundary, where surface water rights to the McIntosh Pit and McIntosh No. 2 Reservoir (a.k.a. Fish Pond) are controlled by others.

The Project is outside of the sage grouse core management area and big game crucial range areas, as discussed in **Appendix D-9** (Wildlife). The Project area coincides with two grazing allotments managed by the BLM; contains a small portion of the Green Mountain Wild Horse Management Area ("HMA") (i.e., 2,930 acres of the total 116,680 acres); and the BLM and private landowners have historically allowed big game hunting and fishing within and surrounding the Project area (**Appendix D-1**, Land Use). The Project will not be in conflict with these present land uses, as the mine reclamation plan seeks to return the mined lands to a condition much improved over its current condition. Also, as discussed in **Appendix D-3** (Archaeological and Paleontological Resources), no eligible cultural properties are present within the mine permit boundary.

3.0 PART 3 – CONSTRUCTION PLAN

3.1 Site Access and Utilities

3.1.1 Access Roads

Access to the Project site is currently from Crooks Gap Road via two access roads: the Hanks Draw Road and the Primary Access Road, as shown on **Map 3-1** (Site Access and Utilities). Both of these existing roads will remain in place through the construction period and the initial development of the Congo Pit.

Once the Congo Pit is in operation, the proposed Hanks Draw Spoils Facility will cover a portion of the Hanks Draw Road. As a result, the road will be reclaimed when it no longer provides beneficial access. The Primary Access Road will be extended to the Ore Pad, Congo Pit, and Sheep Underground portal area and a new road along the south perimeter of the pit will provide access to the Sheep I shaft. The new access road will be located within the disturbance limits of the open pit and will be relocated periodically as the open pit mining and sequential backfilling proceed.

Once inside the Permit Area Boundary, the Primary Access Road will also branch off to the south following its existing alignment providing access from the site entrance to the proposed processing facility. This existing road will also provide access to the Sheep II shaft from the processing facility. A new road will be constructed along the alignment of the proposed overland conveyor extending between the Ore Pad and the processing facility, if an on-site processing facility is constructed.

3.1.2 Utilities

The Project site currently has natural gas, electric, and telephone service as shown on **Map 3-1**. However, the proposed operation will require some upgrading and adaption of this existing infrastructure. The on-site buildings will be heated using natural gas.

Electrical power lines for the site currently run from Big Eagle Road through the proposed processing facility and then up a right-of-way corridor to the Sheep I and Sheep II shafts, as shown on **Map 3-1**. This line will come into the processing facility from a main line located along Big Eagle Road. Electrical power and natural gas for the administration office and other buildings located near the Project entrance will come either from the processing area or as a separate line into the site from Crooks Gap Road using existing rights-of-way. The decision on which route to take will be made during final design of the Project.

An existing groundwater pumping system installed at the Sheep I shaft will be used to dewater the underground workings. A new groundwater pumping system may also be installed, if needed, at the Sheep II shaft. Large submersible pumps will be installed in one or both of the shafts to dewater the

Sheep Underground mine and supply non-potable water for ore processing, dust suppression on the site roads, fire suppression systems, and washing equipment. Energy Fuels has secured groundwater rights associated with dewatering from the Sheep I and Sheep II shafts (refer to **Appendix D-6**, Hydrology), and has also evaluated dewatering requirements for the Congo Pit (refer to **Section 4.8.1**). These water sources will meet the Project's consumptive needs for dust control and mineral processing.

Potable water will initially be supplied by Jeffrey City Water and Sewer District via water trucks. Energy Fuels plans to ultimately procure the necessary permits to construct an on-site water treatment system to treat well water for potable use on site. Refer to **Section 4.8.4** for additional detail.

3.1.3 Site Security

Generally, the Permit Area Boundary will not be fenced but will be demarked with appropriate signage. However, access to the site will be controlled by barbed-wire fencing and/or gating at each defined point of ingress and egress and internally at the proposed NRC License Area with chain-link fence topped with barbed wire. Public access to the mine and ore processing facility will be controlled through a single entrance at the Primary Access Road via a guard shack manned during operating hours and gated at all other times. The Hanks Draw road will be gated and opened only as needed for deliveries (e.g., mine equipment, road materials), maintenance, and inspections. **Map 3-2** (Site Security) shows the location of the proposed guard shack and existing and proposed fencing.

U.S. Department of Labor, Mine Safety & Health Administration ("MSHA") and the State Mine Inspectors Office will regulate the mine facility. The NRC and MSHA will regulate the processing facility. Any persons wanting to enter the facility will be required to sign in and complete site-specific safety training as required by regulations. All visitors must don proper Personal Protective Equipment ("PPE") based on the specific area to be accessed. In addition to confirming safety training, all visitors accessing the radiation control sector within the NRC License Area will be subject to radiometric scanning prior to leaving the area. The entrance to the radiation control area will be through the processing facility's administration building, which will be manned during operating hours and locked at all other times.

3.2 Open Pit Development

3.2.1 Pit Construction

The open pit mine plan employs design parameters and mining equipment configurations similar to those used successfully in past operations. **Appendix D-5** (Topography, Geology and Overburden Assessment) includes earlier pit slope studies performed for the McIntosh South Pit and the Congo Pit (Abel, 1981; D'Appolonia, 1981), used as the basis for the Congo Pit slope designs. The Congo Pit design includes typical highwalls in the range of 100 to 400 ft high, with a maximum height of 600 ft in localized areas of the southeast corner of the pit. The highwall design is based upon the performance of past

projects in the Sheep Mountain and Gas Hills districts, and includes an overall highwall slope of 55 degrees [or 0.7 horizontal to 1 vertical ("0.7H:1V")]. This overall slope corresponds to a wall face slope of 0.5H:1V with a 10-foot wide safety bench every 50 vertical feet, as shown on **Map 3-3** (Mine Construction Details). Unlike the historic mine pits at the Project, which were designed to remain at the constructed configurations indefinitely, the Congo Pit will be progressively backfilled during operations (i.e., the pit slopes are temporary in nature), and completely backfilled to replicate pre-mine contours during final reclamation.

3.2.2 Pit Sequence

Due to the nature and extent of mineralization, the Congo Pit is essentially a single open pit that will be developed sequentially to accommodate the desired mine production rate and allow for internal backfilling throughout the pit development. This sequential excavation and internal backfilling schedule reduces double-handling (re-handle) of spoils material required to backfill and reclaim the mined pit during the Life of Mine ("LOM"). The host formation is exposed at the surface and dips to the southeast at between nine and 16 degrees, with the shallowest mineralized areas existing at the northwest corner of the pit. The overall mine sequence begins in the northwest area, where the access ramp will require less than 40 vertical feet to access the pit. As shown in concept in **Figure 3-1** (General Pit Sequence), 15 general areas will be mined in sequence. During development of these areas, the mine waste rock will be hauled to the Hanks Draw Spoils Facility and the South Spoils Facility. Subsequent pit extensions will utilize this same access, working within the pit floor at grades less than the dip of the formation. Designed ramp grades average four to eight percent and do not exceed 10%. **Section 4.0** discusses the pit sequencing in more detail.

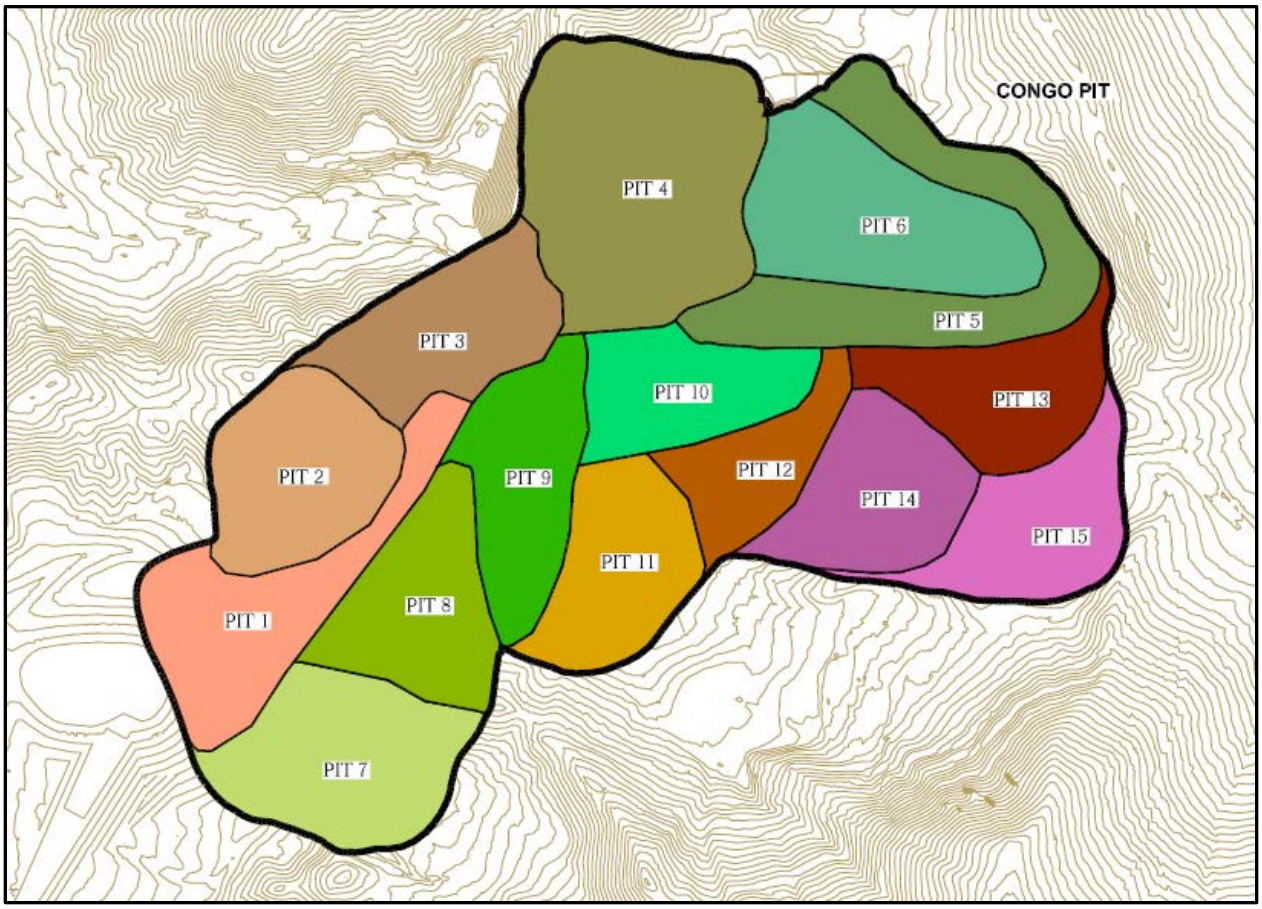


Figure 3-1. General Pit Sequence (BRS, 2012b).

3.2.3 Ore Pad

In conjunction with the initial development of the Congo Pit, an ore pad will be constructed just west of the pit at the existing, partially-backfilled and reclaimed Paydirt Pit and adjacent to the proposed Sheep Underground mine portals. Spoils material from the Congo Pit and local cut material will be placed in the Paydirt Pit to create a relatively level area where the pit access ramps daylight at an approximate elevation of 6,835 ft above mean sea level ("AMSL"). Additionally, the area to the west/southwest of the Paydirt Pit will be graded to extend this pad and create additional usable area. In aggregate, the total pad area (i.e., the Ore Pad) will provide approximately 49 acres to accommodate temporary ore stockpiles, the crushing/screening plant, mine buildings, shop and warehouse, a fueling station, the Sheep Underground mine portal facilities, a holding pond, a water treatment plant, and a haul truck ready line. Prior to constructing the Ore Pad, Energy Fuels will salvage and stockpile available reclamation soil from the undisturbed and previously reclaimed areas.

The Ore Pad design consists of backfilled spoils material overlain by compacted native soils covered with 3/8-inch ("in") minus diameter gravel. The pad grading and earthen berms constructed on the downgradient sides of the pad will serve to isolate and contain precipitation falling directly within the Ore Pad area, and direct runoff to a retention basin located at the internal low point. The berms and area grading will also function to keep upgradient, non-contact storm water (runoff outside of the pad area) away from the Ore Pad. **Map 3-4** (Ore Pad Area) presents the Ore Pad design.

3.2.4 Spoils Facility Construction

Ore will be hauled to the Ore Pad and spoils material will be hauled to the two proposed spoils piles; i.e., Hanks Draw Spoils Facility, located to the northwest of the Congo Pit in Hanks Draw, and the South Spoils Facility, located on the south edge of the Congo Pit footprint (refer to **Map 2-1**). Spoils generated by open pit and underground mining operations will be stored in an environmentally-sound, safe and secure manner in these temporary storage facilities. At full build-out, the Hanks Draw Spoils Facility and the South Spoils Facility will encompass a total of approximately 222 acres.

The spoils facilities will be constructed in a phased manner with vertical lifts of 50 ft or less and with safety berms around the pile perimeters. Spoils will be placed at the angle of repose (approximately 33 degrees) with minimum 10-foot wide set-back benches every 50 vertical feet to achieve an overall maximum slope of 1.7H:1V (i.e., 30.5 degrees). The lower lifts of the Hanks Draw Spoils Facility are designed at a flatter 3H:1V overall slope (i.e., 50-foot lifts at the angle of repose with a 75-foot wide safety bench) to enhance the stability. **Map 3-3** (Mine Construction Details) shows the proposed spoils placement configuration.

3.2.5 Haul Roads

The initial pit construction will create haul road access from the Congo Pit to the spoils facilities and Ore Pad. Two-way ramp and haulage routes are designed to be a minimum of 40 ft wide, with higher speed portions being 60 ft wide for safe passing. The equipment selected for the Project has an average width of 12 ft; therefore, these haul road widths provide ample space between opposing directions of travel.

The haul roads will be crowned and provided with ditches and berms to shed any direct precipitation quickly. Culverts will be installed to convey runoff from first and second order drainages that the haul roads cross. In accordance with MSHA regulations, berms reaching the midpoint of the wheel of the largest equipment on site will be constructed and maintained along the edge of the haul roads where a drop-off exists of sufficient grade or depth to cause a vehicle to overturn or endanger persons. Additionally, berms may be utilized to divide opposing lanes of travel and provide further protection against collision. **Map 3-3** provides a typical haul road section.

The haul roads will be surfaced with site-produced, 3/8-in minus diameter, sandy gravel to provide a surface that minimizes tire wear, is easily maintained, reduces fugitive dust emissions and does not become slick when wet. Full-time maintenance of haul roads will be performed with a motor grader. Off-road water trucks will provide water to aid in dust control and compaction of the road surfaces.

3.3 Underground Mine Development

Depending on market conditions, Energy Fuels will defer development of the Sheep Underground mine for one to five years following commencement of the Congo Pit operation. Deferral of the underground portion of the Project will allow for a gradual, phased expansion of on-site mine personnel and the gradual dewatering of the existing underground workings. Underground mine development will start with construction of twin declines from the Ore Pad (reclaimed Paydirt Pit area) to the base of the ore deposit. The new declines will extend approximately 5,470 ft at a 10% grade. A conveyor belt, installed in one of the two declines, will transport mined ore (and spoils, as needed) to the surface. **Map 3-5** (Sheep Underground Declines) presents the typical design parameters for the proposed declines.

The existing shafts (i.e., Sheep I and Sheep II shafts) will provide both emergency escape egress and ventilation, with exhaust fans mounted at both locations. Energy Fuels may also extend the two existing Big Sheep declines to the top of the ore deposit to provide additional ventilation and emergency escape egress or construct additional, smaller-diameter ventilation shafts.

An existing groundwater pumping system installed at the Sheep I shaft will be used to dewater the underground workings. A new groundwater pumping system may also be installed, if needed, at the Sheep II shaft. Energy Fuels has obtained water rights to appropriate groundwater from both the Sheep I and Sheep II shafts during operations (refer to **Appendix D-6**, Hydrology).

Prior to the start of underground production, rehabilitation of the existing workings is required. This includes establishing the ventilation system; cleaning up and re-bolting areas where ground conditions are poor; installing power, water, and compressed air lines; constructing haulage ways; and conducting long-hole drilling to delineate ore zones.

3.4 Processing Facility

Ore mined from the open pit and underground operations will be blended and sized (crushed/screened) at the Ore Pad. The blended ore will then be trucked off site for mineral processing at an existing mill (refer to **Map 1-2** for off-site mill access), or transported to the on-site processing facility via an enclosed overland conveyor system.

The general site layout and construction requirements for the processing facility (i.e., heap leach and process plant) is shown on **Map 3-6** (Processing Facility Layout). This area is private land owned by

Energy Fuels and a large portion of this area is occupied by the existing spoils pile from the McIntosh Pit. Any topsoil that can be salvaged in this area during construction will be stockpiled for reclamation. Topsoil from other areas or suitable soil salvaged from the mine excavations (see **Section 4.7**) will eventually be needed for reclamation of this area.

The heap leach pad area, which is approximately 40 acres in size, is proposed to be divided into six cells. The pad liner system will consist of multiple synthetic liners with two leak detection systems. The pad will be constructed by excavating the 40 acre area down to the design grade, as the pad will be built mostly below the existing ground surface with only the north facing portion of the pad daylighting toward the ponds and processing plant.

The foundation for the heap leach pad will then be built by compacting the existing foundation soil materials. A triple liner containment system, which incorporates two leak detection systems, will be installed on top of the prepared subgrade materials (Engineering Analytics Inc. ["EAI"], 2014). The proposed heap leach liner system is illustrated in **Figure 3-2** (Heap Leach Liner Detail). The lowermost layer (tertiary liner) will consist of a 60 mil high density polyethylene ("HDPE") Super Gripnet® drain liner as manufactured by Agru America (or approved equivalent) with spikes on the underside of the liner providing increased shearing resistance with the foundation soils, and drain studs on the top surface to provide drainage capacity for the secondary leak detection system. Above the tertiary liner, the secondary liner would consist of a 60 mil HDPE MicroDrain® liner as manufactured by Agru America (or approved equivalent) with Micro Spike® texturing on the underside (adjacent to the drain side of the tertiary liner), and drain studs on the top surface to provide drainage capacity for the primary leak detection system. By incorporating the drain liner, the need for separate drainage geonet layers is eliminated. Above the secondary liner, a 60 mil HDPE Micro Spike® liner would be installed as the primary liner, with texturing on both sides for increased frictional resistance. The rolls of liner material are joined together using heat fusion equipment. Leak detection sumps would be placed at low points between the primary and secondary liner, as well as between the secondary and tertiary liners. The sumps will be equipped with standpipes, which are used to access the sump for monitoring purposes and to pump out any collected solution. Collection pipes would be placed directly over the primary liner in order to enhance solution collection while minimizing solution head on the liner system. Above the synthetic lining system and collection pipe network, a minimum of 24 in (up to 36 in) of gravel overliner materials will be placed as both a drainage layer and a cushioning layer to protect the liner from damage by equipment.

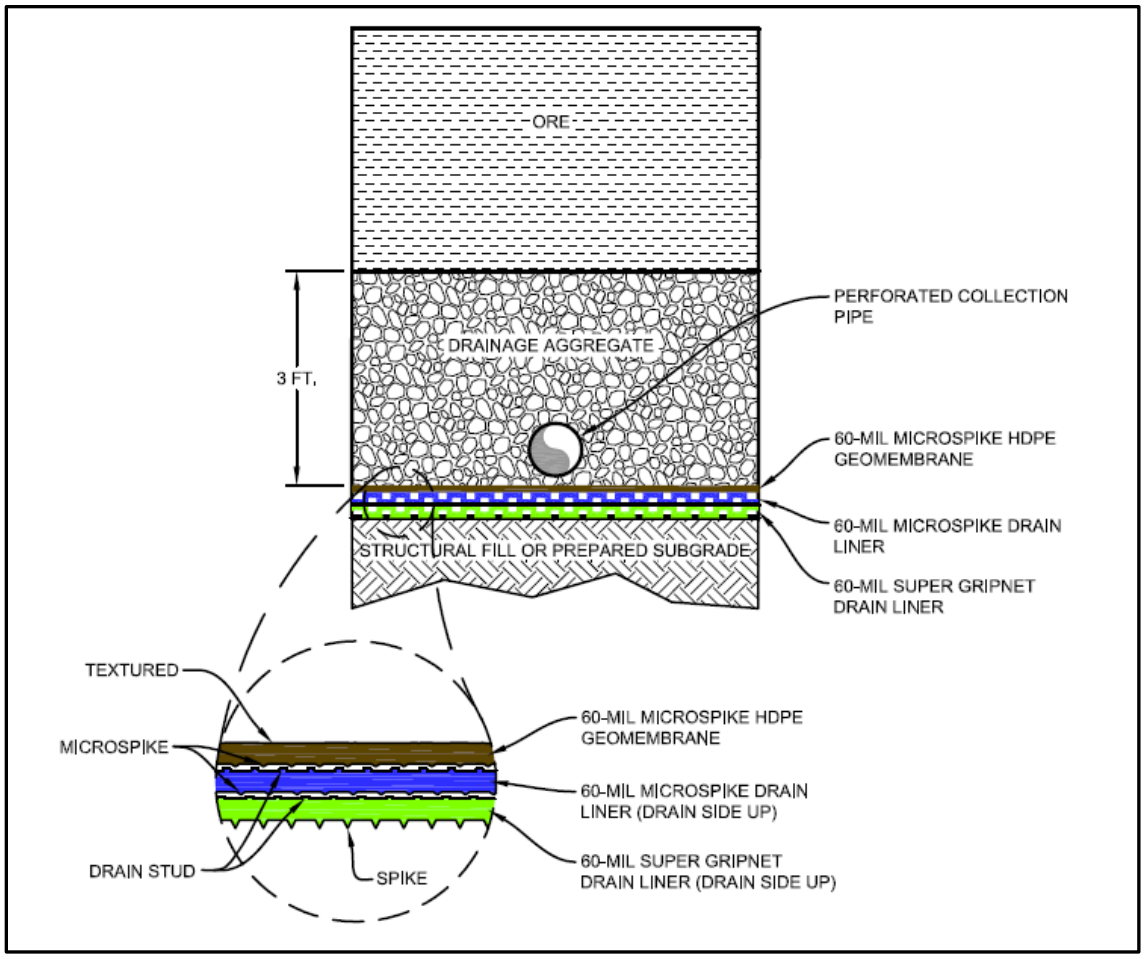


Figure 3-2. Heap Leach Liner Detail (EAI, 2014).

The Collection Pond, Raffinate Pond, and Holding Pond (shown on **Map 3-6**) will also be constructed in a similar manner to the pad liner. The pad liner will drain to the Collection Pond where the PLS can then be pumped to the Raffinate Pond for recirculation, or to the process plant for uranium recovery. As a point of clarification, the Raffinate Pond contains solution that has been processed to remove uranium and/or PLS that is not sufficiently concentrated in uranium to send to the process plant. Additional reagents are added to the raffinate prior to it being recirculated back to the heap for leaching. The Holding Pond is used to evaporate excess solutions and also serves as additional storage capacity in the event of a large precipitation event or upset condition in the heap or process plant.

The process plant or "plant" is defined as the buildings and systems that collectively are utilized to recover uranium from the PLS. The process plant will include two large buildings. Solvent extraction (SX) or ion exchange (IX) processing equipment will be located within one building and yellowcake recovery including precipitation, washing, drying, packaging, storing, and loading will be located within the

second building. Both buildings will be constructed on concrete pads with metal walls and roofing. The concrete pad will include curbs and sumps to allow for containment and cleanup of any releases of reagents or process solutions. The plant buildings will have aerial footprints of approximately 15,000 square feet and 20,000 square feet. In addition several other smaller buildings will be constructed at the process plant including an administration office and dry, a laboratory, a warehouse, and a shop. Tanks for storage of sulfuric acid, hydrogen peroxide, and other reagents will be installed outside the buildings near their point of use. Two water tanks, each with a combined storage capacity of approximately 500,000 gallons, will also be installed in this area. The buildings, tanks, and pond area will encompass approximately 14 acres of the total 87 acre processing facility.

Energy Fuels is in the process of determining whether SX or IX is the preferred method for recovery of uranium from the PLS. The SX system would consist of a large clarifier to remove larger particles from the PLS, polish filters to remove smaller particles, and a series of mixer-settler tanks where the solution will be mixed with an organic consisting mostly of kerosene with small amounts of an amine extractant and an alcohol phase modifier. Because of the large amount of organics used in the SX building, it will be equipped with a robust fire suppression system. The IX system would consist of a series of pressurized "down-flow" vessels that are internally screened to maintain the IX resin in place while allowing the PLS to flow through the vessel. Once the resin becomes loaded with uranium, the vessel is isolated from the normal process flow and the resin is transferred via piping to a separate vessel for elution (i.e., stripping of the uranium and regeneration of the resin).

The uranium recovery building will include a series of precipitation tanks where hydrogen peroxide is added to precipitate uranium, a large thickener where the precipitant is partially dewatered, a filter press to remove the remaining water, a vacuum dryer to dry the yellowcake, and packaging equipment to put the yellowcake into 55-gallon DOT drums. The drums will be stored in a separate room within the building until such time that they are sold and transported to a conversion plant for further processing.

An enclosed, overland conveyor system will be constructed from the Ore Pad at the Paydirt area to the heap leach pad, a distance of approximately 8,000 ft. A feed hopper with a grizzly and crusher will be installed at the front end of the conveyor system, which will be fed by a front-end loader. A radial stacker will be installed at the tail end of the conveyor system, which will be used to place the ore on the heap leach pad. The overland conveyor system will vary in height above the ground from approximately three feet to as high as 35 ft where vehicle traffic has to pass under it. Transfer points between conveyor segments will generally be about 10 to 15 feet above the ground.

3.5 Estimated Construction Costs

The capital cost of the Project has been estimated to be $60.8 million ("M") dollars initially for the processing facility and open pit development. Another $61.6M is estimated to be required for development of the underground mine. **Table 3-1** (Estimated Construction Costs) presents a summary of the estimated costs.

Table 3-1. Estimated Construction Costs (BRS, 2012a).

Capital Expenditure	Initial Capital	Expended Years 2-8	Life of Mine Expenditures
Permitting (NRC, BLM and WDEQ)	$4.3M	--	$4.3M
Pre-Development Mine Design	$1.2M	--	$1.2M
Open Pit Mine Equipment	$14.3M	--	$14.3M
Underground Mine Equipment	--	$61.6M	$61.6M
Office, Shop, Dry and Support	$3.2M	--	$3.2M
Mineral Processing	$37.8M	--	$37.8M
TOTAL CAPITAL EXPENDITURE	$60.8M	$61.6M	$122.4M

Labor and material requirements for the Project are discussed below.

3.5.1 Labor Requirements

Open pit development will be conducted by mine personnel, as there is no large pre-stripping requirement for the Congo Pit. It is anticipated that initial mine development will require about 20 employees and then staffing will expand over a several month period to the full complement of 41 employees (see **Section 4.3.7**). The majority of the personnel needed for the open pit mine operation is expected to come from local areas with just a few staff positions requiring regional recruiting.

Underground mine development will include an estimated 30 employees to drive the double-entry decline, assuming two work shifts a day, and 20 more employees to conduct rehabilitation in the mine, assuming access through one of the existing shafts and one work shift per day. It is estimated to require about 18 months to complete the declines and rehabilitation work. Once the mine is put into production, staffing will gradually expand over about a year to the 128 employees estimated in **Section 4.4.7**. About half the underground miners will be recruited regionally and the remaining half will be hired from the local population and trained.

Construction of the heap leach and process plant will require an average work force of about 110 employees over a nine month period. This includes approximately 100 contracted personnel and 10 Energy Fuels and quality control personnel. Both general and specialized contractors will be hired to do the construction. A general contractor experienced in mill construction will be hired to build the process plant. Specialized contractors will be contracted to erect the larger tanks, and install the liners and overland conveyor. Pre-engineered building and siding suppliers will mobilize company ironworkers and sheet metal installation crews along with mobile cranes, man-lifts, fork lifts, and welding machines to construct the buildings. Smaller, local contractors will be used to supply materials, perform earthwork, and construct the smaller buildings at the site. Energy Fuels will encourage its contractors to review, qualify and employ as many skilled and unskilled workers from the area as possible; however, the process facility work force will likely consist of about 30 percent local hires with the remaining 70 percent consisting of a regionally contracted workforce. As the processing facility nears completion, Energy Fuels will gradually add operational staff. Approximately 35 employees will be needed to operate the facility, as discussed in **Section 4.5.4**.

It is expected that the majority of the employees will live in Riverton, Lander, and Jeffrey City with a few making the longer commute from Casper. At this time, Energy Fuels does not have definite plans to provide buses for employees; however, it will be considered as the Project moves closer to startup. The previous operator of the Sheep Mountain mines did provide bus service to and from Jeffrey City. Given the distances involved to Riverton, Lander, and Casper, most employees living in those areas will likely car pool. Most construction contractors will also provide company trucks and/or vans in which their employees will ride together.

3.5.2 Material Requirements

Development of the open pit mine and ancillary facilities is initially anticipated to require little in the way of outside materials, as the majority of the construction work entails cut-to-fill earthworks. However, construction of an on-site processing facility would require considerable liner and other outside materials. **Table 3-2** (Processing Facility Material Requirements) provides a summary of the major material requirements for the processing facility and the estimated number of truckloads that will be required to transport this material to the site over a nine month period.

Table 3-2. Processing Facility Material Requirements.

Item	Item Unit	Quantity	Weight (lbs)	Load Per Truck	No. of Truckloads
HLF Pad and Ponds – Primary 60 mil HDPE Geomembrane	SF	2,457,000	825,000	30,000 lbs	28

Item	Item Unit	Quantity	Weight (lbs)	Load Per Truck	No. of Truckloads
HLF Pad and Ponds – Secondary 60 mil HDPE Geomembrane	SF	2,457,000	1,032,650	30,000 lbs	35
HLF Pad and Ponds – Tertiary 60 mil HDPE Geomembrane	SF	2,457,000	1,032,650	30,000 lbs	35
Concrete	CY	500	--	10 CY	50
Steel Walkways	--	--	5,700	30,000 lbs	1
Conveyor and Stacking	--	--	200,000	30,000 lbs	7
Piping and Plumbing	LF	584,088	1,213,604	30,000 lbs	41
Buildings	SF	106,000	1,060,000	30,000 lbs	36
Electrical	--	--	50,000	30,000 lbs	2
Major Plant Equipment	--	--	2,000,000	30,000 lbs	67
		TOTALS	7,419,604		302

Notes: SF = square foot; CY = cubic yards; LF = linear foot; lbs = pounds.

3.6 Quality Assurance Plans

Quality assurance plans relate to a variety of activities. For discussion purposes, these are divided into the following categories:

- Pre-Operational Baseline Monitoring
- Mineral Processing Facility Construction and Operations
- Mine Facility Construction and Operations
- Operational Monitoring

3.6.1 Pre-Operational Baseline Monitoring

Pre-operational monitoring and environmental baseline characterization has been completed in consultation with WDEQ, BLM, and NRC and in accordance with appropriate regulations and guidance documents. In cases of overlapping guidance and/or regulation, the most extensive requirements have been met. These monitoring and environmental baseline characterization programs have been completed following the prescribed quality control and assurance requirements. Pertinent data is summarized in **Section 8.0** of this Plan and in **Appendix D**.

3.6.2 Mineral Processing Facility Construction and Operations

Mineral processing facilities in Wyoming currently require a Source Materials License issued by the NRC for construction and operations. However, Wyoming is currently undergoing the process of becoming an Agreement State for NRC license actions involving uranium processing. The license requires quality control and quality assurance procedures to be followed on a specified schedule during construction. This includes testing of foundations, liners, concrete, pipes and valves, tanks, and safety devices on all equipment and buildings. Prior to operations, a standard operating procedure ("SOP") must be in place for each routine task, and the processing facility must pass a pre-operational inspection. During operations, quality control and assurance programs are required as license conditions relating to environmental controls, worker health and safety, and potential off-site exposures for identified environmental pathways. Any non-routine tasks that are not covered by a SOP must be approved by the Radiation Safety Officer ("RSO") through a company Radiation Work Permit that specifies the procedures to be followed in completing the task.

3.6.3 Mine Facility Construction and Operations

Mine facilities are constructed and operated with respect to health and safety under MSHA. This requires implementation of a site safety plan that includes training, a materials handling plan comprising a safety data sheet ("SDS") for each chemical used on-site, and monitoring and testing of various environmental factors in the work place, including, but not limited to, noise, air quality, dust, and radon gas. Training and monitoring must be documented and demonstrate compliance with appropriate standards.

3.6.4 Operational Monitoring

In addition to internal monitoring of the mine and mineral processing facilities, external monitoring of ground and surface water, fugitive dust, and radiological levels is required. Operational monitoring is subject to the same levels of quality control and assurance as are applicable to pre-operational monitoring. **Section 8.0** of this Plan presents additional information on Operational Monitoring.

4.0 PART 4 – OPERATING PLAN

This section describes the proposed Mine Plan that Energy Fuels will implement throughout the Project's LOM.

4.1 General Description of Operations

Mining will be completed by both conventional open pit and underground mining methods at two distinct and independent mining areas, the Congo Pit and the Sheep Underground. Mineral processing to produce uranium oxide will occur either at an off-site mill, or on site via development of a proposed processing facility under jurisdiction of the NRC. The Project is designed to extract approximately 1.1 million to 2.0 million pounds of uranium per year from identified ore deposits using conventional open pit and modified room and pillar underground mining methods over the anticipated mine life.

Proposed operational activities, aside from processing the mined ore, include excavation of the open pit mine, advancement of underground mine workings, development of associated spoils facilities, ore crushing and screening, and related conveyance and transport of ore and spoils material. Furthermore, Energy Fuels will continue to conduct exploration drilling to identify additional mineral resources and reserves on the Project site. During operations and throughout the LOM, Energy Fuels will perform interim reclamation to minimize the extent of surface disturbance at any one time. **Map 4-1** (Operating Plan) shows the maximum extent of proposed mining activities, mine facilities, proposed processing area, and access routes.

Ore from the underground and open pit mine operations will be blended, sized as necessary via crushing and screening, and then trucked to an off-site mineral processing facility or conveyed to the proposed on-site mineral processing facility for production of the final product, uranium oxide (commonly referred to as yellowcake). Spoils material will be temporarily stockpiled on the surface during the initial phases of mining, and sequentially backfilled within previously mined portions of the Congo Pit during later mining phases. To the extent practical, underground mine spoils will remain underground. Excess mine spoils from the underground operation will be backfilled and reclaimed with the Congo Pit spoils material.

Both the surface and underground mining will employ diesel-powered mobile equipment to extract the ore. Diesel-powered trucks will haul ore and spoils material in combination with underground and overland conveyor systems. An overland conveyor system will only be constructed in the case of an on-site processing facility.

Open pit operations will commence upon full regulatory approval and following construction of the ancillary surface facilities. Based on mineral reserves currently identified, an eight-year mine life is

projected for open pit operations. Underground development and rehabilitation will be deferred for up to five years following commencement of open pit operations depending on financing and market conditions. The Sheep Underground mine is projected to have an 11-year mine life based on currently identified reserves, once the new twin declines are installed and the mine workings rehabilitated. The processing facility is currently designed to contain ore derived from only the Congo Pit, though it may be expanded in the future to include ore for the entire LOM. The processing facility will have an operational life that extends a number of years beyond completion of ore placement, as the facility will enter a rinse down period, during which time processing and recovery of uranium will continue. Energy Fuels will perform final reclamation at the cessation of operations. Ultimately, the affected land will be restored to its approved, post-mining beneficial use (see **Section 5.0**, Reclamation Plan).

4.2 Ore Description and LOM Reserve Estimate

Uranium mineralization in the Sheep Mountain/Crooks Gap area is hosted in sandstone deposits within the Battle Spring formation (refer to **Appendix D-5;** Topography, Geology and Overburden Assessment). The Battle Spring formation, consisting of upper and lower members (designated "A" for the lower and "B" for the upper), is a fluvial deposit. Mineralization within the Battle Spring formation, which occurs primarily in the lower member, is commonly referred to as a "Wyoming Roll Front System" (Stephens, 1964). These deposits are organic-rich, fine-grained lenses in tabular, or "roll front", configurations.

Drillhole databases provide the basis for the ore reserve estimate used in this Operating Plan. The drillhole logs have been interpreted to delineate ore thickness, grade and vertical placement within the proposed Congo Pit and Sheep Underground mine areas. The mineable grade material was identified and ore reserve estimates were prepared from interpretation of the drillhole logs. The Project contains an estimated mineable reserve of 18.4 million pounds equivalent of U_3O_8 at an average grade of 0.12 percent via mining of approximately 7.5 million tons ("Mt") of ore from surface and underground sources (BRS, 2012a). **Table 4-1** (Mineable Reserves) summarizes the total mineral reserve estimate.

Table 4-1. Mineable Reserves.

Area	Pounds eU_3O_8	Tons	Average Grade (Percent eU_3O_8)
Open Pit	9,117,000	3,955,000	0.115
Underground	9,248,000	3,498,000	0.132
Totals	*18,365,000*	*7,453,000*	*0.123*
			Source: BRS (2012a)

Notes:

1) eU_3O_8 = radiometric equivalent U_3O_8

2) The Mineable Reserves for the Project, including both open pit and underground projected mining areas, is that portion of the indicated mineral resource that is included in the current Mine Plan and is considered economic under current cost and market conditions.

4.3 Congo Open Pit Operations

4.3.1 Pit Sequence and Spoils Facility Development

The Congo Pit will be developed sequentially to accommodate the desired mine production rate and allow for internal backfilling throughout pit development. Ore will be hauled to the Ore Pad and spoils material will be hauled to the two proposed spoils piles; i.e., Hanks Draw Spoils Facility, located to the northwest of the Congo Pit in Hanks Draw, and the South Spoils Facility, located on the south edge of the Congo Pit footprint. **Table 4-2** (Mine Sequence Quantities) provides the annual schedule for mining ore and spoils material from the Congo Pit and for placement of the spoils material. **Map 4-2** (Congo Pit Sequence – Year 1) through **Map 4-9** (Congo Pit Sequence – Year 8) illustrate the annual, sequential pit development, spoils facility development, and intra-pit spoils backfill.

Table 4-2. Mine Sequence Quantities.

Year	Total Excavated (CY)	Hanks Draw Spoils Facility (CY)	South Spoils Facility (CY)	Intra-Pit Backfill (CY)	Reclamation Backfill (CY)
1	9,447,000	9,122,000	0	325,000	0
2	10,341,000	5,718,000	1,000,000	3,623,000	0
3	11,300,000	2,732,000	1,002,000	7,566,000	0
4	9,482,000	4,226,000	0	5,256,000	0
5	10,542,000	0	0	10,542,000	0
6	10,584,000	2,665,000	0	7,919,000	0
7	11,595,000	0	0	11,595,000	0
8	4,847,000	0	0	4,847,000	0

Year	Total Excavated (CY)	Hanks Draw Spoils Facility (CY)	South Spoils Facility (CY)	Intra-Pit Backfill (CY)	Reclamation Backfill (CY)
9	0	0	0	0	0
10	0	0	0	0	5,000,000
11	0	0	0	0	5,000,000
12	0	0	0	0	5,000,000
13	0	0	0	0	5,000,000
14	0	0	0	0	4,463,000
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0
20	0	0	0	0	2,002,000
Totals	78,138,000	24,463,000	2,002,000	51,673,000	26,465,000

Notes:

1) CY = cubic yards.

2) Total excavated volumes are inclusive of mineralized material (ore) and overburden/interburden (spoils), averaging 9.8 million CY per year over eight years.

3) Spoils and backfill volumes assume that the swell of excavated waste from the pit is equivalent to the volume of mineralized material removed from the pit.

Every year during open pit mining operations (i.e., Year 1 through Year 8), spoils material will be hauled to the two temporary spoils piles and/or sequentially backfilled into mined-out areas of the pit. During the first three years of mining, excavation will occur in a panel along the up-dip portion of the deposit. Subsequent mining, in Year 4 through Year 8, will be completed in successive panels proceeding down and along dip and reaching the greatest depths. Beginning in Year 3, the great majority of annual mined spoils material will be sequentially backfilled into previously mined-out areas of the pit.

In Years 1 through 6, spoils material will be hauled to the Hanks Draw Spoils Facility via a haul road exiting the northwest end of the pit and via the main haul road exiting the southwest end of the pit (through the Ore Pad area). In Year 2 and Year 3, select spoils material will be hauled to the South Spoils Facility via a new, temporary haul road located within the ultimate Congo Pit disturbance footprint. The spoils material transported to the South Spoils Facility will serve as the cover material placed over the

backfilled Congo Pit and other disturbed areas, prior to topsoil placement, during final reclamation. Sequential intra-pit backfilling will occur during each year of the Congo Pit development.

During Years 10 through 14, following cessation of surface mining operations, Energy Fuels will move the majority of spoils material stockpiled in the Hanks Draw Spoils Facility into the Congo Pit. In Year 20, during the final reclamation phase of the Project, the Congo Pit area, haul roads, Ore Pad and other select areas will be regraded and covered with unclassified (i.e., suitable) spoils material, where required, which is stockpiled in the South Spoils Facility (refer to **Appendix D-5** for overburden material classification).

4.3.2 Ore Pad Operation

Ore from the Congo Pit will be trucked to the Ore Pad and ore from the Sheep Underground mine will be transported to the surface via belt conveyors. At the Ore Pad, ore from the underground and open pit operations will be blended and sized (as necessary) prior to transport either to an off-site processing facility or to the proposed on-site processing facility.

In lieu of developing an on-site ore processing facility, ore may be shipped to an off-site facility for processing. In this case, highway-compatible haul trucks would be loaded at the Ore Pad to allow blending of ore materials prior to shipment.

4.3.3 Spoils Handling

As discussed above and shown on **Map 4-1** (Operating Plan), the Hanks Draw Spoils Facility is sited northwest of the Congo Pit in Hanks Draw, and the South Spoils Facility is sited on the south edge of the Congo Pit footprint. The South Spoils Facility is sized to contain approximately two million cubic yards of material. As discussed in **Section 4.3.1**, the South Spoils Facility will be constructed during early Congo Pit development, and contain only near-surface unclassified soils, considered suitable as coversoil during reclamation.

The Hanks Draw Spoils Facility is designed to contain up to 24.5 million cubic yards of spoils material during the life of the Project, with the majority of the spoils derived from Congo Pit development. At maximum development of the facility, which corresponds to Year 8 of Congo Pit operations, the top level of the Hanks Draw Spoils Facility will be approximately 300 ft above the existing ground surface. Refer to **Map 4-10** (Hanks Draw Cross Sections) for cross-sections cut through the Hanks Draw Spoils Facility, which depict the pile configuration for each year of its development.

Throughout development, the spoils piles will be compacted by the haulage units (i.e., scrapers and trucks). Haulage routes within the spoils facility areas will be routinely graded and sprayed with water to control fugitive dust.

Stability analyses of the Hanks Draw Spoils Facility is described in Energy Fuels (2014a). The calculated factors of safety meet or exceed the minimum design values of 1.3 for static conditions and 1.0 for pseudo-static conditions. As such, the evaluated minimum factors of safety are considered adequate for temporary conditions, as ultimately, the spoils material will be backfilled into the Congo Pit. Because the spoils will be placed at the angle of repose, shallow veneer surface failures may occur during operations, which are considered non-critical to the overall stability of the structure, and will be addressed during operations on an as-needed basis.

4.3.4 Open Pit Operating Parameters and Equipment

The Congo Pit will operate two to three shifts per day, five to seven days per week on a year-round basis. Scrapers will remove the overburden (friable sandstone) and haul the material to the two spoils facilities and to mined-out areas of the pit. Dozers will assist by ripping the overburden and pushing the scrapers. Hydraulic excavators will selectively excavate the ore and load it into haul trucks for transport to the Ore Pad. Motor graders and water trucks will maintain the pit ramps and haul roads.

Mining will be completed in a selective manner, using medium-sized excavators with a two cubic-yard bucket capacity. The excavator will load two, 35-ton capacity, articulated off-road haul trucks. The mining fleet is projected to have excess annual capacity and will thus handle the majority of the internal spoils material. The primary stripping fleet consists of three, twin-engine scrapers (Caterpillar [“CAT”] 637 or equivalent) paired with three single engine scrapers (CAT 631 or equivalent) in a push-pull configuration. Motor graders and track dozers will support both mining and stripping equipment. **Table 4-3** (Open Pit Mine Equipment List) lists the proposed major equipment and support equipment.

The proposed stripping and mining equipment fleet is based on the nature and configuration of the ore deposit and physical parameters such as the anticipated haulage profiles. Because the deposit consists of numerous dipping mineralized horizons, it was determined that both the stripping and mining equipment must not only be efficient, but highly selective and flexible. During stripping activities, scrapers can self-load, operate in tandem, or can be push loaded with assistance from the track dozers. The self-loading scraper can excavate in lifts as thin as the unit’s cutting edge (approximately three inches thick). Medium-sized excavators are capable of excavating selective shallow cuts, if necessary. The six-wheel drive, articulated haul trucks are capable of operating in rugged and steep conditions.

Table 4-3. Open Pit Mine Equipment List.

Major Equipment	Quantity
Excavator (2 cubic yard bucket)	2
Motor Grader	2

Major Equipment	Quantity
Track Dozer	2
Mine Haul Truck (35 ton)	2
Wheel Loader	1
Twin Engine Scraper	3
Single Engine Scraper	3
Self-Loading Scraper	1
Water truck (3,000 gallons)	1
Water truck (8,000 gallons)	1
Mine Support Vehicles	**Quantity**
Fuel / Lube Truck	1
Mechanical Service Truck	1
Rubber-Tire Backhoe with Forklift Attachment	1
Pickup Trucks (4WD, ¾-ton)	8

Based on estimates of equipment cycle times, both the stripping and mining requirements can be accomplished by operating two, 10-hour daily shifts, seven days per week. The nominal capacity of the proposed equipment fleet is capable of excavating and placing over 12 million cubic yards ("CY") of material on an annual basis.

4.3.5 Grade Control

In-pit grade control is a critical aspect of the Project. This type of sandstone-hosted uranium deposit may exhibit local variability in grade and thickness and potentially variable radiometric equilibrium conditions. To address these conditions, minimize ore dilution, and maximize mineral extraction, a tiered systematic grade control program is essential. The following narrative describes the tiered grade control program.

4.3.5.1 Tier 1, Radiometric Scanning

Field personnel equipped with calibrated hand-held gamma meters will be assigned to both the stripping and mining crews. Grade control and mine supervisory personnel will be provided with detailed mapping of anticipated mineralized areas within the various work areas and will continually

monitor these areas along with other excavations for radiometric and/or visual indications of uranium mineralization.

4.3.5.2 Tier 2, In-Pit Assay

The mine will have a portable in-pit sample trailer equipped with a portable x-ray fluorescence ("XRF") assay instrument and appropriate sample preparation equipment. Loaded haul trucks working within identified mineralized zones will be sampled with an auger system for assay. The individual trucks will then be directed to deliver the material to the Ore Pad or designated spoils location depending on the results of the assay.

Grade control and supervisory personnel will also have the ability to collect spot samples for immediate assay to field calibrate the gamma meters for variations in radiometric equilibrium conditions. The XRF can assay for uranium and heavy metals that may be present.

4.3.5.3 Tier 3, Quality Control

As each mine truck is sampled and tested, the field assay sample rejects will be collected and separated by grade ranges. The daily pit samples will be blended and split to provide representative samples that will in turn be assayed at a designated laboratory, subject to an outside and/or third party quality control system.

These grade control procedures will also be used to segregate material for final reclamation cover. Procedures will be the same as those used for grade control; however, rather than segregating the material with concentrated metal and radiation levels, the scanning and assaying will be used to identify materials that do not contain elevated metal content and radionuclides.

4.3.6 Ground Control

Refer to **Section 2.3** and **Map 2-6** (Historical Mine Workings) for a description and the location of historic mines within the Permit Area. Equipment and personnel consisting of a medium-sized excavator, a medium-sized dozer, and a field engineer with access to the digital three-dimensional modeling of the historic underground mines, will conduct ground control related to the historic mine workings. This crew will locate shallow underground zones in the pit floor based upon the mine mapping, over-excavate and collapse the mine voids, and backfill the area prior to introducing mining equipment. In-pit drilling equipment and/or shallow seismic testing will assist in locating the voids. Blasting, to shatter cemented, arkosic sandstone layers, may also be utilized on an as-needed basis to help collapse the historic underground mine areas.

4.3.7 Open Pit Staffing

Table 4-4 (Open Pit Mine Staff Estimate) summarizes projected staffing for the open pit mine operation.

Table 4-4. Open Pit Mine Staff Estimate.

Category	Number
General Project Manager	1
Mine Manager (Open Pit)	1
Mine Lead (Open Pit)	2
Maintenance Lead	1
Warehouse / Clerk	1
Safety / Personnel Manager	1
Environmental Engineer	1
Chief Mine Engineer	1
Chief Mine Geologist	1
Surveyor	1
Technicians	3
Secretary / Clerk	1
Accountant	1
Equipment Operators	17
Mechanics and Oilers	4
Open Pit Grade Control	4
Total Open Pit Staff / Labor	41

4.4 Sheep Underground Mine Operations

4.4.1 Operating Parameters and Equipment

The Sheep Underground mine will employ a modified room and pillar mining method, utilizing rubber-tired diesel equipment. The deposit is comprised of 16 stacked mineralized zones with a total thickness of approximately 350 ft. The deposit will be mined primarily from bottom to top as a cut and fill operation. Ore and some spoils material will be crushed and placed on a conveyor belt installed in one of the two new declines, and transported to the Ore Pad on the surface.

The underground mine plan will utilize two conventional mining schemes, one for development drifts and one for mining sections. The development drifts will comprise a dual opening approach with crosscuts on 100-foot centers using two different size openings. A 12-foot wide by 12-foot high opening

will be used for haulage and a 12-foot wide by 8-foot high opening will be used for transportation and ventilation. Ramps and vertical raises will be used to connect the development drifts for efficient movement of equipment and mined ore and spoils material. For the mining panels, multiple entries will be used depending on the width of the mineralized pod. Entries are designed at 12 ft wide and six feet high minimum, with an average height of approximately seven feet. As previously mentioned, crosscuts will be placed on nominal 100-foot centers; however, locations will vary depending on the spatial distribution of the ore.

Production will occur both during advancement and then on retreat when an area has been mined fully. The advance mining is done, as described above, driving approximately 12-foot wide by seven-foot high drifts. Multiple drifts will be driven parallel to one another with connecting crosscuts. This will create pillars in between the drifts that will be left in place initially for ground support. On retreat mining, pillars containing ore are removed via two methods. In areas lacking mineralization directly above, temporary support will be placed (e.g., timbers) and the pillars will be removed allowing the roof to ultimately fail. In areas with mineralized pods directly overhead, the adjoining rooms will be backfilled using a cemented backfill, consisting of spoils material mixed with cement (i.e., paste backfill). This backfill will exceed the strength of the native rock and prevent the roof from failing and diluting the mineralized zones above.

Mucking (excavating) the ore and spoils material will be conducted using scooptrams, which are able to load, haul and dump (hence the common name “LHD”) the mined material over shorter distances without the aid of additional pieces of equipment. Haulage from the working faces to the belt conveyor or to the ore chutes will be accomplished using the LHDs and low-profile underground haul trucks. The LHDs will load the ore and spoils into the haul trucks when longer haul distances are involved.

A raise boring machine will develop boreholes required to construct ore chutes or to aid in ventilation. To accomplish this, a small pilot hole is drilled from the top to the bottom at the location where the raise is to be placed. The raise bore cutting head is placed at the bottom of the hole and the rotating cutting head is pulled up the hole, enlarging the hole to the desired diameter. The cuttings fall to the bottom of the hole to be hauled away by an LHD. **Table 4-5** (Underground Mine Equipment List) provides a preliminary list of the proposed mining equipment required for the underground operation.

Table 4-5. Underground Mine Equipment List

Major Equipment	Quantity
Jumbo Face Drill	5
Jack Leg Drill	12
Rock Bolter	7
LHD (a.k.a., Scooptram)	10
Haul Truck	18
Mine Support Vehicles	**Quantity**
Powder Buggy	1
Bobcat Skidsteer	2
Utility Truck (Flatbed)	1
Scissor Truck	1
Man Trip	6
Fuel / Lube Truck	1
Mechanical Service Truck	2
Forklift	1

4.4.2 Spoils Handling

Underground mine waste rock (spoils material), as much as possible, will be placed in mined-out workings to avoid the necessity of hauling the material to the surface. Spoils material will be placed as both a loose fill and as a paste backfill (see **Section 4.4.1** above). When it is not possible to place the spoils material underground, it will be conveyed to the surface and placed with the spoils material mined from the Congo Pit.

4.4.3 Ventilation

The existing shafts (i.e., Sheep I and Sheep II shafts) will provide ventilation, with exhaust fans mounted at both locations. Two 500-horsepower exhaust fans at the Sheep I Shaft and the Sheep II Shaft, assisted by multiple portable face fans, will provide ventilation. Fresh air will be drawn into the mine through the twin declines. The existing Sheep declines and new and existing boreholes will also be used to augment ventilation in areas located furthest from the ventilation shafts. Ventilation requirements for the Sheep Underground mine are approximately 220,000 cubic feet of air per minute. Fresh air must be directed across each of the working faces and through the drifts designed for personnel transport.

Bulk-heading (partitioning) of mined-out areas will help efficiently direct fresh air to the active working faces.

4.4.4 Blasting

Blasting of the rock, both for development and mining, will be done by drilling eight- to 12-foot deep blast holes using jumbo drill rigs and/or jacklegs and loading the blast holes with a blasting cap, chemical booster, and ammonium nitrate and fuel oil ("ANFO"). The blasts will be initiated using a non-electric system with the hole pattern, firing sequence, and delays designed to allow for optimum breakage and minimum ore dilution. Explosives and detonators will be stored in separate underground powder magazines. Blasting operations will be conducted in accordance with MSHA regulations [30 Code of Federal Regulations ("CFR") Parts 55, 56 and 57].

4.4.5 Ground Control

The back (i.e., roof) and ribs (i.e., sidewalls) in the drifts, both during development and production mining, will be supported with rock bolts and, where needed, wire mesh. A rock-bolting machine, which can drill holes both vertically and horizontally, will install the rock bolts on approximate four-foot centers as the drifts advance. Bolting and wire mesh will overlap between each round to ensure proper ground control coverage. Timbers and cribbing may also be used in areas where ground conditions are poor.

4.4.6 Mine Sequence

Once development of the Sheep Underground mine commences, Energy Fuels will develop the twin declines over approximately an 18-month period. An additional six months of mine rehabilitation will likely be necessary prior to starting full-scale ore production. Spoils material from the initial decline development and rehabilitation will be placed in mined-out portions of the Congo Pit or in the Hanks Draw Spoils Facility. In the unlikely event that underground and open pit operations originate at the same time, the underground spoils material may be utilized to partially backfill the Paydirt Pit.

After decline development and rehabilitation is completed, mining of ore will begin (Year 1), with ongoing transport of spoils material to the surface. By Year 3, adequate space will exist in the areas mined during Year 1 and Year 2 to begin intra-mine spoils backfilling. **Map 4-11** (Sheep Underground Sequence – Year 1) through **Map 4-21** (Sheep Underground Sequence – Year 11) show the Sheep Underground mine development and sequence over an estimated 11 years of underground production operations, and depict the areas of active mining and sequential backfill on an annual basis.

Table 4-6 (Sheep Underground Mine Sequence) summarizes the estimated quantities of underground mine spoils material, intra-mine spoils, and ore mined on an annual basis. The actual underground mine production rate and quantities will vary based upon actual conditions encountered during the mining process. If additional mineral resources were to be discovered through underground drilling and exploration and/or market economics were to improve allowing a lower mine cut-off grade, the mine production rate, LOM, or both would change. Any such changes would be addressed through annual reporting. However, the surface disturbance footprint related to the underground mine operations is not expected to change over the LOM.

Table 4-6. Sheep Underground Mine Sequence.

Year	Extra-Mine Spoil (tons)	Intra-Mine Spoil (tons)	Ore (tons)
Development	200,000	0	0
1	90,226	0	99,524
2	162,016	0	223,234
3	0	144,076	430,924
4	0	189,212	385,788
5	0	207,996	367,004
6	0	224,012	350,988
7	0	189,427	385,573
8	0	260,212	314,788
9	0	275,931	299,069
10	0	158,537	416,463
11	0	74,802	224,406
Totals	452,242	1,724,205	3,497,761

4.4.7 Underground Mine Staffing

Energy Fuels has estimated productivity regarding the Sheep Underground mine for both development and mining activities. Based on the estimate, both the required development and mining production can be accomplished operating two 10-hour shifts per day, four to five days per week. The development crew will consist of two face drill operators, two rock bolter operators, two LHD operators, and two to six haul truck operators. The mining crew will be comprised of five to eight face drill operators, five rock bolter operators, three LHD operators, and ten to fourteen haul truck operators. Both development and mining crews will have additional utility personnel to help place the bolts and wire mesh for ground control; transport supplies and parts; install air lines, water lines, and ventilation tubing; and to scale

down the ribs (walls) and back (roof) following blasting. Two blasting crews will work both the development headings and the mining headings, loading and shooting the faces upon completion of the drilling. **Table 4-7** (Underground Mine Staff Estimate) summarizes the staffing and labor requirements for the underground mine operation.

Table 4-7. Underground Mine Staff Estimate.

Category	Number
Mine Manager (Underground)	1
Shift Foreman (Underground)	2
Maintenance Superintendent	1
Maintenance Foreman	2
Warehouse / Clerk	2
Safety / Personnel Manager	1
Chief Mine Engineer (Underground)	1
Mine Geologist (Underground)	1
Surveyor	1
Technician	2
Secretary / Clerk	1
Accountant	1
Equipment Operator	72
Mechanic / Oiler	18
Utility / Blaster	16
Surface Personnel	6
Total Underground Staff / Labor	128

4.5 Mineral Processing

Ores from the surface and underground mine will be fed into the feed hopper/crusher at the front end of the overland conveyor, or shipped off-site for processing at an existing mill. For on-site processing of ores, the enclosed overland conveyor system will transport the ore approximately 1.5 miles to the processing facility. The on-site processing facility consists of a 40-acre heap leach pad, associated ponds, and the process plant where the uranium is recovered from solution, precipitated, dried, and packaged for shipment.

4.5.1 Heap Leach Pad and Ponds

After being received at the processing facility, ore will be placed on the heap leach pad using a radial belt conveyor. The heap leach pad will be lined with a synthetic triple liner system with dual leak detection. The heap leach recovery method includes the application of a sulfuric acid solution ("H_2SO_4") through low-flow emitters placed on top of the heap for extraction of the uranium mineral from the ore. Solution percolates through the ore on the heap leach pad by gravity flow, dissolving the uranium from the ore. A network of drain pipes convey the solutions that pass through the heap to the lined Collection Pond by gravity flow. Leach solutions returned from the heap to the Collection Pond are regenerated with acid and an oxidant as necessary and recycled through the heap until the solution grades are enriched to suitable levels for processing. Enriched PLS is then pumped to the process plant for uranium recovery. A generalized schematic of the heap leach process is presented in **Figure 4-1** (Typical Heap Leach Schematic).

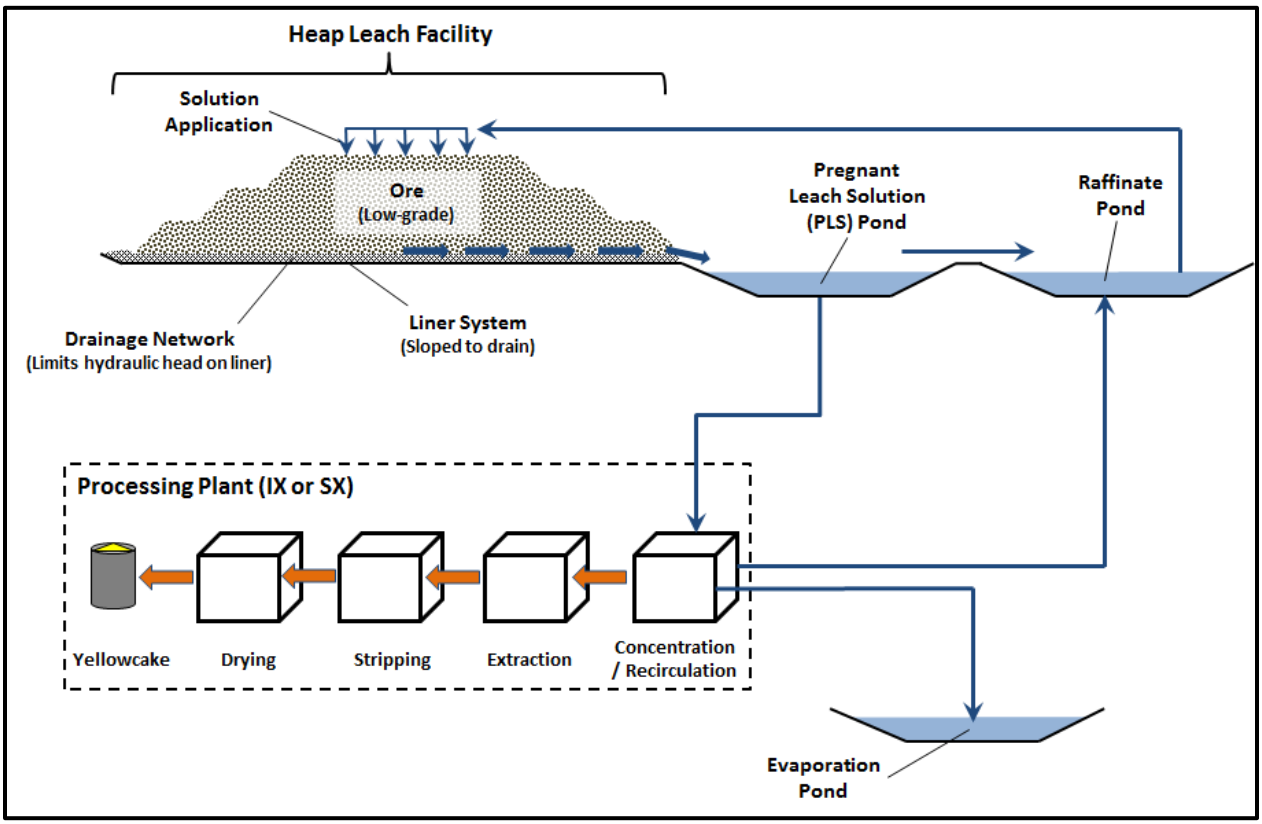


Figure 4-1. Typical Heap Leach Schematic.

4.5.2 Uranium Recovery

Uranium recovery starts at the process plant with either a solvent extraction (SX) or an ion exchange (IX) system. In a SX system, the uranium solution from the heap is mixed with an organic phase extractant

and solvent carrier to concentrate the uranium and remove impurities. In an IX system, the uranium solution is passed through a resin bed where the uranium-carbonate complex ions are transferred to the resin by exchange with a negative ion like chloride. The uranium is removed from the organic carrier in the SX system, or eluted from the resin in the IX system, and precipitated as uranium oxide (yellowcake). The remaining leach solution is treated and then returned to the heap as fresh leach solution. Up to approximately 10 percent of the initial solution volume will be removed from the system as a waste stream that will be stored in a lined evaporation pond and/or spray evaporated on spent portions of the heap leach pads. Spent solutions and process liquid wastes will be managed in triple-lined evaporation ponds on-site; no wastes will be discharged from the site.

Yellowcake precipitation will be accomplished in a series of agitated tanks with hydrogen peroxide solution to produce uranyl peroxide. Precipitated yellowcake will be thickened with the aid of a dilute flocculant solution. Depending on impurity content, the thickener overflow will be pumped to the Collection Pond or evaporation pond and the underflow containing the precipitated uranium will be pumped to a pressure filter (e.g., a filter press). The filtrate will join the thickener overflow, and the filter cake will be fed by inclined screw conveyor and/or positive displacement pumps to a vacuum paddle dryer. This type of dryer has been selected because it utilizes a closed loop air filter and vacuum system to capture particulate emissions and recover vapor as distilled condensate (i.e., it is a zero-discharge system). A wet scrubber will capture fugitive dust and fumes from the surrounding yellowcake precipitation and drying area and its dilute slurry will be recycled to the yellowcake thickener. The dried yellowcake will discharge through a closed chute into 55-gallon DOT drums for storage and later transportation to a conversion facility via a properly placarded semi-tractor and trailer.

4.5.3 Compliance with BLM Regulations

Design, construction and operation of the heap leach facility and associated process ponds will comply with BLM's regulations provided in 43 CFR 3809.420(b)(12), including:

- 3809.420(b)(12)(i): "*You must design, construct, and operate all leach pads, tailings impoundments, ponds, and solution-holding facilities according to standard engineering practices to achieve and maintain stability and facilitate reclamation*." The heap leach facility and associated process and holding ponds are regulated by the NRC and will adhere with regulatory guidance, including Regulatory Guide 3.11, "Design, Construction, and Inspection of Embankment Retention Systems at Uranium Recovery Facilities" (NRC, 2008).
- 3809.420(b)(12)(ii): "*You must construct a low-permeability liner or containment system that will minimize the release of leaching solutions to the environment. You must monitor to detect potential releases of contaminants from heaps, process ponds, tailings*

impoundments, and other structures and remediate environmental impacts if leakage occurs." Liner and containment systems will employ three low-permeability synthetic liners with dual and continuous leak detection systems. The ponds and heap leach pad will be constructed with primary (60 mil HPDE liner), secondary (60 mil HDPE drain liner), and tertiary (60 mil HDPE drain liner) liners. The two lower synthetic liners incorporate an integral drain structure, providing the high permeability layers between the primary and secondary liners, and between the secondary and tertiary liners, respectively, used for leak detection. These permeable layers will gently slope to individual lined sumps that will monitor the heap leach pad and each of the associated ponds independently.

- 3809.420(b)(12)(iii): "*You must design, construct, and operate cyanide or other leaching facilities and impoundments to contain precipitation from the local 100-year, 24-hour storm event in addition to the maximum process solution inventory. Your design must also include allowances for snowmelt events and draindown from heaps during power outages in the design*." Design storm events required by NRC guidance exceed the regulatory requirements of 3809.420(b)(12)(iii). The ponds associated with the heap leach facility are sized as follows:
    - The Raffinate Pond is sized to contain three days of make-up leach solution, and three days of leach solution required to wet fresh ore, assuming a maximum application rate of 360 gallons per minute ("gpm"), plus the volume for the 100-year, 24-hour storm event over the pond surface area. An additional 5 ft of freeboard above the design capacity is incorporated into the design to account for wave motion due to high winds. Should the Raffinate Pond reach its freeboard limit, it will overflow by gravity via a double lined overflow to the Collection Pond.
    - The Collection Pond is sized to contain one day of collected PLS (i.e., the solution contained within the active leaching area of the heap) and the volume of the 100-year, 24-hour storm event over the pond and heap leach pad surface areas. An additional 5 ft of freeboard above the design capacity is incorporated into the design to account for wave motion due to high winds. Should the Collection Pond reach its freeboard limit, it will overflow by gravity via a double-lined overflow to the Holding Pond.
    - The Holding Pond is sized to contain process waste streams (accumulated over 90 days during three winter months), precipitation over the area of the pond accumulated over three winter months, overflow of the Probable Maximum Precipitation ("PMP") event from the Raffinate Pond and the Collection Pond, and

the volume for the PMP event over the Holding Pond and heap leach pad area. An additional 5 ft of freeboard above the design capacity is incorporated into the design to account for wave motion due to high winds.

- 3809.420(b)(12)(iv): "*You must construct a secondary containment system around vats, tanks, or recovery circuits adequate to prevent the release of toxic solutions to the environment in the event of primary containment failure*." All vats, tanks or other vessels used for the storage of reagents, chemicals, fuel and other potentially toxic constituents will be contained by concrete walls or lined earthen berms capable of containing the entire capacity of the storage vessel in the event of a leak or spill with an additional allowance for freeboard.
- 3809.420(b)(12)(v): "*You must exclude access by the public, wildlife, or livestock to solution containment and transfer structures that contain lethal levels of cyanide or other solutions*." Access to the radiation control areas, which may contain toxic and/or radioactive constituents, will be controlled by fencing to exclude access to the public, wildlife, or livestock. In addition, solution ponds will be covered with bird balls to deter waterfowl.

4.5.4 Processing Facility Staffing

Proposed staffing for the heap leach and uranium recovery systems is presented in **Table 4-8** (Processing Facility Staff Estimates).

Table 4-8. Processing Facility Staff Estimates.

Category	Number
Process Manager	1
Radiation Safety Officer ("RSO")	1
Radiation Safety Technician	1
Heap Operations Supervisor	1
Plant Operations Supervisor	1
Heap Operations Leadman	1
Heap Operators, Shift	6
Plant Operations Leadman	1
Plant Operators, Shift	3
Plant Operations, days only	3
Plant General Labor/Helpers	3

Category	Number
Dryer Operators	3
Chief Chemist/Lab Supervisor	1
Lab Technicians	2
Maintenance Leadman	1
General Maintenance Technician	3
Mechanic	1
Electrical/Instrumentation Technician	2
Total Processing Plant Staff	35

4.6 Ancillary Mine Facilities

A portion of the reclaimed Paydirt Pit area and an adjoining undisturbed area will be utilized to accommodate the open pit and underground mine support facilities. The Ore Pad will encompass a large portion of this re-disturbed and newly-disturbed area. The graded pad area will occupy the ore crushing and conveyor systems, ore stockpiles and loading areas, the mobile equipment fueling station, the equipment ready line, the mine shop and warehouse, and the Sheep Underground mine support buildings. Refer to **Map 4-1** for a general layout of the ancillary mine facilities.

The mine shop will support maintenance activities for surface equipment. The warehouse will support both the open pit and underground operations. Portable trailers with meeting/lunch rooms and bathrooms for use by the open pit crews will be set-up near the equipment ready line. For the underground operations, a small office building and dry (i.e., change house) and a separate shop will be located near the Sheep Underground mine portals. Shift and maintenance foremen and surface support personnel will use this office, and major repairs and rebuilds for underground equipment will be made at this shop. Smaller maintenance jobs will be performed in a mine shop located underground. In addition to the ancillary mine facilities sited at the Ore Pad, proposed mine buildings will also include the main administrative office located near the site entrance.

In consideration of the remoteness of the site and the potential hazardous winter driving conditions, emergency stores of non-perishable food and water will be kept on-site along with portable cots should it be necessary for personnel to remain on-site during such conditions.

4.6.1 Overland Conveyor

As discussed in **Section 4.3.2**, ore from the open pit and underground mining operations will be crushed and blended (as necessary) at the Ore Pad prior to transport either to an off-site processing facility or to the proposed on-site processing facility. An overland conveyor will transport ore to the on-site processing facility. Prepared ore will be loaded into a feed hopper at the front end of the overland conveyor either directly from the crushing/screening plant or via a front-end loader from stockpiles. As shown on **Map 4-1** (Operating Plan) and **Map 3-4** (Ore Pad Area), the overland conveyor will run from the Ore Pad area, south along the proposed access road, to the ore processing facility located within the controlled NRC License Area. The conveyor will be covered to eliminate spillage and control fugitive dust.

4.6.2 Solid Waste Disposal

Domestic solid wastes such as office trash and spent equipment parts not associated with uranium recovery will be collected and stored on-site and periodically removed to an off-site sanitary landfill permitted by the WDEQ Solid and Hazardous Waste Division. Liquid wastes such as used oil, hydraulic fluid, cleaners, solvents, and degreasers will be recycled or disposed of off-site at a permitted hazardous waste facility or by other EPA-approved disposal methods. It is currently planned that domestic sewage will be disposed of in a permitted conventional septic/leach field system.

4.7 Topsoil Management

4.7.1 Soil Surveys

In 1983, the U.S. Department of Agriculture, Natural Resource Conservation Service ("NRCS") studied and mapped the soils in this portion of Fremont County to an Order 3 scale. Information regarding Fremont County is available in both electronic and hard copy formats, and the NRCS has centralized dissemination of typical soil series descriptions.

During the fall of 1979, Western Nuclear completed original soil assessments within the study area for the Mining Permit (Western Nuclear, 1973-1983), with results included in **Appendix D-7** (Soil Assessment). The soil series identified within the study area included the BlackHall, Cotopaxi, Elk Mountain, Fluetsch, Ryan Park and Typic Cryorthents series. At that time, the overall depth of salvageable topsoil was estimated to be 0.73 ft. The most common limiting factor described was coarse textures with high percentages of fine sand or coarser material that limited the available water-holding capacity.

BKS Environmental Associates, Inc. ("BKS") conducted additional field mapping (Order 2 soil surveys) in August 2010 and September 2013 within the proposed site disturbance areas according to techniques and procedures outlined in the National Cooperative Soil Survey and LQD Guideline No. 1 (Topsoil and

Overburden; WDEQ/LQD, 1994). BKS identified actual soil boundaries in the field by exposing soil profiles to determine the nature and extent of soil series within the Project area. BKS developed approximate topsoil salvage depths of each map unit series, which ranged from zero (i.e., disturbed areas) to 1.79 ft. Due to the limited nature of topsoil within the Project area, BKS identified additional soil material that may be suitable for use as a plant growth medium. However, this plant growth medium may be located in such a place that removal may be difficult or impossible (i.e., steep mountain slopes), or the medium may contain numerous large rocks or boulders. Whether or not the additional plant growth medium can be salvaged will vary with each disturbance area, and by equipment capabilities.

Given that a significant portion of the Project area is heavily disturbed or has already been reclaimed (refer to **Map 2-2**, Surface Disturbance), BKS estimated that the weighted average topsoil salvage depth is approximately 0.45 ft, and that an additional one or more feet of suitable plant growth medium could potentially be salvaged, if conditions are suitable. **Appendix D-7** (Soil Assessment) includes the historic and updated soils assessment information.

4.7.2 Topsoil and Coversoil Salvage

During construction, available, suitable topsoil and coversoil will be salvaged from the proposed disturbance areas, including the Congo Pit area, the Ore Pad and surrounding Paydirt Pit area, the two spoils pile areas, the proposed haul road, the proposed on-site processing facility (if constructed), and other ancillary facility areas. Ground control personnel experienced in identifying topsoil and/or other suitable plant growth material that may be encountered during excavation (such as alluvial soils or buried topsoil from previous mine operations) will direct topsoil and coversoil salvage operations. A CAT 623 self-loading paddlewheel scraper, or equivalent, capable of selectively excavating the topsoil and coversoil, will be used to salvage the material, with other equipment supporting the scraper, as needed (i.e., dozer, front-end loader, motor grader, haul trucks and water trucks). Topsoil and coversoil stripping will be conducted in a phased manner as the pit and spoils piles expand. Temporary and permanent erosion controls consisting of silt fence, sediment control wattles, berms, ditches, sedimentation ponds, and culverts will be installed throughout the disturbed areas, as necessary, to minimize erosion and capture sediment.

Salvaged topsoil and coversoil will be placed in designated stockpile areas. Topsoil and coversoil stockpiles will be neatly dressed; stabilized with a temporary seed mixture (refer to **Section 5.5.7**); and clearly identified by signage in compliance with LQD regulations.

Map 4-22 (Topsoil Inventory) illustrates the existing topsoil stockpile locations from previous operations, and the proposed stockpile locations where the salvaged soil will be placed (for mine-only operations).

Additional stockpile locations, if needed, will be identified prior to construction of an on-site processing facility. In addition to the proposed salvaged topsoil and coversoil, the existing stockpiles will be preserved, as feasible, for future reclamation needs. **Table 4-9** (Topsoil Quantities, Mine Areas) provides the soil quantities for the existing topsoil stockpiles and the available topsoil to be salvaged for the mine areas. **Table 4-10** (Additional Plant Growth Medium Quantities, Mine Areas) provides estimated quantities of additional potentially salvageable plant growth medium for the mine areas. **Table 4-11** (Estimated Topsoil and Additional Plant Growth Medium Quantities, Processing Facility Area) provides an estimate of additional salvageable topsoil and plant growth medium within the proposed processing facility area.

4.7.3 Topsoil and Coversoil Placement

In addition to salvaging topsoil during mining operations, Energy Fuels will salvage a minimum of two million cubic yards of unclassified earthen material from the mine excavations, and stockpile the material in the South Spoils Facility (see **Section 4.3.1**). This material will meet LQD guidelines for overburden suitability for pH, metals and radionuclides, and will be non-acid forming (refer to **Appendix D-5**, Topography, Geology and Overburden Assessment). The material will come from Quaternary alluvial deposits and/or weathered Battle Spring Formation meeting the suitability criteria within the planned mine disturbance limits. This cover material will be spread over regraded areas of the Congo Pit prior to placement of topsoil.

Approximately 222,200 cubic yards of topsoil is currently stockpiled, of which approximately 150,255 cubic yards is available for use by Energy Fuels in site reclamation (the remainder is planned for use by the AML for reclamation of the McIntosh Pit). For the mine areas (i.e., excludes the proposed processing facility area), it is estimated that an additional 578,610 cubic yards of topsoil will be salvaged over the LOM (see **Table 4-9**), yielding a total available estimated topsoil resource of 728,870 cubic yards. Excluding the proposed processing facility area, the proposed total disturbance area for the Project is 723 acres, of which approximately 277.3 acres are currently disturbed. An additional small area of existing bonded disturbance (i.e., 27.8 acres) located within the proposed NRC License Area, but outside of the proposed disturbance boundary and outside of AML's project extent for reclamation of the McIntosh Pit (see **Map 4-23**, Disturbance in Vicinity of McIntosh Pit) is included in **Table 4-9**. This area is included for purposes of evaluating the total disturbed area that would require topsoil placement if Energy Fuels elects not to construct an on-site processing facility. As such, the available topsoil quantity would cover a total disturbance area of 751 acres at an approximate placement depth of 7.2 inches.

If an on-site processing facility is constructed, an additional topsoil volume of approximately 154,950 cubic yards is estimated to be available for use (see **Table 4-11**). An estimated 61.2 acres of the 205.5 acre proposed processing facility area has been previously disturbed.

In addition to potential topsoil salvage thickness, BKS evaluated the thickness of potential salvageable plant growth medium within the various soil units (refer to **Appendix D-7**, Soil Assessment). Based on this evaluation, it is estimated that up to an additional 2,000,000 cubic yards of suitable plant growth medium could potentially be salvaged over the LOM (see **Table 4-10**), with an additional approximately 535,700 cubic yards if an onsite processing facility is constructed (see **Table 4-11**). However, as noted previously, this plant growth medium may be located in such a place that removal may be difficult or impossible (i.e., steep mountain slopes), or may contain numerous large rocks or boulders.

The same or similar equipment used for salvaging topsoil and other suitable plant growth medium will be used for spreading the topsoil and coversoil during final reclamation. Energy Fuels proposes placing topsoil at an approximate six-inch-loose depth over areas disturbed by mining activities. As reclamation proceeds, if there is sufficient topsoil and other suitable plant growth medium available, the placement thicknesses could be nominally increased in order to fully utilize the available resource.

Table 4-9. Topsoil Quantities, Mine Areas.

Existing Stockpiles		Proposed Salvaged Topsoil				
Stockpile I.D.	Volume (CY)	AREA - Soil Map Unit	MU Symbol	Acres	Depth (ft)	Volume (CY)
TSP-E1	2,230	Congo Pit				
TSP-E2	909	Bosler	BO	26.4	1.13	48,147
TSP-E3	46	Cushool	CU	103.0	0.47	78,064
TSP-E4	5,000	Disturbance / Not Surveyed	D	64.0	0	0
TSP-E5	Does Not Exist	Onason	ON	116.1	0.31	58,055
TSP-E6	52,100	Rock River	RO	6.3	1.79	18,078
TSP-E7*	22,900		Subtotal	315.7	--	202,344
TSP-E8	74,802	Ore Pad Area				
TSP-E9	6,737	Bosler	BO	28.3	1.13	51,556
TSP-E10*	11,523	Disturbance	D	23.1	0	0
TSP-E11*	10,272	Onason	ON	6.1	0.31	3,071
TSP-E12*	27,250	Onason / Reclaimed Varient	ON-RV	1.8	0.31	875
TSP-E13	875	Rock River	RO	0.7	1.79	2,079
TSP-E14	1,830		Subtotal	60.0	--	57,582
TSP-E15	Does Not Exist	Spoils Facilities (Hanks Draw and South)				
TSP-E16	Does Not Exist	Bosler	BO	26.0	1.13	47,382
TSP-E17	Does Not Exist	Cushool	CU	7.9	0.47	6,021
TSP-E18	1,500	Disturbance / Not Surveyed	D	17.4	0	0
TSP-E19	2,250	Onason	ON	92.7	0.31	46,337
TSP-E20	1,225	Rock River	RO	43.5	1.79	125,478
TSP-E21	750		Subtotal	187.4	--	225,217
TSP-E22	Unknown Quantity	Administration Office & Access Roads				
Total**	150,255	Bosler	BO	19.0	1.13	34,656
*AML plans to use topsoil stockpiles TSP-E7, TSP-E10, TSP-E11 and TSP-E12 for reclamation of the McIntosh Pit within the AML APE Boundary. **Total available stockpile volume excludes stockpiles to be used by AML.		Cushool	CU	13.3	0.47	10,077
		Disturbance / Not Surveyed	D	82.6	0	0
		Onason	ON	26.9	0.31	13,444
		Onason / Reclaimed Varient	ON-RV	7.5	0.31	3,726
		Rock River	RO	10.9	1.79	31,564
			Subtotal	160.2	--	93,468
Proposed Salvage Area (Undisturbed or Reclaimed Area) / Topsoil Volume				446.0	--	578,611
Existing Disturbance Within Proposed Disturbance Area / Available Stockpiled				277.3	--	150,255
Existing Bonded Disturbance Outside of Proposed Mine Disturbance Area				27.8	--	--
TOTAL DISTURBANCE AREA / TOTAL TOPSOIL AVAILABLE				751.1	--	728,866

Note: Listed depths are provided to the nearest hundredth decimal place as an artifact of calculation, despite the fact that salvage/replacement equipment depth capabilities are limited.

Table 4-10. Additional Plant Growth Medium Quantities, Mine Areas.

Proposed Salvaged Coversoil				
AREA - Soil Map Unit	MU Symbol	Acres	Depth (ft)	Volume (CY)
Congo Pit				
Bosler	BO	26.4	1.99	84,790
Cushool	CU	103.0	2.86	475,025
Disturbance / Not Surveyed	D	64.0	0	0
Onason	ON	116.1	2.35	440,098
Rock River	RO	6.3	1.54	15,553
	Subtotal	315.7	--	1,015,466
Ore Pad Area				
Bosler	BO	28.3	1.99	90,794
Disturbance	D	23.1	0	0
Onason	ON	6.1	2.35	23,279
Onason / Reclaimed Varient	ON-RV	1.8	2.35	6,635
Rock River	RO	0.7	1.54	1,789
	Subtotal	60.0	--	122,496
Spoils Facilities (Hanks Draw and South)				
Bosler	BO	26.0	1.99	83,442
Cushool	CU	7.9	2.86	36,636
Disturbance / Not Surveyed	D	17.4	0	0
Onason	ON	92.7	2.35	351,267
Rock River	RO	43.5	1.54	107,953
	Subtotal	187.4	--	579,298
Administration Office & Access Roads				
Bosler	BO	19.0	1.99	61,032
Cushool	CU	13.3	2.86	61,322
Disturbance / Not Surveyed	D	82.6	0	0
Onason	ON	26.9	2.35	101,911
Onason / Reclaimed Varient	ON-RV	7.5	2.35	28,245
Rock River	RO	10.9	1.54	27,156
	Subtotal	160.2	--	279,666
Proposed Salvage Area / Coversoil Volume		723.3	--	1,996,927

Notes:

1. Coversoil represents suitable growth medium in addition to topsoil (i.e., excludes topsoil volumes).
2. Listed depths are provided to the nearest hundredth decimal place as an artifact of calculation, despite the fact that salvage/replacement equipment depth capabilities are limited.

Table 4-11. Estimated Topsoil and Additional Plant Growth Medium Quantities, Processing Facility Area.

Proposed Salvaged Topsoil & Coversoil				
AREA - Soil Map Unit	MU Symbol	Acres	Depth (ft)	Volume (CY)
Topsoil – Processing Facility Area				
Bosler	BO	1.8	1.13	3,282
Cushool	CU	34.9	0.47	26,464
Disturbance / Not Surveyed	D	61.2	0	0
Onason	ON	41.8	0.31	20,906
Onason / Reclaimed Varient	ON-RV	35.9	0.31	17,955
Rock River	RO	29.9	1.79	86,347
Proposed Salvage Area / Topsoil Volume		205.5	--	154,953
Coversoil - Processing Facility				
Bosler	BO	1.8	1.99	5,779
Cushool	CU	34.9	2.86	161,033
Disturbance / Not Surveyed	D	61.2	0	0
Onason	ON	41.8	2.35	158,478
Onason / Reclaimed Varient	ON-RV	35.9	2.35	136,109
Rock River	RO	29.9	1.54	74,288
Proposed Salvage Area / Coversoil Volume		205.5	--	535,686

Notes:

1. Approximately 5.8 acres of this area has not been surveyed by BKS, conservatively included in the "Disturbance" quantity.
2. Listed depths are provided to the nearest hundredth decimal place as an artifact of calculation, despite the fact that salvage/replacement equipment depth capabilities are limited.
3. Coversoil represents suitable growth medium in addition to topsoil (i.e., excludes topsoil volumes).

4.8 Site-Wide Water Management

This section describes the management plans for groundwater, surface water and potable water, as well as providing a water balance for the Project and discussion of treatment and discharge requirements for excess water. Pumping of groundwater to dewater the Sheep Underground mine and the Congo Pit is expected to exceed the water needed to support mining and processing operations, requiring management of excess water. Potable water will initially be supplied by Jeffrey City, Wyoming, and later by on-site water wells via an approved water treatment system. Given the semi-arid climate and the

absence of perennial stream flow within the Permit Area, surface water management will focus on storm water control and erosion protection. **Appendix D-6** (Hydrology) summarizes the groundwater and surface water hydrology for the Project.

Both the open pit and underground workings will require dewatering during proposed mine operations, as discussed in **Section 4.8.1** and **Section 4.8.2**. Excess water will be managed as discussed in **Section 4.8.6**.

4.8.1 Pit Dewatering

Based on the depth of the phreatic surface and the mining rate, the Congo Pit is expected to encounter groundwater during the first year of mining operations. **Table 4-12** (Elevation Difference Between Bottom of Congo Pit and Phreatic Surface) presents a comparison of the elevation difference between the proposed base of the Congo Pit to the 2013 phreatic surface, which illustrates that groundwater is expected to be encountered during Year 1 of open pit operations. As such, the open pit will require dewatering during proposed mine operations.

Table 4-12. Elevation Difference Between Bottom of Congo Pit and Phreatic Surface.

Year	Low Point in Congo Pit (ft AMSL)	Water Table Elevation at Low Point[1] (ft AMSL)	Depth Below Water Table in Congo Pit at Low Point (ft)
1	6650	6788	138
2	6740	6840	100
3	6650	6855	205
4	6550	6788	238
5	6620	6802	182
6	6550	6812	262
7	6570	6850	280
8	6640	6840	200

[1] Based on water level data from May 2013.

Western Nuclear (1973-1983) estimated an average groundwater flow into the Congo Pit of approximately 182 gpm over the life of mine, with a peak flow of 275 gpm, and proposed dewatering via an in-pit sump. These flow rates were based on the previous Congo Pit design, which included excavation to a depth of approximately 260 ft below the potentiometric surface and a maximum pit area of 210 acres. Currently, the proposed Congo Pit comprises a maximum area of 316 acres, while the

maximum pit excavation extends to a depth of approximately 280 ft below the 2013 potentiometric surface.

Energy Fuels commissioned Lytle Water Solutions, LLC ("LWS") to perform groundwater modeling to estimate the dewatering rates for use of an in-pit sump system within the Congo Pit during the life of open pit operations. This approach to pit dewatering is consistent with the previous approach proposed by Western Nuclear (1973-1983), whereby sumps will be used to capture water that collects in the lower portions of the pit. Based upon the dip of the ore body, the pit floor will naturally slope to a low area, which changes on a year-by-year basis requiring relocation of the in-pit sump. As a result, the remainder of the floor will stay dry allowing year-round operations under most conditions and facilitate quick restoration following direct precipitation events.

The LWS (2015) groundwater model report is included as **Exhibit D-6.15** (Preliminary Mine Dewatering Plan) to **Appendix D-6** (Hydrology), with results summarized in **Table 4-13** (Total Congo Pit Dewatering Rates by Year) and **Figure 4-2** (Estimated Congo Pit Dewatering Rates for the Life of Mine). Based on the interpretation of local geophysical logs, LWS (2015) estimates that approximately 60 percent of the local aquifer (i.e., the Battle Spring formation) comprises water-bearing strata. As such, the estimated pumping rates from a sump within the Congo Pit ranges from 156 to 377 gpm, with an average rate of 263 gpm. These adjusted inflow rates have been assumed for purposes of water balance modeling (refer to **Section 4.8.5**).

Table 4-13. Total Congo Pit Dewatering Rates by Year (LWS, 2015).

Year	Total Dewatering Rate (gpm)	Total Pumping Rate Adjusted for Water-Bearing Strata (gpm)
1	260	156
2	339	203
3	508	305
4	629	377
5	590	354
6	535	321
7	327	196
8	332	199

[1] It is estimated that water-bearing sandstones in the Battle Spring formation represent approximately 60 percent of the stratigraphic column to be dewatered in the Congo Pit, based on interpretation of local geophysical logs.

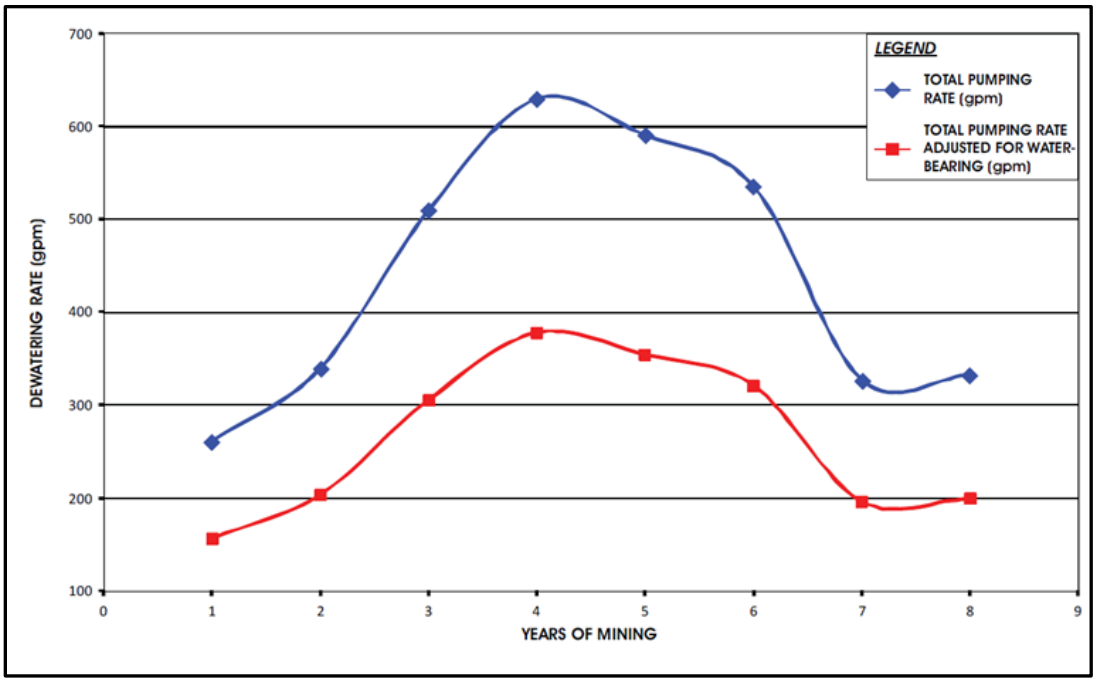


Figure 4-2. Estimated Congo Pit Dewatering Rates for the Life of Mine (LWS, 2015).

4.8.2 Underground Dewatering

Dewatering from the Sheep Underground mine is required in advance of re-opening the mine. Dewatering of the underground workings will be performed from one or both of the existing mine shafts (Sheep I and/or Sheep II shafts). Initial underground mine dewatering is scheduled to begin during the construction period, and anticipated to require continuous pumping at a rate of 750 to 1,000 gpm for a period of approximately nine months to one year. After initial mine dewatering and during operations, a steady-state dewatering rate of 250 to 400 gpm is expected, based on historical information. The water will be used for dust suppression, ore processing, cleaning and maintenance, fire suppression, and other uses throughout the site. Higher water usage will occur during the summer months, when evaporation rates and dust suppression demands are high.

Once underground development and production mining operations commence, the ventilation system and operational drilling activities will consume an average of approximately 20,000 gallons of additional water per day. With the exception of the water used for the development of the new twin declines, water collected in the underground mine sumps will supply this additional demand.

In the event that mine dewatering at the proposed rates is not sufficient to completely draw down the phreatic surface in the Sheep Underground mine, increased dewatering rates may be required. At the currently estimated dewatering rates, as discussed in the water balance section (**Section 4.8.5**), Energy

Fuels anticipates that a water treatment plant will be required prior to initiating underground mining operations to treat excess water for discharge into Crooks Creek (refer to **Section 4.8.6**).

4.8.3 Surface Water Management

Based upon topographic relief in the area of the Congo Pit, surface water inflow to the pit can be controlled by constructing diversion channels around the pit highwall crest, which release runoff from undisturbed areas to off-site drainages. In addition to controlling storm water runoff, the channel configuration serves as a safety berm to prevent access to the highwall crest (see **Map 3-3**, Mine Construction Details). Energy Fuels (2014a) provides design of storm water controls for the mine areas.

The Project has an active and current SWPPP, which will be updated as necessary during mine operations. A copy of the SWPPP will be maintained at the Mine Office. Off-site drainage will meet the requirements of the WYPDES storm water permit, which includes the requirement to implement appropriate sediment control measures.

4.8.4 Potable Water

Energy Fuels anticipates that 50 gallons per day ("gpd") of potable water will be needed on site for each employee showering at the end of work shifts. Additional potable water will be needed at the ore processing facility for laundry services. As a general rule, the construction crews and open pit mine crews will not shower on site, while the crews working in the processing facility and underground mine will shower before leaving the site due to higher exposures to radon dust.

Initially, Energy Fuels plans to purchase water from Jeffrey City, Wyoming, and import it to the site for the portable bathrooms and limited shower facilities that will be present during the construction period. This purchased supply will likely continue through the initial mine operations period when only the Congo Pit is in operation, given that the potable water requirement (approximately 2,000 gpd) could be met by one water truck or less per day. As the mine operation expands with underground mining, Energy Fuels will build a potable water treatment system in accordance with EPA requirements. Assuming up to 200 personnel at full operation, the system will be designed to treat and provide approximately 10,000 gpd.

4.8.5 Site-Wide Water Balance

Energy Fuels has developed a site-wide water balance based on estimated inflows and outflows during mining operations considering both on-site and off-site processing of the uranium ore.

Make-up water requirements for an on-site processing facility are expected to range from 150 to 300 gpm based on current design of the proposed processing facility. This relatively large range in water usage is due in part to the currently-proposed EPA Subpart W regulations for operation of uranium heap

leach facilities, which would require much higher water volumes than the current industry standard. A make-up water requirement of 200 gpm was assumed for this site-wide water balance.

Assuming Sheep Underground operations commence three years after Congo Pit operations, the Congo Pit dewatering rates developed by LWS (2015) (refer to **Section 4.8.1**), and an estimated Sheep Underground dewatering requirement of 750 gpm during initial dewatering (one year prior to operations) and 250 gpm thereafter (refer to **Section 4.8.2**), the estimated inflows (exclusive of climatic considerations) are illustrated in **Figure 4-3** (Preliminary Water Balance Inflows). With the estimated outflows illustrated in **Figure 4-4** (Preliminary Water Balance Outflows), the results of the preliminary site-wide water balance are illustrated in **Figure 4-5** (Preliminary Water Balance Results), and discussed below:

- **Scenario A:** Operation of the Congo Pit combined with an on-site processing facility will likely result in a small water shortage, up to about 60 or 70 gpm. The additional water required to operate the processing facility may be obtained through pumping from the Sheep Underground using established groundwater rights;
- **Scenario B:** Operation of the Congo Pit without an on-site processing facility is anticipated to result in a water surplus on the order of 150 to 200 gpm;
- **Scenario C:** Combined Congo Pit and Sheep Underground mining operations are anticipated to result in excess water management on the order of 200 to 600 gpm; however, during initial Sheep Underground dewatering (prior to commencing underground mining operations), excess water on the order of 800 to 1000 gpm may be anticipated; and
- **Scenario D:** After initial dewatering, operation of the Sheep Underground alone is anticipated to result in an approximate water balance for the scenario with an on-site processing facility, and an excess on the order of 200 to 250 gpm without an on-site processing facility.

In summary, water treatment is not anticipated to be required initially for the Project if on-site processing is used. However, if off-site processing is employed, Energy Fuels anticipates that excess water will be generated that requires management. **Section 4.8.6** (Water Management) discusses how water will be managed at the site.

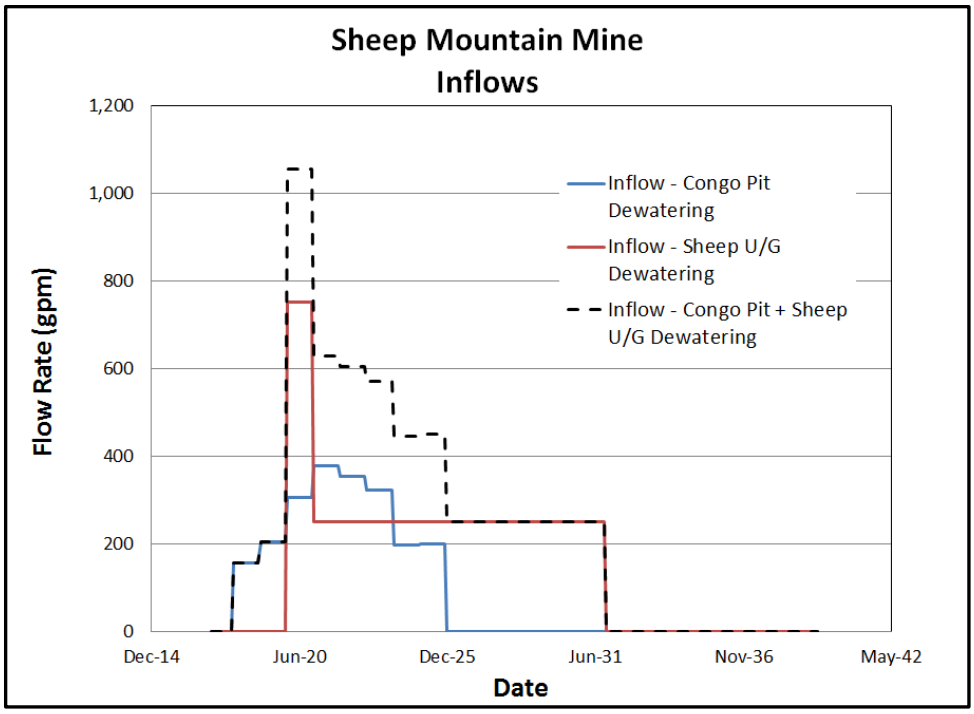


Figure 4-3. Preliminary Water Balance Inflows.

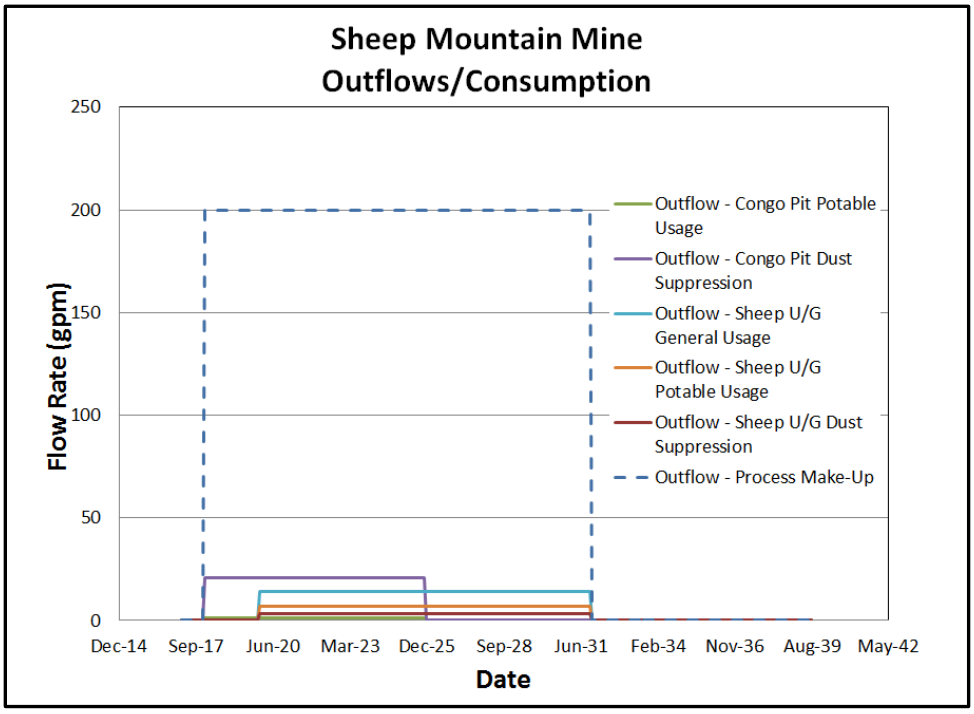


Figure 4-4. Preliminary Water Balance Outflows.

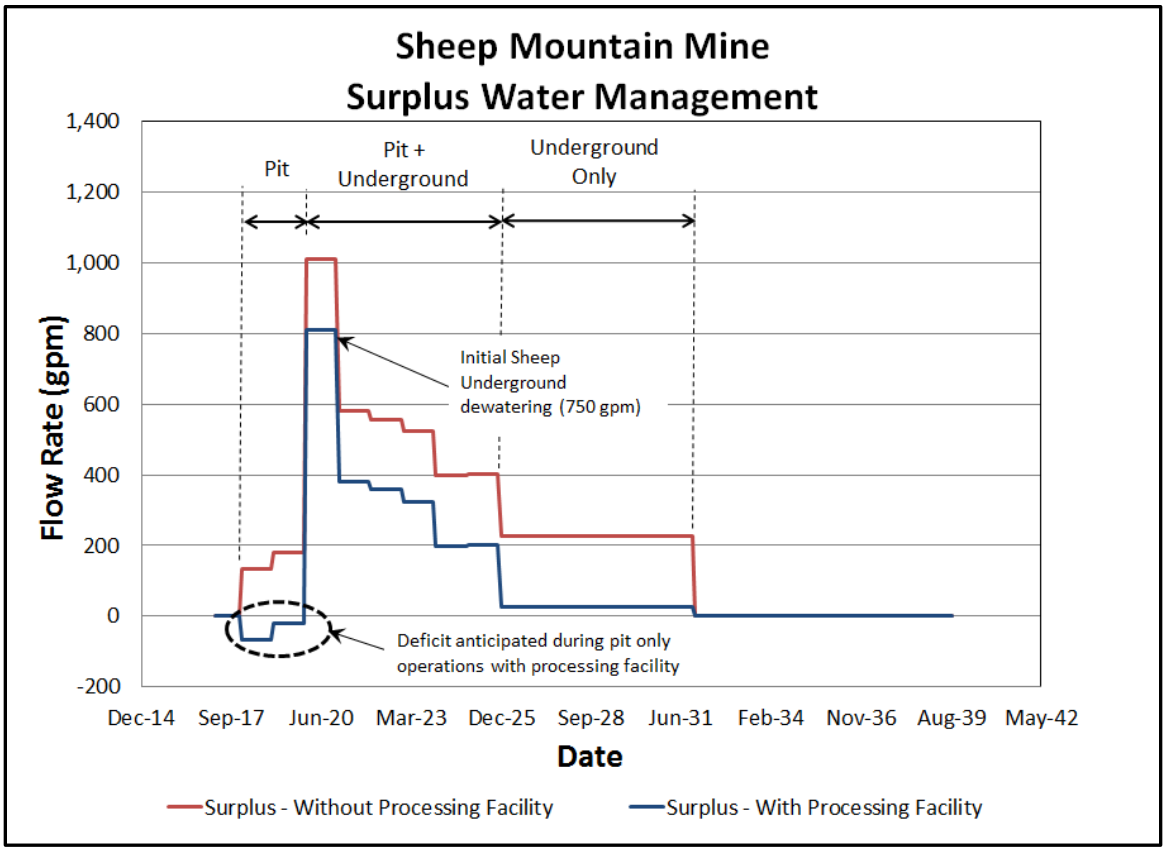


Figure 4-5. Preliminary Water Balance Results.

4.8.6 Water Management

As discussed in **Section 4.8.1**, Energy Fuels plans to dewater the Congo Pit via an in-pit sump. A barge placed in the sump will pump water to a lined holding pond located on the Ore Pad to store untreated water to facilitate settling. With a retention time of three days based on an average anticipated treatment rate of 200 gpm, the holding pond capacity is estimated at approximately 115,500 cubic feet, and would be constructed with three feet of freeboard above this capacity (see **Map 3-4**, Ore Pad Area).

Historically, excess water from mining operations (surface and underground) was pumped to an external holding pond in Hanks Draw, and treated via ion exchange and barium chloride prior to discharge through a series of settling ponds in Hanks Draw for flow into Crooks Creek under a discharge permit (Western Nuclear, 1973-1983). The historic treatment facility was designed with a capacity to treat 750 gpm.

As discussed in **Section 4.8.5**, Energy Fuels generally anticipates that excess water will be generated during mining operations that exceed the consumptive requirements for water, particularly if an on-site processing facility is not constructed. Considering the likely potential for excess water management,

Energy Fuels (2015a) submitted an application to WQD for a WYPDES discharge permit in June 2015. Based on a review of the Congo Pit water quality data, constituents of concern were evaluated to include zinc, selenium, uranium, adjusted gross alpha and combined radium based on WYPDES permit standards, with radium being the primary concern. Underground water characteristics were taken from the Sheep I shaft, and indicate historically higher uranium concentrations than those found in the Congo Pit wells. The WYPDES discharge permit application proposed design of a water treatment plant located on the Ore Pad (adjacent to the holding pond) to remove the primary constituent of concern (i.e., radium). The proposed water treatment plant will initially be designed to treat the Congo Pit water at a flow rate of 375 gpm. The increased flow rate that will result from commencement of underground operations will be handled by an additional treatment pond. Based on staggered operations, the water treatment plant will have the capacity to treat the initial high pumping rates required to dewater the underground mine.

The proposed water treatment plant will consist of one process step for radium removal, as illustrated in **Figure 4-6** (Simplified Process Flow Diagram for the Water Treatment Plant). In this treatment process, the initial raw influent water is mixed with barium chloride ($BaCl_2$). When the barium chloride salt is mixed in water, the barium combines with sulfate in the water to form barium sulfate, which is highly insoluble. Dissolved radium (2+) co-precipitates with the barium (2+) in the barium sulfate crystal structure, effectively removing the dissolved radium as the barium sulfate precipitates from solution. This chemical precipitate, along with the particulate matter in the influent (total suspended solids, "TSS") will be removed from the water by a sedimentation pond. The solids removed by the sedimentation process, which includes the removed radium, will be removed from the lined sedimentation pond by a vacuum truck and sent off-site to a licensed facility (e.g., White Mesa Mill) for further waste processing.

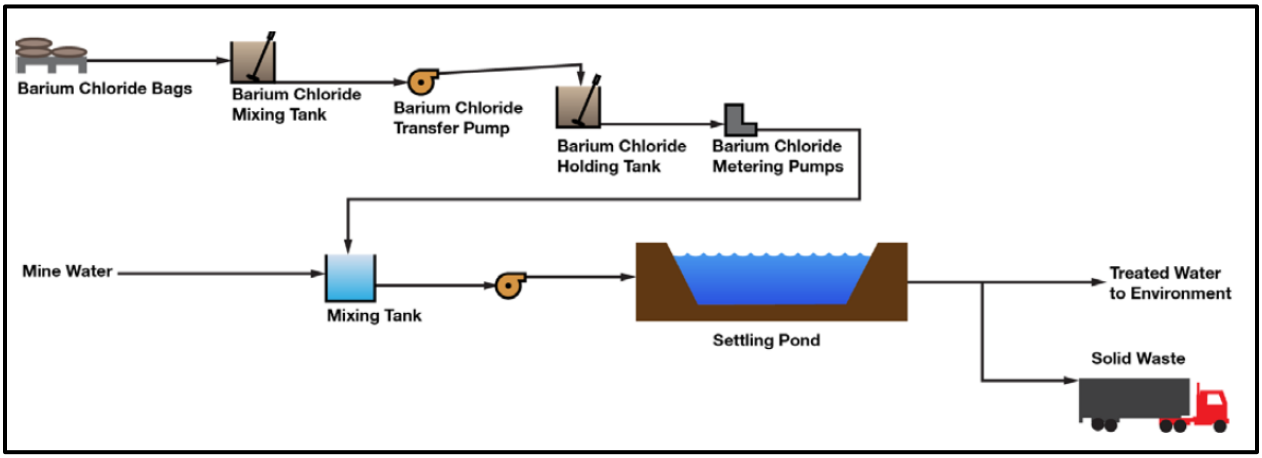


Figure 4-6. Simplified Process Flow Diagram for the Water Treatment Plant (Tetra Tech, 2015).

If operational water quality is found to contain constituents other than radium at higher concentrations than is anticipated, additional steps could be added to treat the water. For example, higher concentrations of uranium could be treated by installing an IX plant. Alternately, elevated metals concentrations could require the addition of a filtration system.

4.9 Waste Characterization and Handling

WDEQ/LQD regulations require an assessment of the geology and overburden within the Project. **Appendix D-5** (Topography, Geology, and Overburden Assessment) presents this information, including supplemental data collected from 2010 overburden sampling.

4.9.1 Overburden Characteristics

As discussed in **Appendix D-5**, pre-mining overburden characterization within the proposed Congo Pit has been completed to the depths and frequencies recommended in LQD Guideline No. 1 (WDEQ/LQD, 1994). Specifically, a minimum of one core hole per 40 acres of proposed pit disturbance has been completed to substantiate the stratigraphy.

Review of not only the chemical and physical properties of the sampled overburden, but also the geology of the area, indicates that overburden materials are generally suitable for reclamation purposes. Surficial geologic units exposed in the Congo Pit area consist of Quaternary Alluvial deposits and weathered Battle Spring Formation. The Battle Spring Formation is the uranium host and is mineralized at or near the surface in some locations.

Stratigraphic zones within sampled boreholes have been defined as unclassified, marginal, or unsuitable material based on LQD guidelines. Unclassified material does not contain any deleterious properties with respect to radiological or metal concentrations and is non-acid forming. Without exception, the upper oxidized portions of the boreholes, whether collared in the Battle Spring Formation or in Quaternary Alluvium, contained unclassified material.

Analyses of representative overburden materials from some of the geologic units indicate that certain parameters of concern exceed the LQD Guideline No. 1 (WDEQ/LQD, 1994) criteria for suitability, specifically the Sodium Adsorption Ratio, acid-base potential, and levels of potentially toxic elements including boron, selenium and molybdenum. These parameters are generally identified only within ore zones, and non-ore zones appear to comprise suitable soils. Based on a review of the information, these parameters are not expected to pose significant problems for overburden suitability for the following reasons:

- Parameters in exceedance of the criteria established by LQD were typically identified in ore zones, and the ore materials are not subject to the overburden suitability criteria;

- Mine spoils will be returned to the Congo Pit as backfill during progressive reclamation, with the deepest encountered overburden materials being replaced in deeper portions of the pit;
- Unclassified (i.e., suitable) overburden from the South Spoils Facility will be placed as a cap over the rest of the overburden prior to placement of topsoil; and
- Mixing of overburden material during mining should result in dilution of the material. Further mixing of overburden material will occur during replacement of the overburden into the Congo Pit during reclamation activities.

4.9.2 Selective Handling

Based on available data, recommended clean-up criteria for radium-226 (i.e., <20 pCi/g; refer to **Appendix D-5** [Topography, Geology and Overburden Assessment] and **Appendix D-11** [Radiological Assessment]), and applicable standards and/or criteria, mine spoils material has been subdivided into the following categories:

- **Topsoil/Coversoil:** Coversoil consists of native topsoil and subsoil, but also includes buried alluvial soils, salvageable mine reclamation soils, and other material suitable as a plant growth medium. Coversoil is reasonably free from clay, rocks, and other chemical or physical properties, which inhibit the germination of seeds or growth of cover crops.
- **Unclassified:** Unclassified material is that which does not meet criteria as coversoil, yet is not radioactive, not acid forming, and does not contain concentrations of metals or other constituents in excess of LQD criteria. This material is suitable for most construction purposes.
- **Marginal:** Marginal material is that which is not radioactive or only slightly elevated in radionuclides, but does have the potential to be acid forming and/or contains metals in excess of LQD criteria. This material can be used for most construction purposes. When placed near the surface, a lime amendment may be necessary to mitigate potentially acid generating characteristics.
- **Unsuitable:** Unsuitable material is that which is radioactive (exceeds 20 pCi/g), acid forming, and/or exceeds LQD criteria for metals. This material will be isolated below the rooting zone.

As discussed in **Section 4.9.1** above, the majority of unsuitable material is represented by, or closely associated with, the ore that will be mined and processed and therefore will not be of concern in mine reclamation. Control of radiological parameters during construction by field methods will generally serve to control non-radiological parameters of concern as well. Visual identification in combination with field monitoring of radiological levels will provide for reasonable classification and control of unsuitable materials during construction, which exceed radiological suitability criteria, have visual sulfide minerals, and/or have a high acid forming potential based on regraded spoils sampling (refer to **Section 5.5.3**). Marginal materials will also be controlled by both visual identification and radiological

levels as discussed above, and sampling of the regraded surface prior to topsoil placement will determine acid/base potential and required levels of lime as an amendment (refer to **Section 5.5.3**).

Mine operations will segregate both available topsoil/coversoil and oxidized surficial mine overburden with low radiological levels for final cover of the mine and ore processing areas during reclamation. The ore control methods and equipment previously described will be utilized to segregate this material. As discussed in **Section 4.3.3**, an estimated two million cubic yards of suitable cover material salvaged from the upper levels of the Congo Pit will be placed in the South Spoils Facility for use as cover material to be placed over the backfilled Congo Pit and other select disturbance areas, prior to topsoil placement during final reclamation.

Unclassified spoils material will be placed in the Hanks Draw Spoils Facility. When possible, marginal and unsuitable material mined from the Congo Pit and Sheep Underground mine will be directly backfilled within the pit and/or remain underground, circumventing placement into the Hanks Draw Spoils Facility. Marginal material encountered, which cannot remain in the pit or underground, will be isolated within the internal portions of the Hanks Draw Spoils Facility and buffered with unclassified material.

LQD will be notified in the Annual Report of the location and analytical results of the ongoing monitoring program, along with the mitigative measures that were taken, if such measures are necessary.

4.10 Spill Contingency Plans

Spill contingency plans are applicable to both mine and mineral processing operations and for transportation.

4.10.1 Mine Operations

Mine operations use a variety of fuel and lubricants, as well as antifreeze and other chemical products, in daily operations. Fuel and lubricant storage areas will be enclosed with berms capable of containing any spill plus adequate freeboard from any storage tank. The Ore Pad and surrounding berms will be constructed of compacted native soils. Mine shops and warehouses will be equipped with drain and waste containment sumps to contain any spills. Spilled fuel, used oil, used antifreeze, and other liquid wastes from maintenance operations will be recycled and/or disposed off-site at a licensed facility.

4.10.2 Mineral Processing

The mineral processing facility, including the heap leach pad area, is designed to contain all flows and spills and the PMP event. The heap leach pad area is designed with a positive drainage and collection system, with solutions reporting to the Collection Pond. Any spill not contained in the process plant, even in the event of a complete loss of power, will gravity drain to the Raffinate Pond, which in turn

would overflow into the Collection Pond under extreme conditions. Finally the Collection Pond is designed with an overflow to the Holding Pond, which has sufficient design capacity for all operational solutions and containment of the PMP event, including an allowance for freeboard and potential wave action.

The process ponds (Collection Pond and Raffinate Pond), heap leach pad, and liquid waste containment pond (Holding Pond) are proposed to be triple-lined with dual leak detection systems, which will be monitored regularly according to standard operating procedures to ensure prompt assessment of primary containment system performance. In addition, groundwater monitoring downgradient of the mineral processing facilities will allow for detection of adverse impacts to groundwater quality should the liner system fail. Leak detection monitoring and groundwater monitoring are addressed in more detail in the Monitoring Plan presented in **Section 0** of this Plan.

4.10.3 Transportation

Transportation on public roads, both to and from the mine and mineral processing operations, is subject to DOT regulations, including requirements for a spill response plan. Material transportation to the operation will primarily involve diesel fuel, consumable items such as chemical reagents for mineral processing, underground mine materials, and explosives. Items transported from the operation will primarily consist of yellowcake, which is a solid product packaged in DOT-approved 55-gallon drums for shipment, and/or mineralized material (i.e., ore) for off-site processing.

5.0 PART 5 – RECLAMATION PLAN

As defined by the Wyoming Environmental Quality Act, "Reclamation" means the process of reclaiming an area of land affected by mining to use for grazing, agricultural, recreational, wildlife purposes, or any other purpose of equal or greater value. The reclamation process may require implementation of measures to eliminate: (i) water diminution to the extent that existing water sources are adversely affected; (ii) pollution; (iii) soil and wind erosion or flooding resulting from mining; and (iv) any other measures necessary to restore the affected land to its useful post-mining purpose. State regulatory agencies require that final surface reclamation be assured by a reclamation bond held by WDEQ/LQD.

The proposed measures described in this Reclamation Plan are intended to return the disturbed areas to a safe and long-term stable configuration, as well as re-establish the pre-mine land use of rangeland and wildlife habitat (refer to **Appendix D-1**, Land Use). **Map 5-1** (Final Reclamation Plan) shows the areas that will be reclaimed, as well as the final proposed land configuration. Final reclaimed slopes will be similar to pre-mining slopes, or slightly less steep, and reclaimed features are designed to be free-draining and maintenance free.

Surface disturbance will be phased over several years, depending on the uranium production rate, economic conditions, and the availability of mine construction equipment and personnel. During development of the Project facilities, topsoil will be salvaged and stockpiled for later use during reclamation (see **Section 4.7**). Following cessation of open pit operations, spoils material stockpiled in the Hanks Draw Spoils Facility and the South Spoils Facility will be placed in the Congo Pit. Disturbed surface areas will be re-graded to approximate pre-mine contours, covered with topsoil, and seeded with native plant species approved by the BLM and LQD. Final reclamation activities also include plugging and abandoning mine ventilation shafts and access tunnels, removing buildings and other infrastructure, and reclaiming roads and drainage structures that do not have a post-mining beneficial use.

5.1 Congo Pit Area Reclamation

The mineralized horizon within the Congo Pit dips southeast and requires removal of between 100 to 600 vertical feet of overburden (spoils material) for ore access. During the first few years of mining, the majority of the spoils material removed from the Congo Pit will be stored in the Hanks Draw Spoils Facility. The spoils material stored in the South Spoils Facility will be less mineralized material with low radiation levels suitable for placement directly below the topsoil during final reclamation.

5.1.1 Progressive Pit Backfill

Due to the nature and extent of mineralization, the Congo Pit is essentially a single open pit that will be developed sequentially to accommodate the desired mine production, while allowing for internal progressive backfilling. This sequential schedule and internal backfilling reduces the amount of double-handling of spoils material required to backfill and reclaim the mined pit during the life of the mine. Refer to **Map 4-2** (Congo Pit Sequence – Year 1) through **Map 4-9** (Congo Pit Sequence – Year 8) that depict the mine sequence on an annual basis over a planned eight years of operations. These maps also show areas of intra-pit backfill during development of the Congo Pit. Beginning in Year 7, it is anticipated that all spoils materials excavated in the pit will be backfilled internally.

5.1.2 Material Handling and Mass Balance

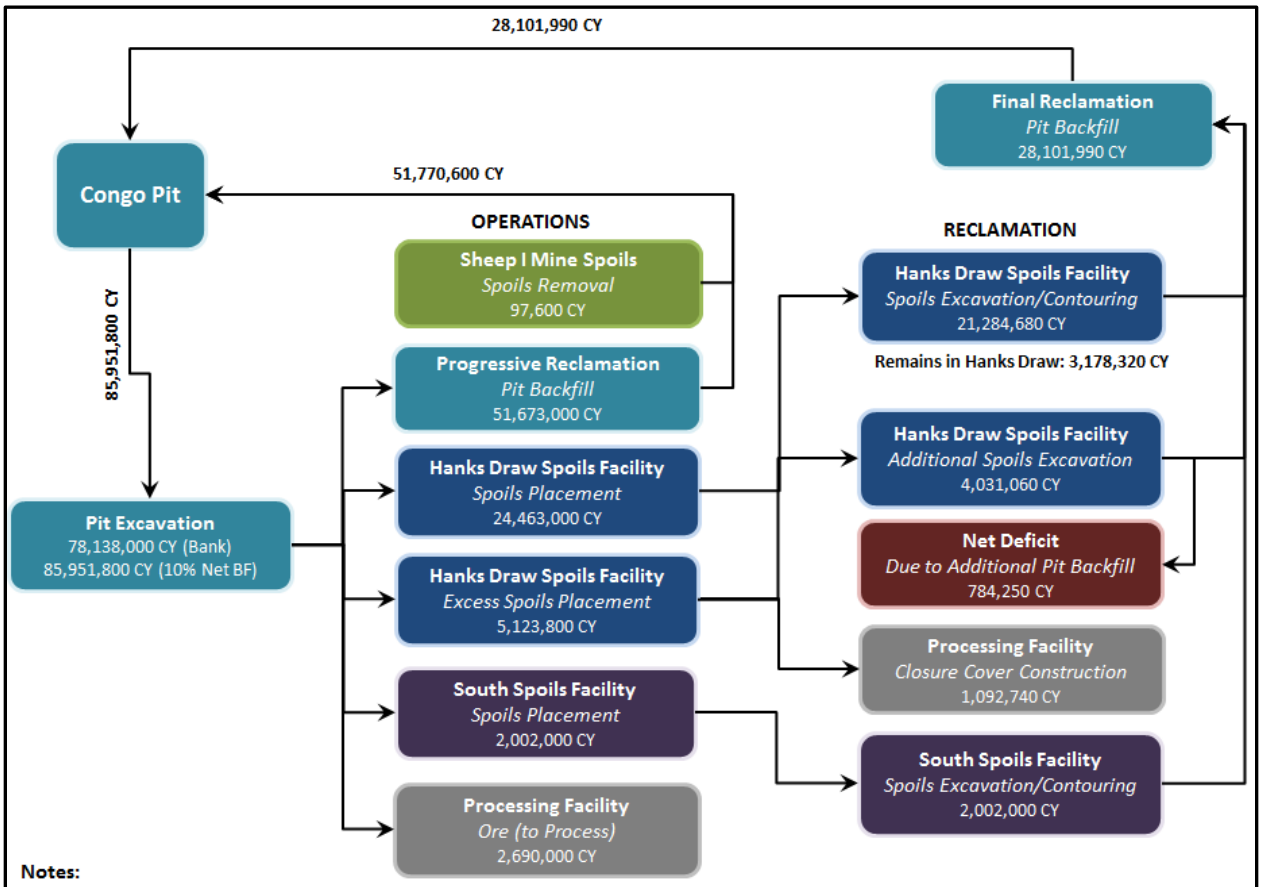
Volumes of materials to be handled within the Congo Pit and stored within the external temporary spoils areas were presented in **Table 4-2** (Mine Sequence Quantities). The volume of ore removed in addition to the material used to reduce the steepness of the existing slopes within the Congo Pit and the Hanks Draw areas, and the material used for closure cover construction within the proposed processing facility, balances with the swell of the material being excavated, assuming a net bulking factor of 10 percent. The net bulking factor is the result of excavation, transport, placement and compaction of the material, where Trenter (2001) notes that this typically amounts to between 0 and 10 percent for the majority of soils and weak rock, and between 5 and 20 percent for harder rock. Use of a 10 percent net bulking factor was discussed and confirmed with the LQD as a reasonable assumption for the Project. In essence, the mass balance allows for the approximate original topography to be re-established within the Congo Pit area, and a more stable (i.e., less steep) configuration to be achieved within the Hanks Draw area.

The reclaimed Congo Pit will be free draining and will have no remaining high walls (refer to **Map 5-2**, Congo Pit Area Reclamation Plan). Drainage channels within the reclaimed Congo Pit will be placed in approximately the same location as existing drainages while trying to minimize the channel slopes for long-term erosional stability. The proposed closure grading for the Congo Pit area requires an additional approximately 1.7 million cubic yards of material be placed within the pit area, as compared to the existing grades.

The Hanks Draw area is currently characterized by steep slopes (locally as steep as 1.2H:1V). Proposed closure grading within the Hanks Draw area (refer to **Map 5-2**) requires that approximately 3.2 million cubic yards of spoils remain within the area to provide a more stable slope configuration, with maximum slopes on the order of 3H:1V.

Assuming a unit weight of 110 pounds per cubic foot ("pcf") for the ore, with a total of approximately 4 Mt of ore removed from the Congo Pit, this equates to a volume of approximately 2,690,000 cubic yards of ore removed. Based on preliminary closure design of the proposed processing facility, an additional approximately 1.1 million cubic yards of material is required for closure cover construction.

The mass balance for the Project is illustrated in **Figure 5-1** (Material Mass Balance), showing that a net deficit of less than one percent is achieved for the Project. As discussed above, the mass balance assumes a net bulking factor of 10 percent on material excavated from the Congo Pit. If the net bulking factor is actually slightly higher than 10 percent, or if an on-site processing facility is not constructed, a mass balance will be achieved for the Project.



Notes:

1. Assuming a net bulking factor (BF) of 10% on material excavated from the pit, an approximate mass balance is achieved (net deficit less than 1%).
2. Closure grading for Congo Pit area achieved by placing approximately 1.7 MCY of additional loose fill (compared to existing grades).
3. Closure grading for Hanks Draw requires that approximately 3.2 MCY of fill (i.e., spoils) remain in area (i.e., not returned to Congo Pit).

Figure 5-1. Material Mass Balance.

5.1.3 Final Congo Pit Area Reclamation Contours

The Congo Pit and proposed Hanks Draw Spoils Facility are situated within natural low spots in the terrain with relatively steep side slopes (refer to **Map D-5-1**, **Appendix D-5**). During final reclamation, the slopes within the Congo Pit and adjacent Hanks Draw areas will be reduced from their existing configuration to enhance long-term stability.

While the final reclaimed surface configuration will approximate original contours, the Congo Pit is located in a rather steep upland area and reclamation will employ design criteria developed through geomorphic site investigations completed for the pre-mine conditions (see **Appendix D-6**, Hydrology). Based on current success with geomorphic mine reclamation techniques on AML projects in the Gas Hills, it is believed that applying these techniques to the Congo Pit area reclamation will create a diverse and erosionally-stable landscape.

The Congo Pit reclamation grading design was created by BRS using the Natural Regrade™ software package to provide a geomorphically-stable and natural-looking reclamation surface (refer to **Map 5-2**). Key design aspects of the Natural Regrade™ surface include convex to concave slope profiles, concave channel profiles, a high degree of dissection of the reclamation surface utilizing multiple small drainage basins, and sinuous channel alignments to increase channel length and decrease gradient. The net effect of these characteristics of the Natural Regrade™ surface decreases the discharge peak flow quantity and velocity over more traditional reclamation surfaces. In addition, it creates a more aesthetically-pleasing, sustainable landform, which allows for increased snow capture to provide much needed spring moisture and allow for increased vegetative diversity, and increased habitat value.

The Hanks Draw area will be reclaimed in a similar manner to the Congo Pit area. Proposed reclamation grading contours are presented in **Map 5-2**, showing a slope reduction for enhanced stability upon reclamation (as compared to the current steep slope configuration). Proposed channel locations within the Hanks Draw area are also shown on the map.

5.1.4 Closure Surface Water Drainage Design

The conceptual reclamation grading plan for the Project is intended to return the Project's topographic contours to their approximate pre-mining condition, or more stable configuration, and includes a drainage system based on natural landforms. Smaller first order streams will collect runoff from headwaters and convey this water downstream in a system of topographic valleys. As part of the surface water management design for reclamation, Energy Fuels (2014a) presents preliminary channel sizing and armoring requirements. However, more detailed analysis and sizing of the closure drainage system is anticipated to be required as part of the final closure plan. It is believed that the reclamation

design, as presented, will function similarly to the native environment that it attempts to replicate, and will provide the best possible final reclamation product for the future intended land use.

5.2 Sheep Underground Reclamation

The Sheep Underground mine is planned as a cut/fill mine such that the majority of mine waste is used as mine backfill, while ore is successively removed. As such, a limited amount of net mine spoils is expected to report to the surface. Out-of-mine spoils from the underground mine operations is primarily related to the initial decline development and additional mine development haulage drifts. It is estimated that the total out-of-mine spoils will be approximately 570,000 cubic yards (approximately 1 Mt). Out-of-mine spoils will be placed in the Hanks Draw Spoils Facility and later backfilled within the open pit during reclamation (refer to **Section 5.1.3**).

5.2.1 Sheep Underground Progressive Backfill

By Year 3 of Sheep Underground mining operations, adequate space is anticipated to exist in the previously mined areas from Years 1 and 2 to begin intra-mine waste backfilling. From this point forward, it is not anticipated that any mine waste will be brought to the surface; however, the actual underground mine production rate and quantities will vary based upon actual conditions encountered during the mining process.

5.2.2 Sheep Underground Final Reclamation

Decommissioning and closure of the Sheep Underground will proceed immediately following the completion of underground mining. The shafts and vent holes will be capped to approximately four feet below the ground surface with a reinforced concrete cap, which will be designed by a qualified engineer. The concrete cap will be a “beam-type” cap that relies on transmitting the applied load to the subsurface, similar to a mat foundation, with steel reinforcement to address bending in the cap over the void, shear stresses that develop in the cap at the edges of the void, and tensile stresses that develop along the base of the cap.

For the declines, a bulkhead will be constructed (refer to **Map 5-3**, Sheep Decline Reclamation). The bulkhead will be at a sufficient depth to minimize the potential for mine subsidence to reach the surface. This depth is generally 10 times the mine opening height and will be determined based on geotechnical factors, including the bulking factor and draw angle. The surface disturbances will be regraded to approximate original contours, covered with topsoil, and seeded.

5.3 Processing Facility Reclamation

Reclamation of the heap leach pad and associated mineral processing facilities will be regulated by the NRC, or the Agreement State. Regulatory guidance is incorporated in NUREG-1620 (NRC, 2003), which

addresses cover and long-term erosional stability. When the heap leach pad area has reached capacity and spent ore material has been rinsed and stabilized, the spent ore material will be graded to its final configuration less an allowance of approximately 10 vertical feet for the cap and cover. Byproduct material from the plant decommissioning (mostly equipment, tankage and building materials) will be placed in an excavated repository within the heap prior to placing the final cover and cap. **Figure 5-2** (Heap Leach Typical Closure Cross-Section) provides a typical cross-section through the re-graded heap leach area, and **Figure 5-3** (Typical Heap Leach Cap and Cover Detail) provides typical details for the proposed radon barrier and closure cover. The final cover design will require approval by the NRC, or the Agreement State.

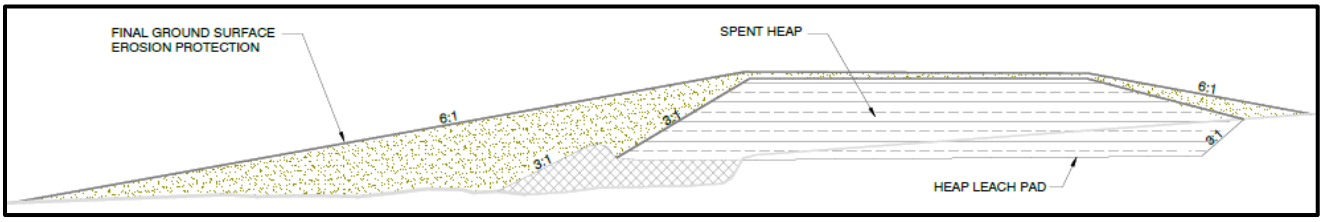


Figure 5-2. Heap Leach Typical Closure Cross-Section.

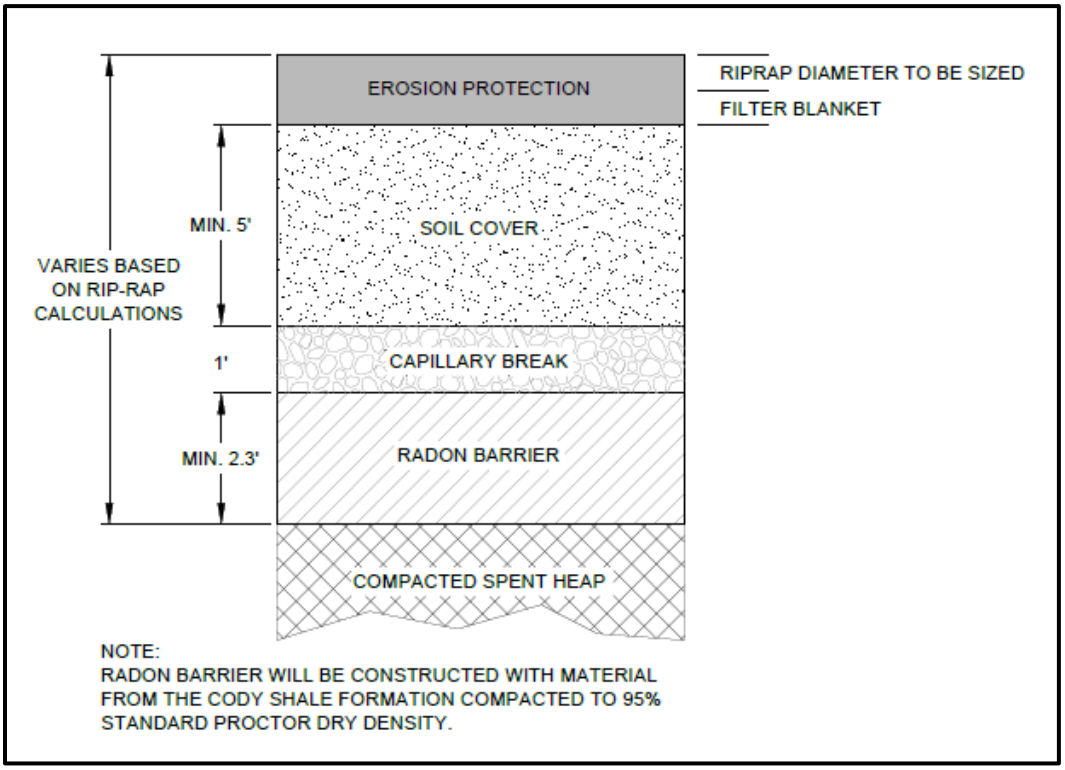


Figure 5-3. Typical Heap Leach Cap and Cover Detail.

At the start of plant reclamation, equipment and structures that can be cleaned to meet NRC release requirements will be removed from the site and reused at another project or recycled. Specialized demolition equipment will then be brought to the site to break up the concrete foundations and shred the remaining metal structures and equipment. This work may be done by a specialty contractor and/or on-site personnel with leased equipment. These materials will be placed in compacted layers within an excavated repository within the lined heap leach facility. During this same time, an interim cover of contaminated soils followed by clean soils will be placed over the heap. This will be followed by placement of the final cover, which is expected to include a low permeability radon barrier, a capillary break consisting of coarse granular material, a soil cover layer, and an erosion protection layer of riprap and/or a soil/rock mulch. The total cover thickness is anticipated to be approximately 10 ft. Based on current designs, the reclaimed heap will have gentle slopes of 6H:1V, with a maximum height of approximately 100 ft above the primary liner system.

Reclamation of the processing facility area is anticipated to require two to three years, with most of the work being completed during the six to eight month construction season. The reclamation staff will consist of approximately 24 personnel, including six on the demolition crew, 12 on the earthworks crew, and six supervisory and health and safety personnel. Most materials needed for the cover will be available on site. If such materials cannot be located on-site, imported materials may include low permeability soil (e.g., clay) for the radon barrier and riprap for erosion protection obtained from nearby quarries.

5.4 Reclamation of Ancillary Facilities

Ancillary facilities associated with the proposed mining and processing operations, including the conveyor, buildings, and access roads, will be reclaimed as follows:

- **Demolition:** The conveyor system, site utilities, and buildings (i.e., Administration Office, Sheep Underground Shop and Dry, Mine Shop/Warehouse) will be dismantled or demolished. Materials that can be salvaged or sold will be removed from site for re-use. Concrete pads will be broken into manageable pieces and steel buildings disassembled into manageable pieces, with both types of demolition debris placed within the Congo Pit prior to final grading. Wood and other organic debris will be transported to an approved solid-waste landfill for disposal;
- **Site Grading:** Disturbed areas associated with access roads and other ancillary facilities will be regraded, as needed, to provide long-term stable configurations. Ponds will be backfilled and areas regraded to approximate original contours. Where sediments in ponds exceed radiological site clean-up standards, the sediments will be excavated and buried within the Congo Pit prior to pond backfill; and
- **Revegetation:** Disturbed areas will be revegetated, in accordance with the sequence and details provided on **Map 5-4** (Revegetation Details).

5.5 Mine Reclamation Practices

As the open pit mine moves from operating status to reclamation, the open pit crew will be reduced in size to approximately 24 personnel, primarily equipment operators. Most of the equipment used during production will be utilized for reclamation activities. However, given that less selectivity is required during backfilling of the pit, larger equipment may be brought on site to reduce costs and shorten the reclamation period. Depending on the equipment used, two to five years will be required to backfill the Congo Pit, spread topsoil, reshape the surface, and seed the reclaimed areas.

Demolition of buildings and placement of mine seals will be completed by a small crew of approximately six people over an eight-month period. Removal of waste rock from the Sheep I shaft area and regrading, topsoil placement, and seeding on the surface areas affected by underground operations will be done by the open pit reclamation crew in conjunction with reclamation of the Congo Pit. The following reclamation practices will be used to reclaim the Project.

5.5.1 Drillhole Abandonment

Drillholes will be abandoned in accordance with BLM and State of Wyoming rules and regulations. Exploration drilling outside the permit area is regulated and bonded through the WDEQ Drilling Notification ("DN") process. The DN process addresses methods and costs for drillhole abandonment and drill site reclamation. At this time, Energy Fuels does not have an active DN for the Project. Future exploration drilling activities within the permit boundary will be facilitated through the existing Permit to Mine, with costs for drillhole abandonment and drill site reclamation included as part of the reclamation bond estimate.

5.5.2 Demolition

Demolition and reclamation of existing facilities within the Project area is addressed in the current bond. This includes reclamation of the existing Sheep Declines, and removing the existing shop and office buildings. New facilities will meet the same demolition requirements and will be bonded in accordance with WDEQ guidance. The only exception will be the facilities within the Proposed NRC Licensed Area, as equipment and materials generated during demolition of the processing facility will be handled in accordance with NRC regulations.

5.5.3 Materials Handling and Regraded Overburden Monitoring

As described in **Appendix D-5** (Topography, Geology and Overburden Assessment), the mine plan will segregate and stockpile both available topsoil and oxidized surficial mine overburden with low radiological levels for final cover. During development, unsuitable materials will be identified and selectively excavated and stored based on radiological levels, visual identification, and sampling. Radiological levels in excess of 70 µR/hr are indicative of unsuitable material, which will be isolated and

stored within the Hanks Draw Spoils Facility until final reclamation, or placed for progressive backfill directly in the Congo Pit. This material can be readily identified in the field with hand-held scintillometers.

Monitoring of the regraded or backfilled surface will be conducted prior to the topsoil replacement phase of reclamation according to the following methods:

- **Radiation measurements:** Radiation measurements will be conducted on a 100-ft by 100-ft grid at both contact and hip height. If an elevated area is detected, a grid of 10-ft by 10-ft will be measured to isolate the material needed to be placed below grade.
- **Overburden sampling:** Sampling will be accomplished by drilling holes four feet deep into the regraded or backfilled surface on a 300-foot grid. The drillholes will be sampled in two intervals, from 0 to 2 ft and from 2 to 4 ft. The samples will be analyzed in accordance with the parameters set forth in Table I-3 of Guideline No. 1 (WDEQ/LQD, 1994) (e.g., pH, conductivity, particle size analysis). In addition to the parameters outlined therein, Energy Fuels will perform acid-base potential testing on sampled regraded materials. If the sampling indicates that the surface material is undesirable in nature, the extent of the undesirable area will be delineated by taking additional samples approximately 150 ft apart, and by visually inspecting the areas.

To ensure that the near-surface overburden meets suitability standards prior to topsoil placement, undesirable material will be addressed in one or more of the following ways: (i) covered with at least three feet of suitable material; (ii) removed; and/or (iii) treated with amendments.

5.5.4 Regrading and Reshaping

Surface disturbances related to mining and exploration will be backfilled, where necessary, and regraded to approximate original contours. Where original contours are in excess of 3H:1V, grading will be performed to minimize slopes, where feasible. The Hanks Draw Spoils Facility area has sideslopes in excess of 2.5H:1V in a number of locations. As such, Energy Fuels proposes to regrade the area to provide a more stable long-term configuration, as shown in **Map 5-2** (Congo Pit Area Reclamation Plan). Because the final slopes will still be relatively steep, additional measures such as pitting of the surface, and/or installation of erosion control blankets or turf reinforced mats to limit erosion while supporting revegetation efforts may be employed.

During site regrading, positive surface drainage will be restored. Dewatering of the Congo Pit will continue into the backfilling stage of reclamation until material has been placed above the baseline static water level of approximately 6800 to 6850 ft AMSL. Ripping will be conducted along contour, where practical, which includes most areas with slopes of 3H:1V or less steep. Any remaining slopes that are steeper than 3H:1V will be shaped with small pits (i.e., pitted), where feasible (i.e., where the

slopes are accessible by heavy equipment and there is sufficient cover soil to allow for pitting). The small pits allow for concentration of precipitation as well as to break up the flow paths along the slopes and reduce erosion. Details of the soil and subsoil preparations are shown on **Map 5-4** (Revegetation Details).

5.5.5 Topsoil Placement

Prior to topsoil placement, overburden sampling and testing will be complete (as discussed in **Section 5.5.3**), and available topsoil will be inspected and sampled, as necessary, to determine the need for amendments. Topsoil will be tested in accordance with the parameters outlined in Table I-2 of Guideline No. 1 (WDEQ/LQD, 1994) (e.g., pH, conductivity, selenium). Also, prior to topsoil placement, Energy Fuels will request LQD approval to place topsoil over those areas that have been regraded to final contour.

Compacted areas will be ripped to relieve compaction to a minimum depth of 12 inches in the subsoil, enhancing root penetration. Topsoil will be placed in an incremental manner to limit haulage over previously-placed topsoil. Suitable subsoil and topsoil placement will be conducted directly after finish regrading and reshaping.

Suitable subsoil will be placed at an average thickness of 12 inches, with topsoil placed at a minimum thickness of six inches (refer to **Section 4.7**). Isolated areas with difficult terrain may have varied thicknesses of subsoil and topsoil replaced, with a minimum of six inches. The topsoil will be disced in preparation for seeding on slopes shallower than 3H:1V. Benefits of contour ripping/discing include precipitation concentration within the small depressions, creation of a protected environment for the seeds, and disruption of flow paths on slopes.

5.5.6 Soil Amendments

Soil amendments, including fertilizer, will be determined by sampling of the available topsoil (as discussed in **Section 5.5.5**). If needed, fertilizer will be broadcast by equipment specifically designed for application of granular fertilizer. Typically a 2-1-1 (Nitrogen-Phosphorus-Potassium ratio, or “N-P-K”) fertilizer will be applied at the rate determined by sampling.

If the materials at the final regraded surface exhibit the potential to develop acidic conditions, lime will be added. This is considered unlikely based on the overburden analysis previously performed (refer to **Appendix D-5**), and the intent to segregate suitable material for final cover within the South Spoils Facility in volumes sufficient to cover the mine disturbed areas prior to topsoil placement. If needed, lime application rates will be determined by sampling the rough graded surface. Application equipment shall be specifically designed for such work and operated by experienced personnel. Once applied, agricultural lime will be incorporated into the regraded surface by discing within 12 hours of application.

5.5.7 Seeding

The revegetation method proposed for steeper areas (greater than 3H:1V) is broadcast seeding, while contour ripping/discing and drill seeding is proposed for less steep areas (i.e., less than 3H:1V). The specified seed mix shall be uniformly distributed with a mechanical device specifically designed for such work, and the ground thoroughly raked or dragged immediately after seeding to cover the seed with approximately one-quarter inch (0.25-in) of soil. Raking or dragging will be performed parallel to the contour. Broadcast seeding with raking or dragging will be performed in ditch and channel flowline areas.

Though the seed mixes previously approved by the BLM and the LQD for use on-site have been used successfully, Energy Fuels proposes the seed mixes presented in **Table 5-1** (Broadcast Seed Mixture) and **Table 5-2** (Drill Seed Mixture) for increased diversity, as recommended by BKS. Specifically, the rates for Wyoming big sagebrush are increased significantly, and one additional shrub and two additional forbs are included to assist in replacing the previous Sagebrush-Grass community (refer to **Appendix D-8**, Vegetation Inventory). The application rate for broadcast seeding is approximately twice that of drill seeding due to the reduced success of broadcast seeding. Fall seeding will be completed between September 15th and the time that frost prevents preparation of a proper seed bed. Spring seeding will be performed after the frost leaves the ground and until May 15th.

Table 5-1. Broadcast Seed Mixture.

Seed Mixture Species	PLS Pounds/Acre
Thickspike wheatgrass (*Elymus lanceolatus ssp. lanceolatus*), "Critana"	6.5
Bluebunch wheatgrass (*Pseudoroegneria spicata ssp. spicata*), "Secar"	4.5
Western wheatgrass (*Pascopyrum smithii*), "Rosana"	4.5
Slender wheatgrass (*Elymus trachycaulus ssp. trachycaulus*), "Pryor"	4.5
Needle and thread grass (*Stipa comata*)	1.0
Indian ricegrass (*Achnatherum hymenoides*), "Nezpar"	2.0
Sainfoin (*Onobrychis vicaefolia*), "Eski"	0.5
Wyoming big sage (*Artemesia tridentata wyomingensis*)	0.5
Scarlet globemallow (*Schaeralcea coccinea*)	0.25
Western yarrow (*Achillea millefoilum var. occidentalis*)	0.25
Fourwing saltbush (*Atriplex canescens*)	2.0
Total	26.5

Note: PLS = Pure Live Seed

Table 5-2. Drill Seed Mixture.

Seed Mixture Species	PLS Pounds/Acre
Thickspike wheatgrass (*Elymus lanceolatus ssp. lanceolatus*), "Critana"	3.25
Bluebunch wheatgrass (*Pseudoroegneria spicata ssp. spicata*), "Secar"	2.25
Western wheatgrass (*Pascopyrum smithii*), "Rosana"	2.25
Slender wheatgrass (*Elymus trachycaulus ssp. trachycaulus*), "Pryor"	2.25
Needle and thread grass (*Stipa comata*)	0.5
Indian ricegrass (*Achnatherum hymenoides*), "Nezpar"	1.0

Seed Mixture Species	PLS Pounds/Acre
Sainfoin (*Onobrychis vicaefolia*), "Eski"	0.25
Wyoming big sage (*Artemesia tridentata wyomingensis*)	0.5
Scarlet globemallow (*Schaeralcea coccinea*)	0.1
Western yarrow (*Achillea millefoilum var. occidentalis*)	0.1
Fourwing saltbush (*Atriplex canescens*)	0.25
Total	12.7

In addition to permanent revegetation, as discussed above, temporary seeding will be used for soil stabilization during mining operations as a dust and weed control method on stockpiles and disturbed areas that are expected to remain in place more than six months. Soil stabilization on steep south-facing slopes may also require temporary seeding with a cover crop, as permanent vegetation will take longer to establish and will therefore be more susceptible to erosion. The temporary seed mix consists primarily of annual grasses that will produce a significant amount of litter as they die, which helps reduce erosion. The temporary seed mix contains a cover crop comprised of oats, if planted after July 1, and barley, if planted before July 1. BKS recommends the temporary seed mix drill rates summarized in **Table 5-3** (Temporary Seed Mixture) for the Project.

Table 5-3. Temporary Seed Mixture.

Seed Mixture Species	PLS Pounds/Acre
Thickspike wheatgrass (*Elymus lanceolatus ssp. lanceolatus*), "Critana"	3.0
Streambank wheatgrass (*Elymus lanceolatus ssp. psammophilus*), "Sodar"	3.0
Slender wheatgrass (*Elymus trachycaulus ssp. trachycaulus*), "Pryor"	2.0
Cover Crop: After July 1 - Oats (*Avena sativa*); Before July 1 - Barley (*Hordeum vulgare*)	6.0
Total	14.0

5.5.8 Revegetation

Baseline vegetation surveys were completed at the site, and included in **Appendix D-8** (Vegetation Inventory). The vegetation surveys included vegetative diversity and production measurements, and

recommend use of the extended reference area ("EXREFA") methodology for comparison of vegetative success in reclaimed areas for bond release. WDEQ/LQD (1997) (i.e., Guideline No. 2 [Vegetation]) defines the EXREFA as "*all the undisturbed portions of a vegetation type which has not experienced disturbance by mining activities. The representative nature of the Extended Reference Area is verified by evaluation of vegetation mapping procedures, adequacy of premining vegetation data, soils data, physiography and land use history information*." BKS mapped the vegetation communities within a half-mile buffer of the permit boundary, and this half-mile buffer area will serve as the EXREFA.

In accordance with Section 2(d) of Chapter 3 of the Noncoal Rules (WDEQ/LQD, 2006), revegetation is considered complete when: (i) the vegetation species of the reclaimed land are self-renewing under natural conditions prevailing at the site; (ii) the total vegetation cover of perennial species (excluding noxious weed species) and any species in the approved seed mix is at least equal to the total vegetation cover of perennial species (excluding noxious weed species) on the area before mining; (iii) the species diversity and composition are suitable for the approved post-mining land use; and (iv) these requirements (i, ii, iii) are achieved during one growing season, no earlier than the fifth full growing season after reclamation.

5.5.9 Riparian Mitigation

No natural riparian areas are present with the limits of planned disturbances associated with the Project. As such, no riparian habitats are planned to be constructed as part of Project reclamation. Storm water discharges to Crooks Creek will be mitigated in accordance with the SWPPP. A 500-foot buffer along the eastern edge of Crooks Creek is proposed, within which there would be no surface disturbance related to the Project.

5.5.10 Wildlife Habitat Rehabilitation

Wildlife surveys conducted for approval of the original Permit to Mine 381C included April 1974 surveys and updated observations in 1980 (Western Nuclear, 1973-1983). Additional wildlife surveys were conducted by Real West Natural Resource Consulting ("Real West") in 2010 through 2015 to update and augment the previous surveys. **Appendix D-9** (Wildlife) documents the results of the 2010 through 2013 surveys and combines the information, where appropriate, with that of the original baseline wildlife surveys contained in the original mine permit documents (Western Nuclear, 1973-1983). Results of 2014 and 2015 raptor surveys performed by Real West are included in the respective Annual Reports to LQD (Energy Fuels, 2014b; Energy Fuels, 2015b).

Much of the proposed Project surface disturbance will occur in areas of previous disturbance. As such, the habitat in these areas is comprised primarily of monoculture grassland that provides minimal wildlife forage benefit. Energy Fuels and others (e.g., AML) have, and continue to, reclaim portions of the

Project area that have been impacted by previous mining activities. While the return to a more native species mix will take some time, the on-going reclamation will eventually supplement the available wildlife forage.

6.0 PART 6 – MONITORING PLAN

6.1 Baseline Monitoring

Map 6-1 (Baseline Environmental Monitoring Locations) shows the locations of monitoring and sample locations for ground and surface water, air quality, meteorological, and radiological parameters that define environmental baseline conditions in compliance with Federal and State regulations including the BLM, NRC, and WDEQ. In addition, pre-operational surveys and sampling programs have documented baseline conditions relative to wildlife, vegetation, soils, and climate.

6.2 Operational Monitoring Plan

Operational monitoring includes environmental monitoring, compliance monitoring, and health and safety monitoring of personnel and the workplace. Operational monitoring will be required by regulation and permit and/or license conditions. Operational monitoring will comply with the necessary State and Federal regulations, including, but not limited to:

- BLM 3809.401(4):
  - Primary focus is surface and ground water quality and quantity; air quality; revegetation stability; noise; and wildlife.
- WDEQ/LQD:
  - Primary focus is mine reclamation; revegetation stability, diversity, and productivity; surface and ground water quality and quantity; and erosional stability.
- WDEQ/AQD:
  - Primary focus is fugitive dust and carbon emissions.
- WDEQ/WQD:
  - Surface water discharge via the WYPDES storm water and discharge permits (quantity and quality), and SWPPP inspections and maintenance.
- NRC (if applicable):
  - Primary focus is environmental pathways (air, water, soils, flora and fauna) for radiological and non-radiological constituents, as well as radiation exposure (both occupational and general public).

- EPA:
    - Primary focus is radon gas emissions regulated under NESHAPS.
- MSHA:
    - Primary focus is worker health and safety including fugitive dust, underground working levels with respect to gases, exposures to chemical and solvents, and noise.
- Wyoming State Mine Inspector:
    - Primary focus is worker health and safety.
- Wyoming State Engineer's Office:
    - Primary focus is impoundments and water rights.
- Wyoming Game and Fish Department and US Fish and Wildlife Service:
    - Primary focus is wildlife.

Discussions of the major aspects of the approved and/or anticipated operational monitoring programs follow.

6.2.1 Personnel and Workplace Monitoring

Monitoring of personnel and the workplace is required in the mines (surface and underground), the proposed mineral processing facility, and in the office and maintenance facilities with respect to potential occupational exposures. The nature, extent and frequency of personnel and workplace monitoring vary based on the potential exposure pathways and risks. Occupational exposure to chemicals and solvents is regulated. Safety Data Sheets (SDSs) are required for chemicals in use or stored on site.

Within the radiation control boundary, personnel and visitors are required to complete radiological scans prior to exiting the facility. Work areas within the radiation control boundary will be monitored through either fixed instrumentation or routine testing, as determined by the NRC license conditions. Personnel working in radiation protection areas will be equipped with individual monitors and/or badges and will be required to participate in a routine bioassay program to further monitor exposure to radionuclides. Personnel and workplace monitoring for the processing facility is summarized in **Table 6-1** (Personnel and Workplace Monitoring, Processing Facility).

Work areas subject to dusty conditions or chemical fumes will be monitored through fixed instrumentation and/or routine testing, as required. Engineering controls will be employed in such

areas to minimize exposures to the extent practicable. If the levels cannot be reduced sufficiently through engineering controls to meet regulatory requirements, then persons entering or working in these areas will be required to use appropriate PPE.

Table 6-1. Personnel and Workplace Monitoring, Processing Facility.

Media	Location	Frequency	Type of Analysis	Agency
Personnel	Radiation Control Areas	Continuous, quarterly sampling	Radon-222, Direct Gamma, Natural Uranium	NRC
Workplace		Throughout buildings	Radioparticulates, Radon-222 & Daughters, Beta/Gamma Radiation	

6.2.2 Air Quality and Radiation Level Monitoring

EPA and WDEQ/AQD regulate air quality for the Project. Primary concerns are hazardous air pollutants ("HAPs"), airborne fugitive dust (regulated by AQD), and radiological particulates and radon gas (regulated by the EPA). **Map 6-1** (Baseline Environmental Monitoring Locations) shows the locations of air monitor stations, which were used to monitor radioparticulates, radon-222 and direct gamma radiation continuously for a minimum of one year. No site Particulate Matter ("PM") (i.e., PM-10 or PM-2.5) data have been collected to-date.

At this time, Energy Fuels considers that existing baseline air monitoring data is sufficient for licensing of the proposed processing facility, and has therefore suspended air monitoring at the site. AQD issued an Air Quality Permit (Permit P0015550) for construction of the mine facilities in July 2015. Continued monitoring of the air quality using the air monitor stations is not required as part of the conditions of the Air Quality Permit; however, opacity of fugitive dust emissions from the crusher, screen and conveyor transfer points shall be monitored annually via Method 9 observation (40 CFR Part 60, Appendix A). To ensure compliance with NRC regulations, air monitoring will be conducted at the mineral processing facility on a continuous basis during operations, closure and post-closure. Additional mobile measurements will be taken, as required, within the workplace.

Mine-related air quality monitoring and measurements will be performed to monitor underground working levels and protect worker health and safety, as required by MSHA and the Wyoming State Mine Inspector's Office. EPA will require monitoring of radon gas from mine vents as per 40 CFR Part 61, Subpart B, which results in an annual assessment of incremental radon exposure to nearby residents.

Additional radiological characterization of the site has been completed, including surface gamma measurements (refer to **Appendix D-11**, Radiological Assessment), sediment sampling and analysis (refer to **Appendix D-6**, Hydrology), and radon flux measurements to determine background conditions. Similar radiological surveys will be completed during reclamation and decommissioning of the mine facility to verify that radiological levels meet the voluntary clean-up levels proposed by Energy Fuels. Air quality monitoring for the site is summarized in **Table 6-2** (Air Quality Monitoring).

Table 6-2. Air Quality Monitoring.

Location	Monitoring Points	Frequency	Type of Analysis	Agency
Mine Areas	Crusher, screen and conveyor transfer points	Annual	Opacity of fugitive emissions via Method 9 Observation (one 6-minute average)	WDEQ/AQD
Processing Facility	AM-4, AM-5, AM-6, AM-7, AM-8, AM-9 and AM-10	Continuous Measurement, Quarterly Sampling	NRC Regulatory Guide 4.14	NRC
Nearest Resident to Processing Facility	AM-1			

6.2.3 Noise Monitoring

The National Institute for Occupational Safety and Health ("NIOSH") recommends an exposure limit for workplace noise of 85 decibels ("dBA") for a duration of eight hours per day (NIOSH, 1998). Exposures at and above this level are considered detrimental to hearing.

6.2.3.1 Worker Exposure

The Project will comply with MSHA regulations, which require a hearing protection program complying with NIOSH standards at the open pit mine, the underground mine, and at the processing facility. Depending on the type of activity and the equipment being used, noise levels resulting from construction, mining, and mineral processing activities might reach or occasionally exceed 85 dBA near the source. For any work areas exceeding 85 dBA that cannot be reduced by implementation of practicable engineering controls, personal hearing protection will be required. MSHA regulations further require routine worker screening for hearing loss.

6.2.3.2 Off-Site Exposure

The Project site is characterized as rural grassland with varied topography. Other land uses include mining, recreation, grazing and wildlife habitat (refer to **Appendix D-1**, Land Use). Due to the remote

location of the Project and low number of nearby off-site noise receptors, noise impacts are expected to be minimal.

Noise levels associated with the open pit will generally be limited to infrequent blasting operations and the operation of mobile mining equipment and the crusher/conveyor. Off-site noise levels associated with the underground mine will be limited due to the lack of associated surface activities. Electric fans powered by line power will be located at the Sheep I and Sheep II shafts. These electric motors will emit a low steady hum.

Construction background noise may be as high as 105 dBA at a distance of 100 ft. The noise level diminishes by 300 dBA over a mile (roughly 50 times distance at a drop of 6 dBA per distance multiplier). If noise measurements were taken at the site boundary, the measured levels would be one-half mile from construction activities and reduced by an estimated 150 dBA. Based on these assumptions, noise generated from construction activities is expected to dissipate to background levels at the Permit Area Boundary. Occupational noise levels will be monitored per MSHA and/or NIOSH regulations.

Environmental noise will be estimated based on distance from the source and confirmed with spot measurements for initial operating conditions. Measurements will be updated annually. A summary of the noise monitoring for the Project is presented in **Table 6-3** (Noise Monitoring).

Table 6-3. Noise Monitoring.

Location	Frequency	Type of Analysis	Agency
Permit Boundary	Quarterly	dBA	MSHA and/or NIOSH
Mine Areas			

6.2.4 Site Stability Monitoring

At any surface mining operation, some instability should be expected, from minor bench raveling to large-scale slope failure. Even slopes with conservative slope designs may experience unexpected failure due to the presence of unknown geologic structures, abnormal weather patterns, or seismic activity (Girard, 2001). Several ways to reduce the hazards associated with slope failures include: (i) safe geotechnical designs; (ii) rock fall catchment systems (e.g., benches on the slopes); (iii) monitoring devices; and (iv) scaling of loose material from highwalls (Girard, 2001).

During mining activities, Energy Fuels will employ an observational approach to monitor slope stability of the Congo Pit and Hanks Draw Spoils Facility. This will include performing daily walk-through

inspections of the sites to inspect for tension cracks above the slopes, abnormal seeps in the face, bulges in the slope, and rubble at the toe of slopes, which are considered warning signs of slope instability. Slope stability monitoring is the responsibility of the mining department. The mine manager has a responsibility, however, to ensure that the mine staff have the ability to recognize warning signs, and that evacuation plans are in place. Training of mining personnel in basic slope stability and evacuation plans are performed to achieve this objective. Because the first line of defense in slope monitoring is visual inspections, the pit foreman and superintendents will perform visual monitoring at the start of each shift, and note their observations in the shift logbook.

For the Congo Pit, Energy Fuels will also implement monitoring devices to provide advance warning of impending pit slope failure. A survey network comprised of electronic distance measurement ("EDM") equipment, or similar, will be employed to monitor the higher (i.e., more critical) pit slopes, such as those proposed in the southeastern portion of the Congo Pit. EDMs are a common and effective method for monitoring slopes, and consist of target prisms placed on and around areas of anticipated instability, with one or more non-moving control points for survey stations (Girard, 2001). The angles and distances from the survey station are measured on a regular basis (i.e., weekly) to establish a history of movement. The survey department is responsible for maintaining the EDMs and for collecting, storing, and distributing the data. The chief mine engineer (or designee) will then analyze the data, looking for significant movement, and report any potential areas of slope failure to the mine manager. Energy Fuels currently plans to perform manual monitoring of the EDMs; however, the surveys may be automated to allow for more frequent measurements.

Due to the presence of existing underground mine workings, as well as planned future underground mining, some surface subsidence may occur. Mining-induced subsidence is typically localized to the surface directly above (and a limited extent beyond) the mined area, and the vertical magnitude of the subsidence itself is typically small (i.e., considerably less than the height of the working due to bulking of collapsed materials). Several factors influence the degree, magnitude and nature of subsidence, including the width and height of the underground mine workings; size and stability of pillars; depth of ground cover; and the overlying and underlying geology. Subsidence can be successfully managed through a combination of careful mine planning, implementing mitigation measures, and carrying out repairs when required. The primary method of subsidence mitigation that Energy Fuels will employ is locating proposed surface infrastructure in areas outside of historic and proposed future underground mining activities. During underground mining operations, Energy Fuels will visually inspect and monitor for surface subsidence by performing monthly inspections of mining extraction areas, and daily inspections of access roads when being undermined.

General site stability and erosion is being monitored under the existing SWPPP. The SWPPP will be updated as needed when site conditions related to new mine disturbance or mine reclamation change. The SWPPP calls for routine inspection and spot inspection following significant precipitation or runoff events. Site stability monitoring is summarized in **Table 6-4** (Site Stability Monitoring).

Table 6-4. Site Stability Monitoring.

Location	Monitoring Points	Frequency	Type of Analysis	Agency
Mine Areas	Congo Pit	Weekly	Survey network to monitor pit slope stability	WDEQ/LQD
	Congo Pit and Hanks Draw Spoils Facility	Daily	Visual observation of stability	
Mine Areas and Processing Facility	Per SWPPP	Monthly, opportunistically after rainfall	Visual observation of landform stability, sediment control, storm water discharge	WDEQ/WQD

6.2.5 Wildlife Monitoring

Wildlife surveys have been completed for the Project in consultation with the BLM, WGFD, and USFWS. The results of the wildlife surveys are included in **Appendix D-9** (Wildlife) and in subsequent Annual Reports to LQD (Energy Fuels, 2014b; Energy Fuels, 2015b). No critical habitat or sensitive species are anticipated to be affected by the Project operation. The Project is not located within the sage grouse core area or within critical winter range for big game.

Energy Fuels intends to continue wildlife surveys during mining operations with a focus on species of concern and wildlife mortality. Specifically, Energy Fuels will perform annual raptor nest surveys during operations, with survey results provided to the LQD in the Annual Report. Refer to **Table 6-5** (Wildlife Monitoring).

Table 6-5. Wildlife Monitoring.

Wildlife	Frequency	Type of Analysis	Agency
Raptors	Seasonal, annually	Visual Observations	WDEQ/LQD

6.2.6 Vegetation Monitoring

Vegetation diversity and productivity have been quantified for the Project, as discussed in **Appendix D-8** (Vegetation Inventory). One BLM sensitive species, Limber Pine, is present within the Project area. As part of the McIntosh Pit reclamation project, the AML has established an on-site nursery in an attempt to limit impacts to the Limber Pine. Energy Fuels will assess the effectiveness of this approach prior to implementing it for future site reclamation.

LQD regulations require monitoring of areas that have been revegetated for cover, diversity, and productivity. Revegetated areas are compared to pre-established reference areas (i.e., EXREFA) to measure the success of revegetation, and to verify that the reclaimed lands have been returned to their pre-mine land use. Vegetation monitoring for radionuclide uptake is required by NRC regulations on an annual basis. **Table 6-6** (Vegetation and Soil Monitoring) summarizes the anticipated vegetation and soil monitoring requirements.

Table 6-6. Vegetation and Soil Monitoring.

Media	Location	Frequency	Type of Analysis	Agency
Vegetation	Revegetated Mine Areas	Annual	Compared to pre-established reference areas to measure success	WDEQ/LQD
Vegetation	Downwind of Processing Area (TBD)	Annual	NRC Regulatory Guide 4.14	NRC
Soil				

6.2.7 Surface Water Monitoring

Surface water has been continuously monitored for a minimum of one year along the nearest potential receiving surface water body, Crooks Creek, at three locations as shown on **Map 6-1** (Baseline Environmental Monitoring Locations), to establish background conditions in the vicinity of the Project. Additionally, three existing ephemeral impoundments (SW-1 through SW-3) have been sampled on an opportunistic basis (refer to **Map 6-1**). Limited monitoring of water quality within the existing pond at the southern project perimeter (i.e., McIntosh No. 2 Reservoir) has also been performed.

Surface water monitoring will continue during operations on a quarterly basis and will include WDEQ/LQD (2005) water quality parameters in the case of off-site processing, and both WDEQ and NRC (1980) water quality parameters if an on-site processing facility is constructed, as outlined in **Table 6-7** (Operational Surface Water Quality Sampling Guidelines). If an on-site processing facility is constructed, sediment sampling will be performed on an annual basis during operations, as outlined in **Table 6-8**

(Operational Sediment Sampling Guidelines). During the pre-operational period, a reduced monitoring program will be performed, comprised of annual surface water sampling (and no sediment sampling) at the locations shown on **Map 6-2** (Mine Area Pre-Operational Monitoring Locations). In addition, water flow measurements will be recorded during each sampling event at the Crooks Creek weir. The locations of proposed operational surface water monitoring locations are shown on **Map 6-3** (Mine Area Operational Environmental Monitoring Locations), and will include the proposed sediment ponds and collection ponds, in addition to continued monitoring of Crooks Creek and existing ephemeral impoundments SW-2 and SW-3 (note that SW-1 will be removed via proposed mining activities). Additional sampling will be conducted, as appropriate, should a spill or excursion be detected. The results of annual operational surface water and sediment monitoring will be provided to the LQD in the Annual Report.

Table 6-7. Operational Surface Water Sampling Guidelines.

Location	Method	Frequency	Type of Analysis	Agency
Impoundments	Grab	Quarterly	WDEQ/LQD Guideline No. 8.	WDEQ/LQD
Streams (XSCCMU, XSCCUS, XSCCDS)	Grab	Quarterly	WDEQ/LQD Guideline No. 8.	
Stream Flow (Near XSCCUS)	Weir	Quarterly	Flow rate	
Impoundments	Grab	Quarterly	NRC Regulatory Guide 4.14.	NRC[2]
Streams (XSCCMU, XSCCUS, XSCCDS)	Grab	Quarterly	NRC Regulatory Guide 4.14	
Treated Effluent	Grab	Monthly or Quarterly (per WYPDES permit)	Effluent quality	WDEQ/WQD
	Instantaneous	Weekly	Flow	

Table 6-8. Operational Sediment Sampling Guidelines.

Location	Method	Frequency	Type of Analysis	Agency
Impoundments	Composite	Annually	NRC Regulatory Guide 4.14	NRC
Streams	Composite	Annually	NRC Regulatory Guide 4.14	

For treatment and discharge of water under the WYPDES permit, and/or treatment of on-site water for potable use, Energy Fuels will monitor effluent in accordance with the Federal and State permit requirements.

[2] Surface water sampling will only include monitoring for NRC Regulatory Guide 4.14 parameters if an on-site processing facility is constructed, and if required by the NRC (or Agreement State).

6.2.8 Groundwater Monitoring

Groundwater monitoring to establish baseline hydrologic and water quality conditions both upgradient and downgradient of the proposed mines and processing facility has been completed with a continuous record of more than one year. In addition, the McIntosh Pit (a legacy uranium mine pit filled with groundwater) and certain groundwater monitoring wells have been sampled continuously on an annual basis since 1988.

Groundwater monitoring will continue throughout the life cycle of the Project. During site development, several of the existing groundwater monitoring wells will be removed and reclaimed. The locations of proposed operational groundwater monitoring locations are shown on **Map 6-3** (Mine Area Operational Environmental Monitoring Locations).

As required through the WDEQ/LQD's approval of the Permit Revision for Permit to Mine 381C, proposed monitoring wells MW-11 and MW-12 will be installed to monitor downgradient and side gradient groundwater conditions, respectively, and will serve as replacements to wells MW-7 and PZ-7, which will be abandoned during site development. The screened intervals of wells MW-11 and MW-12 will be determined based on the results of drilling, such that the screened interval occurs entirely within a single water-bearing formation. Based on geologic mapping and other drilling in the area, it is anticipated that well MW-11 will be completed in the Fort Union formation, supplementing the currently limited database on this formation, while well MW-12 will be completed in the Battle Spring formation. However, if the Fort Union formation is encountered during installation of well MW-12, a concerted effort will also be made to construct the well(s) such that independent monitoring of the Fort Union formation is facilitated. If well MW-11 and/or MW-12 encounter the Fort Union formation, aquifer testing of the well(s) installed in the Fort Union would also be performed.

In addition to wells MW-11 and MW-12, two wells will be installed (MW-13 and MW-14) to provide enhanced characterization of the Battle Spring formation for purposes of the dewatering plan (refer to **Exhibit D-6.15** in **Appendix D-6**). Well MW-13 would be paired with existing well PZ-6 (which will be abandoned during site development), and well MW-14 would be paired with existing well PZ-8. In both instances, Energy Fuels proposes to screen the Battle Spring formation at a greater depth than the existing wells in order to isolate the portion of the Battle Spring aquifer being monitored currently. If the results of aquifer testing performed on wells MW-13 and MW-14 indicate that the Battle Spring formation properties vary markedly from previously estimated in the MODFLOW model developed by LWS, the dewatering plan will be modified accordingly. Depending on the information provided by additional monitoring wells installed in the Fort Union formation, separate MODFLOW modeling of the Fort Union aquifer may be warranted in the future. However, separate modeling of the Fort Union formation is not considered necessary unless water level data indicate that a vertical hydraulic

connection exists between the Fort Union formation and the Battle Spring formation, and that a hydraulic gradient will be created through dewatering of the Congo Pit (i.e., that water levels in the Fort Union formation are actually above the base of the Congo Pit and, therefore, will be impacted by the dewatering operations). New wells MW-11 through MW-14 would be installed prior to initiating dewatering activities to enable collection of four rounds of quarterly groundwater monitoring data.

During operations, groundwater monitoring will be conducted on a quarterly basis for water levels and water quality, as summarized in **Table 6-9** (Operational Groundwater Monitoring Guidelines). During the pre-operational period, a reduced monitoring program will be performed, comprised of annual water level measurements and water quality sampling at the locations shown on **Map 6-2** (Mine Area Pre-Operational Monitoring Locations). Additional sampling will be conducted as appropriate should a spill or excursion be detected. If the water quality is shown to be steady-state after mining commences, Energy Fuels may request a reduction in the monitoring frequency. The results of annual operational groundwater monitoring will be provided to the LQD in the Annual Report.

Table 6-9. Operational Groundwater Monitoring Guidelines.

Location	Monitoring Points	Aquifer	Method	Frequency	Type of Analysis	Agency
Mine Areas	Wells MW-6, MW-10, MW-12, MW-13, MW-14, PZ-1, PZ-3, PZ-4, PZ-8, PZ-9	Battle Spring	Water Level, Groundwater Sampling	Quarterly	Measure water level using probe. Parameters described in WDEQ/LQD Guideline No. 8.	WDEQ/LQD
	Wells PZ-10, MW-11	Fort Union	Water Level, Groundwater Sampling	Quarterly		
Processing Facility	Point of Compliance Wells (TBD)	TBD	Water Level, Groundwater Sampling	TBD	TBD	NRC

If during mine development, other monitoring wells will be destroyed or mined through, Energy Fuels will replace the well one year prior to planned removal of the well. If a well is inadvertently destroyed during mining, Energy Fuels will replace the well as soon as feasible.

6.2.9 Noxious Weed Control Plan

Noxious and invasive weeds can occur both directly and indirectly from site development. Prevention and control of noxious and invasive weeds during construction, operations and reclamation will be performed using an integrated approach, which includes the following management practices:

- Seeding and revegetating areas of disturbance as soon as practical with certified weed-free seed;
- Minimizing soil disturbance to the extent possible;
- Using weed-free mulch/straw for erosion control; and
- Selecting and spraying herbicides based on weed species and desired results. Only BLM-approved herbicides will be used.

6.2.10 Corrective Action

If operational monitoring detects conditions in excess of expected or permitted levels, considering background conditions and variability, State and Federal regulations require timely reporting on the nature and location of the event. Although the specific response will be dependent upon of the nature and location of monitoring results, the general approach following discovery will be:

- Determine if emergency response and/or immediate action is required;
- Take appropriate initial action to secure the location of impact from public access, isolate the area of impact from the environment, and stop the excursion at its source, if possible;
- Assess the excursion with respect to public safety and the environment;
- Notify the appropriate regulatory agencies within required timeframes;
- Sample, clean up, and dispose of associated wastes, as appropriate;
- Restore the site; and
- Follow up with site personnel and regulatory authorities to assess the event and measures to prevent reoccurrences of a similar nature.

6.2.11 Early Detection Operational Monitoring

Early detection operational monitoring is focused on mineral processing operations, and includes:

- Routine measurement of solution flows in relationship to the anticipated water balance;
- Routine inspection of the heap leach pad, associated ponds, and plant site; and
- Continuous monitoring of leak detection systems.

Flow of solutions throughout the system will be measured and recorded using an automated system. Anomalous flow conditions in the system will be immediately investigated to determine the cause, and identify any needs for corrective action.

Routine inspection of the plant and heap leach facility will include observation of work areas with respect to general housekeeping, and to confirm that instrumentation is functioning properly. Inspections will include visual observations of the perimeter of the plant, ponds, and heap leach pad, as well as evaluation of the leak detection systems. Inspection logs will be kept and included in internal weekly, monthly and annual inspection reports.

Leak detection systems will monitor the heap leach pad and ponds. Any flow within the leak detection system will be directed by gravity flow to individual sumps with automatic level alarms and pump-back systems. **Table 6-10** (Early Detection Monitoring) summarizes the early detection monitoring proposed for the processing facility.

Table 6-10. Early Detection Monitoring, Processing Facility.

Area	Locations	Frequency	Type of Analysis	Agency
Radiation Control Areas	Leak Detection Sumps within the Heap Leach Pad and Associated Ponds	Daily, Weekly, Monthly, Annual (TBD)	Natural Uranium, Ra-226, Th-230, Pb-210, Po-210, SO_4 as per license (TBD)	NRC

6.3 Post-Closure Monitoring Plan

After closure, the mine area will be monitored and a bond will remain in place until such time that the reclamation conditions of the permit have been met, including, but not limited to, establishment of vegetation, stabilization of the site with respect to erosion, and demonstration through monitoring that the groundwater system has returned to its pre-mine class of use. Note that the "pre-mine" class of use, as mentioned herein, refers to the baseline water quality discussed in **Appendix D-6** (Hydrology), which may reflect impacts of historic mining activities at the Project.

The proposed environmental monitoring locations after reclamation of the mine areas are illustrated in **Map 6-4** (Mine Area Reclamation Environmental Monitoring Locations). Surface water and groundwater shall be sampled and tested quarterly for a minimum of five years after reclamation, in accordance with the standard operating procedures provided in **Appendix D-6** (Hydrology). If steady-state conditions are demonstrated, Energy Fuels will request a reduction in the frequency of the monitoring program.

Some site maintenance will likely be required during the monitoring period. This may include reseeding of areas with poor vegetation, erosion repairs, replacement/cleaning of sediment controls, and maintenance of gates and fencing.

A separate environmental monitoring program will be established for the processing area during the closure period, per the requirements of the NRC or the Agreement State.

7.0 PART 7 – INTERIM MANAGEMENT PLAN

The interim management plan addresses management of the Project during periods of temporary closure (including periods of seasonal closure) to prevent unnecessary or undue degradation. Interim management plans are required by the BLM under Section 3809.401(5) of 43 CFR, and by both LQD and NRC regulations. In the advent of circumstances requiring interim cessations of mine operations, the BLM, LQD, NRC, and other pertinent regulatory agencies would be promptly notified.

Should interim cessation of mining and/or mineral processing operations be necessitated, the operation would not immediately shutdown, but would proceed in an orderly manner to cease operations and stabilize the site.

7.1 Mine Operations

WDEQ/LQD (1999) Noncoal Standard Operating Procedure 2.1 (Subject: Interim Mine Stabilization for Noncoal Mines) states "*if mining (initiation of backfill) is halted for periods exceeding 180 days and primarily for economic reasons, the permittee must submit a Request for Interim Mine Stabilization (Request) under Noncoal Rules, Chapter 3, Section 2(k)(ii)(A). This provision does not elaborate on the "economic conditions" which may trigger a Request. The Request may apply to all currently disturbed lands or to specific disturbed units (e.g. an individual pit) within the permit area. A permittee may seek approval for reclamation delays up to five years in length. A permittee may request renewal of the Interim Mine Stabilization under Noncoal Rules, Chapter 3, Section 2(k)(ii)(D).*"

The cessation of mining could proceed at different rates, depending on the status of each operation at the time the decision to place the operation on interim status was made. Interim cessation and stabilization of mine operations would include:

- Filing of a request for Interim Mine Stabilization and securing approval of the plan by the BLM and LQD. The request would include:
  - Specific reasons why mining should cease, as well as an outline of the economic conditions that would restore viability to the permitted operation;
  - Access roads, haul roads, crusher/equipment areas, stockpile areas, buildings, load-out facilities, and other ancillary facilities within the permit area boundary that are necessary to allow eventual mining of the remaining resources (and would therefore need to be preserved) would be clearly identified; and
  - Areas requiring stabilization and detailed stabilization procedures (e.g., temporary seeding, permanent reclamation, partial backfilling, slope stabilization, safety fencing, etc.) necessary to establish a low maintenance configuration would be identified and addressed upon approval of the plan.

- Removal of any stored fuel, lubricants, or other chemicals from the site, and proper disposal at licensed facilities. Storage vessels would be stabilized or removed.
- Completion of mining of exposed ore and transfer of the ore to the on-site processing facility or to an off-site mill for processing. No new land disturbance would be created by these activities.

The primary items of concern would be human safety, maintenance of surficial stability on lands within the Permit Area, sediment control (or minimization of sediment loss) for disturbed lands, and environmental protection.

7.2 Processing Facility

Interim management plans would also be required by the NRC for the proposed NRC License Area. Energy Fuels would comply with NRC's "Timeliness in Decommissioning of Material Facilities" rule (NRC, 1996), and subsequent revisions to 10 CFR 40.42, which set forth procedures for a 24-month interim standby period at uranium recovery facilities. If operations have not resumed by the end of that period, the licensee must proceed with decommissioning of the Project in accordance with license conditions unless a request for time extension has been submitted and approved by the NRC.

If the mineral processing facility was receiving feed from other mine operations, it is possible that mineral processing operations would continue while the mine operations were temporarily ceased. Alternatively, if ore from the Project is shipped off-site to another existing processing facility, mineral processing operations may cease temporarily or permanently while mine operations continue.

Interim cessation and stabilization of mineral processing operations would include:

- Completion of active leaching operations to remove soluble constituents;
- Draining and decontamination of plant equipment, including tanks and vessels, and protection for future use;
- Decontamination and cleaning of interior surfaces in the processing facilities;
- Solids removal from the Raffinate, Collection and Holding ponds, including decontamination and cleaning of liners;
- Draining of tanks containing fuel, reagents and other products, and stabilization for future use;
- Disposal, stabilization and covering of wastes generated by the decontamination and clean-up process, with wastes disposed in the heap leach pad area;
- Secure the processing facility, including the heap leach pad and associated ponds, from public access; and

- Maintain site security, by physical presence and/or remote surveillance, as approved in the interim plan.

7.3 Monitoring and Corrective Action

As part of the interim management plan for the Project, monitoring and corrective action would include:

- Routine inspection of facilities (i.e., on a monthly basis). The inspected areas would include both the mine and mineral processing areas, perimeter fencing, and components of the SWPPP;
- Reporting of any breach of the site infrastructure to the appropriate regulatory agencies. Potential hazards to human health and the environment would be assessed and reported, as required. Remedial action would then proceed in a timely manner with approval of the respective regulatory authorities; and
- Environmental monitoring (e.g., ground and surface waters, radiological levels, and air particulates, if required) would continue at standby frequencies, unless otherwise approved by the regulatory agencies.

8.0 PART 8 – OPERATIONAL AND BASELINE ENVIRONMENTAL INFORMATION

Site environmental and resource conditions are summarized in this section, documented annually in the Annual Reports to the Mining Permit No. 381C (current edition dated August 2015; Energy Fuels, 2015b), and included in supporting documentation provided as **Appendix D** (Description of the Land), as follows:

- **Appendix D-1**: Land Use
- **Appendix D-2**: History of the Area
- **Appendix D-3**: Archaeological and Paleontological Resources
- **Appendix D-4**: Climatology
- **Appendix D-5**: Topography, Geology and Overburden Assessment
- **Appendix D-6**: Hydrology
- **Appendix D-7**: Soil Assessment
- **Appendix D-8**: Vegetation Inventory
- **Appendix D-9**: Wildlife
- **Appendix D-10**: Wetlands
- **Appendix D-11**: Radiological Assessment

8.1 Land Use

Currently, the Project site is characterized as rural grassland with varied topography. In addition to mineral exploration and development, non-mining land uses include oil and gas production, stock grazing, crop production, transportation, recreation, and wildlife habitat (refer to **Appendix D-1**, Land Use).

Ultimately, the affected land will be restored to its approved, post-mining beneficial land use. While the post-mining land use will not change from the pre-mining use, historical surface disturbance within the mined area will be reclaimed. This will include regrading the surface to approximate pre-mine contours (where practical), replacing topsoil, and revegetating the disturbed surface with native plant species approved by the BLM and LQD. Reclamation conditions stipulated by the Mining Permit include, but are not limited to, establishment of vegetation, stabilization of the site with respect to erosion, and demonstration through monitoring that the groundwater system has returned to its pre-mining class of

use. Revegetated areas will be compared to pre-established reference areas to measure the success of revegetation and to verify that the reclaimed lands have been returned to its pre-mining land use.

8.2 History

Mine exploration and mining has been conducted in the Project area since the early 1950s. Refer to **Appendix D-2** (History of the Area).

8.3 Archaeology

As discussed in **Appendix D-3** (Archaeological and Paleontological Resources), no eligible cultural properties are present within the mine permit boundary. Cultural surveys have been completed and submitted separately to the BLM.

8.4 Climatology

An on-site weather station has been in place since August 2010, which collected continuous measurements through September 2014. Refer to **Appendix D-4** (Climatology), as well as the 2014 and 2015 Annual Reports to LQD (Energy Fuels, 2014b; Energy Fuels, 2015b).

8.5 Geology

Appendix D-5 (Topography, Geology and Overburden Characterization) provides detailed information on the geological characterization of the site. In addition, characterization of mine overburden is provided, with selective material handing to segregate suitable materials for final cover and reclamation presented in **Section 5.5.3**.

8.6 Hydrology

A comprehensive ground and surface water monitoring program has been established for baseline, pre-operational, and operational monitoring of the site. Refer to **Appendix D-6** (Hydrology) for detailed information on the baseline groundwater and surface water characterization.

8.6.1 Groundwater

The Project site is located within a limited surface water and groundwater basin on the northern margins of the Great Divide Basin of central Wyoming. The basin is formed by a plunging synclinal fold of Cody Shale, a sequence of shale and mudstone layers over 1,000 ft thick in the Project area, which acts as an aquitard to vertical and lateral groundwater flow. The basin plunges to the south-southeast at approximately nine degrees and is filled with the fine-grained sandy lithologies of the Battle Spring formation and the Fort Union formation. These lithologies form the highlands of Sheep Mountain on the north and east sides of the basin. Surface water and groundwater recharge result from runoff and

infiltration of meteoric waters in the Sheep Mountain highlands. The conceptual hydrogeologic model for the Project site is illustrated in **Figure 8-1** (Conceptual Hydrogeologic Model of the Project Site).

The uppermost aquifer beneath the Project site is comprised of saturated sands of the Battle Spring formation. Where present, the Fort Union formation is also considered a site aquifer, but the contact between the Battle Spring and Fort Union formations cannot be easily distinguished in drill cuttings, and there is not a continuous aquitard between the two formations within the Project site. Both units are reasonably transmissive and, locally, both are recharged from the same source areas in the highlands east and north of the site. Within the Project site, only one piezometer (PZ-10) was completed within the Fort Union formation, with the majority of the other site piezometers completed in the overlying Battle Spring formation. The geologic structure in the vicinity of PZ-10, with near-vertical bedding, contributes to differing hydrogeologic behavior within the two formations at this location (refer to **Appendix D-6**, Hydrology). The relationship between the Fort Union and Battle Spring aquifers are anticipated to be better defined with additional monitoring in the Fort Union formation.

Site groundwater flows westward at rates that range between approximately three and 70 ft per year depending on local gradients and porosities. Groundwater discharges to Crooks Creek west of the site; however, the groundwater flow is very low due to the presence of the Cody Shale formation immediately below the shallow alluvium. Crooks Creek flows north, but does not join any other perennial surface water bodies and infiltrates into the deep alluvial basin to the north, many miles before reaching the Sweetwater River.

Groundwater data have been collected at the Project site in support of uranium mining activities since the late 1970s. **Appendix D-6** (Hydrology) discusses and presents available historical groundwater quality and water level data. The groundwater data provide insight into the relative stability of groundwater levels and water quality in a naturally mineralized area through cycles of historic mine development, dewatering and subsequent groundwater recovery. The groundwater quality is variable across the Project site, but generally does not meet the criteria for Class III use due to elevated levels of radionuclides (e.g., uranium, radium-226 and gross alpha) associated with the natural mineralization of the area.

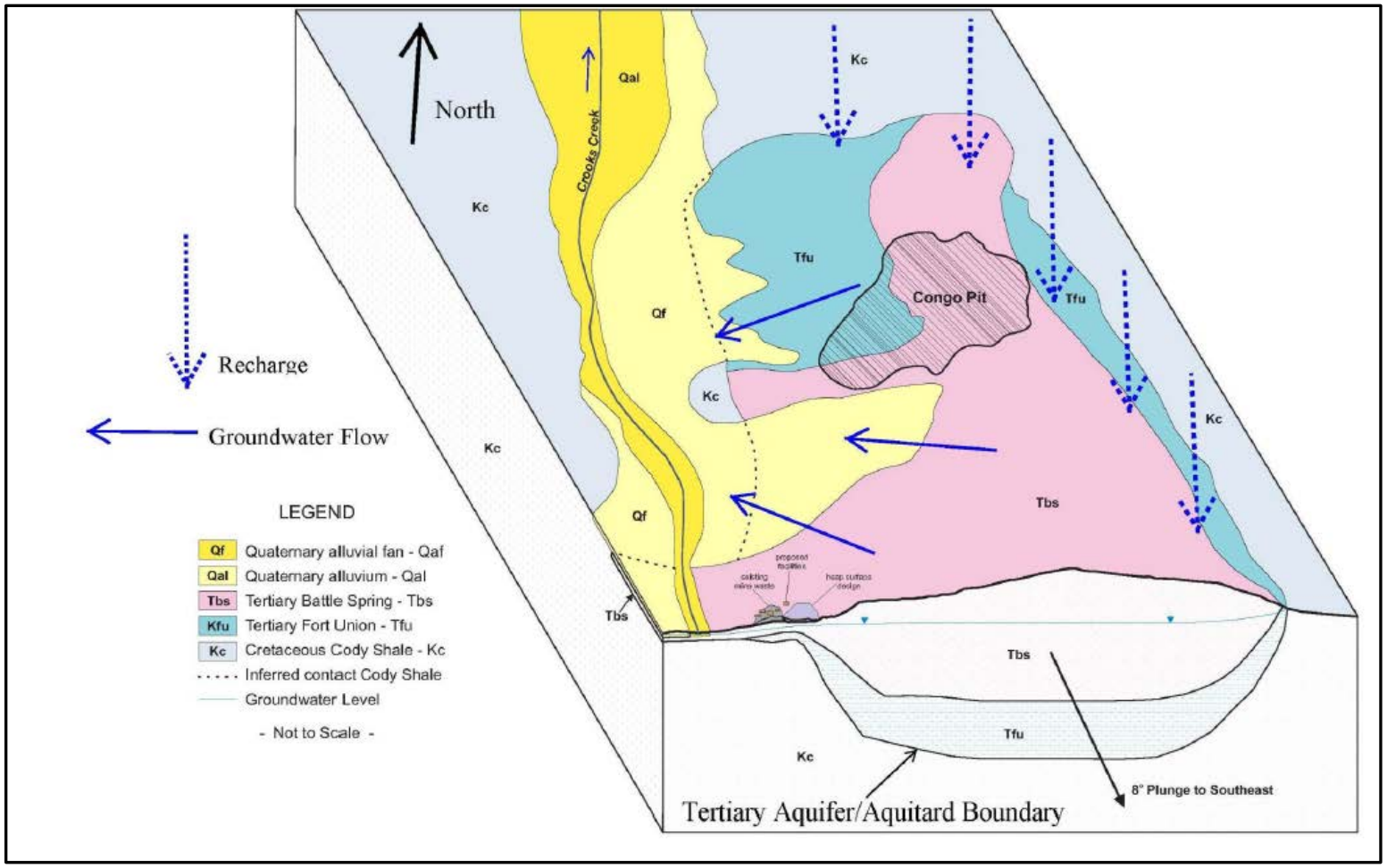


Figure 8-1. Conceptual Hydrogeologic Model of the Project Site.

8.6.2 Surface Water

The Sheep Creek drainage (located east of the Project site) and Crooks Creek drainage (located west of the Project site) are both perennial river systems. Both drainages are located within the South Platte drainage basin, although neither has continuous surface flow to the Sweetwater drainage located to the north.

Mining and processing operations are not expected to directly affect either Sheep Creek or Crooks Creek. Surface disturbance is not planned in the Sheep Creek drainage and groundwater flow is west and away from the creek. Crooks Creek is downgradient from the Project and likely receives groundwater inflow through adjacent saturated sediments, although the rate is low as evidenced by the lack of springs and monitoring well data in the area.

8.7 Probable Hydrologic Consequences

8.7.1 Surface Water Consequences

The Project site is situated between two perennial drainages: Crooks Creek and Sheep Creek. Though portions of the Project contribute runoff to each of these drainages, no runoff from areas of newly-proposed disturbance will contribute runoff to Sheep Creek (i.e., all surface water runoff will be directed to the west toward Crooks Creek). Crooks Creek, located to the west of the Project site and outside of the mine permit boundary, is within the Sweetwater River drainage basin and tributary to the North Platte River. However, Crooks Creek disappears a nominal distance downstream of the Project where flows infiltrate into the groundwater system (i.e., no surface flows from Crooks Creek directly enter other surface waters of the State). Crooks Creek receives surface water runoff from ephemeral drainages within the mine permit boundary, as well as from groundwater under the Project area. Refer to **Appendix D-6** (Hydrology) for information on the streamflow characteristics, watershed and stream channel geomorphology, and surface water and sediment quality.

During operations at maximum site development, the watershed contributing flows to Crooks Creek from the Project vicinity will be reduced by only about 18 percent. However, on a more regional scale, the Crooks Creek drainage area upstream of the Hanks Draw confluence is approximately 90 square miles, while the proposed mining will temporarily remove less than 1,000 acres (or 1.5 square miles), which is only approximately 1.75 percent of the contributing drainage to Crooks Creek. Much of this is already removed given the current site conditions, and to Energy Fuel's knowledge, there has been no injury claims made to the SEO's office by downstream water right holders. Energy Fuels believes that the site surface hydrology during mining will differ little from the existing condition; therefore, no impact to the existing flow conditions and downstream water rights holders is expected. Post-mine, the

reclamation plan calls for the restoration of flow-through drainages, thus it can be reasonably concluded that there will be more water, in terms of total runoff volume available. Proposed mining activities will have a limited effect on the southern portion of the mine permit boundary, where surface water rights to the McIntosh Pit and McIntosh No. 2 Reservoir (a.k.a. Fish Pond) are controlled by others. Regarding water quality, no long-term impacts are anticipated given the material replacement protocol at reclamation (refer to **Section 5.5.3**).

Excess water is anticipated to be encountered during mining of the Congo Pit and Sheep Underground, as discussed in **Section 4.8.1** and **Section 4.8.2**, respectively. The primary option being considered for management of the excess water is treatment and discharge to Crooks Creek (refer to **Section 4.8.6**). With respect to Crooks Creek, the dewatering discharge would generally represent a small percentage of the creek flow, assuming all of the flow reached the creek from the ephemeral drainage where it will likely be discharged (e.g., existing AML drainage adjacent to the Ore Pad). The lowest recorded flow in the creek was 2 cubic feet per second ("cfs"), and an average anticipated treatment rate of 200 gpm would be only about 20 percent of that lowest rate. Therefore, the dewatering discharge would generally be a smaller percentage than that, and unlikely to have any noticeable impact.

8.7.2 Groundwater Consequences

Mining has the potential to impact groundwater resources. The Project includes dewatering operations, both at the Congo Pit and the Sheep Underground. While the Congo Pit will be dewatered using passive collection ditches and in-pit sumps, the Sheep I and Sheep II shafts will be actively pumped to dewater the historic (and future) mine workings.

8.7.2.1 Groundwater Quality

The potential groundwater impacts associated with mining include minor impacts to water quality resulting from potential oxidation of minerals in the mine workings. Oxidation may result in changes in total dissolved solids, and concentrations of metals and radionuclides. Based on current groundwater quality, which has already experienced a full cycle of mine development and reclamation, these potential future changes to groundwater quality are not likely to result in a change in the class of use of the aquifer.

Although the foregoing impacts are only potential impacts, an extensive network of monitoring wells has been established for the Project. All baseline monitoring wells have been sampled quarterly for more than one year, and new proposed wells will be sampled for four quarterly rounds prior to initiating dewatering activities (refer to **Section 6.2.8**). Historic water quality and water level records for many of these wells provide a continuous record dating back to 1988. Despite over 50 years of mining history,

some of which preceded modern regulations, existing groundwater quality does not show significant degradation from mining. In the vicinity of the McIntosh Pit, the pit itself and five surrounding wells (i.e., PZ-1 through PZ-5) have been monitored for water level and water quality since 1988. This included the period from 1990 to 2000 when the Sheep Underground mine was being dewatered and discharged into the McIntosh Pit. Water quality in both the pit and monitoring wells was stable and consistent. The only exception was a slight but general rise in radium-226 and uranium concentrations in the McIntosh Pit.

8.7.2.2 Groundwater Consumption

A more significant impact is consumption of groundwater in the Battle Spring aquifer system due to dewatering of the Sheep Underground and the Congo Pit. The dewatering will result in significant drawdown in the uppermost aquifer beneath the Project site. In addition to water consumption related to an on-site mineral processing facility, if constructed, principal water uses for the site will include dust control in the Congo Pit, Hanks Draw Spoils Facility, and the Sheep Underground, as well as water used for drilling and other operational purposes. Water use for dust control for the open pit mine, surface roads, stockpile areas, and conveyor is estimated to average 150 gpm for 9 months of the year, or slightly in excess of 100 gpm on a year-round basis. Water usage underground will vary depending on the number of working faces and the in situ water content of the ore and waste rock, but is expected to average 20 gpm on a continuous basis. Assuming an off-site processing facility, the overall water consumption for the Project is anticipated to be approximately 170 gpm on an annual basis. Combined with the estimated 200 gpm of water needed for make-up water associated with an on-site processing facility, the overall water consumption for the Project is anticipated to be approximately 370 gpm on an annual basis.

Based on groundwater modeling performed by LWS (2015), discussed in **Section 4.8.1** (Pit Dewatering) and included as **Exhibit D-6.15** to **Appendix D-6**, the groundwater inflow into the Congo Pit will range from approximately 156 to 377 gpm, with an average dewatering rate of 235 gpm. The Congo Pit will be dewatered via use of an in-pit sump, resulting in a cone of depression centered on the sump location, which moves as required based on the mine plan.

To provide a similar evaluation of water level changes associated with the dewatering of the Sheep Underground, LWS (2015) simulated pumping using the Theis equation, which simulates groundwater flow to a pumping well under homogeneous, isotropic conditions in an infinite aquifer. While these conditions are not strictly met, particularly since the Sheep I and Sheep II shafts are not conventional wells, given the historic vertical and horizontal workings, the Theis equation can provide representative water level drawdown estimates. However, to account for the fact that the Battle Spring aquifer is not

infinite in areal extent, no-flow boundary conditions were input for the Cody Shale on the western, northern and eastern sides of the simulation area. For modeling of worst case dewatering conditions, the combined dewatering rates at the Sheep Shafts were estimated at 1,000 gpm for approximately one year, with maintenance dewatering during the remainder of the mining period of approximately 400 gpm (i.e., 11 years, and a total mining period of 12 years). The Theis analysis was used to evaluate the steady-state water level drawdown after 12 years of continuous dewatering operations.

The resultant water level change map associated with the combined Congo Pit and Sheep Underground dewatering is shown in **Figure 8-2** (Groundwater Impact Map). As shown in **Figure 8-2**, there is extensive drawdown in close proximity to the Sheep Shafts, which extends to as many as two miles from these shafts, and generally to the no-flow boundaries. However, most of the water-level drawdown is contained within the Permit boundary, based on the limitations and areal extent of the Battle Spring aquifer.

During the mining period, water dewatered from the Congo Pit and the Sheep Shafts will either be used for dust suppression and mineral processing, or treated and released to Crooks Creek. Though discharge of excess water via a UIC permit has also been considered for the Project, the worst-case scenario from a groundwater consumption perspective is off-site discharge. If ore is processed on-site, it is anticipated that approximately 30 to 100 percent (averaging 88%) of the dewatering water will be beneficially used on-site, while an average of 12 percent (maximum of 70%) of this water will be treated and discharged. For off-site processing, an average of 48 percent (maximum of 92%) of this water will be treated and discharged.

In addition, LWS (2013) previously evaluated the hydrologic connection of the Sheep Shafts to the North Platte River Basin in a letter to the SEO (refer to **Exhibit D-6.12**, **Appendix D-6**). This analysis indicated that dewatering of the Sheep Underground would not impact the North Platte River Basin, and hence Crooks Creek, relative to the 28:40 criteria. Based on this analysis, the SEO issued permits for dewatering of the Sheep Shafts.

Depletions related to consumptive use during mining operations are not anticipated to affect existing water rights. Given the extent of the water level drawdown associated with both the Congo Pit and the Sheep Shafts, groundwater rights within the area of influence and within five miles of the site were identified. Energy Fuels holds water rights in excess of 3,000 gpm, and also controls access to all groundwater wells within the Project boundary. Because drawdown in the uppermost aquifer resulting from mine dewatering will not extend significantly beyond the mine permit boundary, the net consumption impacts to groundwater are considered minor. Further, there are no permitted water wells

being put to beneficial use within two miles of the Project boundary. As such, no impacts to groundwater users are expected to result from dewatering activities at the Project.

8.7.2.3 Groundwater Recovery

Depletions related to consumptive use during the mining operations will not impact water level recovery to pre-mining levels. At the cessation of mining, groundwater levels will begin to recover from the dewatering operations at both the Congo Pit and the Sheep Underground. LWS (2015) used MODFLOW to perform a recovery model for the Congo Pit after dewatering ceases, which shows that it will take approximately 13.5 years for the full recovery of ground water levels in the Battle Spring aquifer, based on the previous eight years of dewatering. For the Sheep Underground, LWS (2015) used the Theis equation to estimate recovery, which indicates that it could take approximately 55 years for the water level to fully recover after the Sheep Shaft dewatering operations cease. However, because of the extensive underground workings that will facilitate recovery (beyond that of a conventional well), a shorter timeframe for water level recovery is anticipated (LWS, 2015).

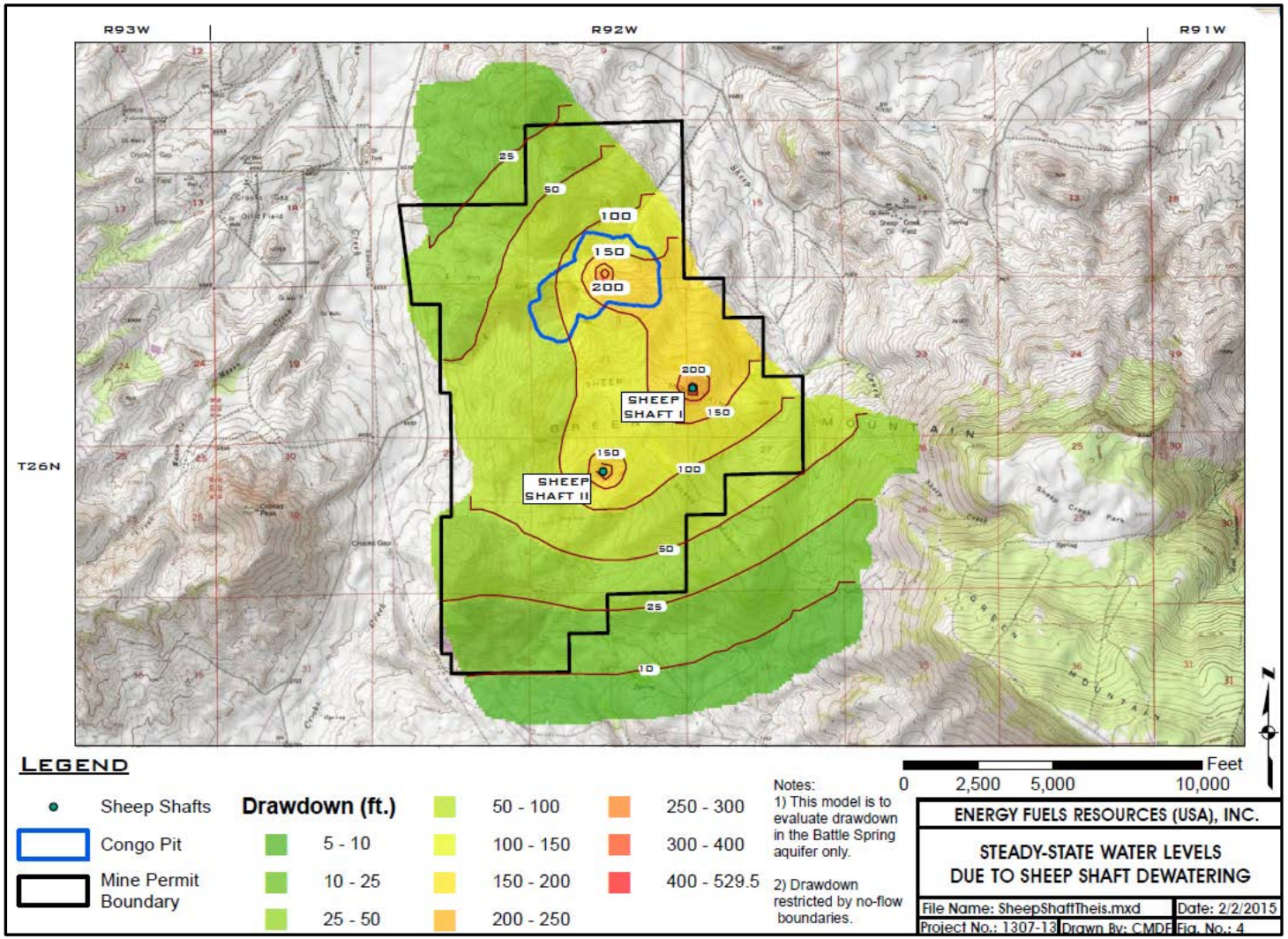


Figure 8-2. Groundwater Impact Map (LWS, 2015).

8.8 Soils

Topsoil resources have been evaluated and are sufficient to support mine reclamation goals. Refer to **Appendix D-7** (Soil Assessment) and **Section 4.7**.

8.9 Vegetation

Vegetation diversity and productivity have been quantified. Refer to **Appendix D-8** (Vegetation Inventory).

8.10 Wildlife

No critical habitat or sensitive species will be affected by the proposed mine operation. The Project is outside of the sage grouse core management area and big game crucial range areas, as discussed in **Appendix D-9** (Wildlife).

8.11 Radiology

Baseline radiological conditions and background levels, NORM and TENORM, have been defined. Refer to **Appendix D-11** (Radiological Assessment).

9.0 PART 9 – RECLAMATION COST ESTIMATE

Currently, Energy Fuels has a reclamation bond on the Project, based on prior mining disturbances. The current reclamation performance bond is $961,674.89. The bond amount is updated annually per Wyoming State regulations (WDEQ/LQD, 2013). The total reclamation obligation, as detailed in the 2015 Annual Report (Energy Fuels, 2015b), is estimated as $886,200, a difference of $75,474.89 from the current bond amount.

Prior to commencing operations, and once the BLM Plan of Operations is approved, Energy Fuels will be required to post a bond based on the reclamation requirements for the first year's disturbance, providing annual updates to that bond. The Year 1 reclamation cost estimate for the mining aspects of the Project (i.e., excludes processing facility) is presented in Energy Fuels (2014a). It is important to note that if the Project does not proceed as per this Plan, the current reclamation obligations (discussed in **Section 2.4**) and associated bonding will remain in effect.

10.0 REFERENCES

Abel, J.F., 1981. "Stability Evaluation for Southeast Slope of McIntosh South Pit."

BRS Engineering, Inc. (BRS), 2011. "Bureau of Land Management, Plan of Operations, Sheep Mountain". Prepared for Titan Uranium USA, Inc. June.

BRS Engineering, Inc. (BRS), 2012a. "Updated Preliminary Feasibility Study, National Instrument 43-101 Technical Report for the Sheep Mountain Uranium Project, Fremont County, Wyoming USA". 13 April 2012.

BRS Engineering, Inc. (BRS), 2012b. "Bureau of Land Management, Plan of Operations, Sheep Mountain". Prepared for Energy Fuels Resources Corporation. July.

BRS Engineering, Inc. (BRS), 2013a. "AML Project 16-O, McIntosh Pit Reclamation Project, Crooks Gap Uranium Mining District, Pre-Design Report". June.

BRS Engineering, Inc. (BRS), 2013b. "AML 16-O McIntosh Design Alternatives Evaluation". Letter submitted to Don Newton, AML Project Manager, Lander, Wyoming. 21 November 2013.

BRS Engineering, Inc. (BRS), 2014. "AML Project 16-O, McIntosh Pit Reclamation Project, Crooks Gap Uranium Mining District, Final Design Report." May.

BRS Engineering, Inc. (BRS) and Energy Fuels Resources (USA) Inc. (Energy Fuels), 2013. "Bureau of Land Management, Plan of Operations, Sheep Mountain Project." Prepared for Energy Fuels Resources (USA) Inc. August.

Bureau of Land Management (BLM), 2015. "Draft Environmental Impact Statement, Sheep Mountain Uranium Project." Prepared by Edge Environmental for BLM – Lander Field Office. WYW168184. January.

Bureau of Land Management (BLM), 2001. "43 CFR Subpart 3809: Surface Management."

D'Appolonia Consulting Engineers (D'Appolonia), 1981. "Highwall Stability."

Energy Fuels Resources (USA) Inc. (Energy Fuels), 2015a. "Wyoming Pollutant Discharge Elimination System (WYPDES) Permit Application, Sheep Mountain Project, Fremont County, Wyoming," Submitted to Wyoming Department of Environmental Quality, Water Quality Division. June 2015.

Energy Fuels Resources (USA) Inc. (Energy Fuels), 2015b. "2015 Annual Report, Permit to Mine 381PT, Sheep Mountain Project, Fremont County, Wyoming." Submitted to WDEQ/LQD. 10 August 2015 (Addendum issued 31 August 2015).

Energy Fuels Resources (USA) Inc. (Energy Fuels), 2014a. "Revision to Permit to Mine 381C, Sheep Mountain Project, Fremont County, Wyoming." Submitted to Wyoming Department of

Environmental Quality, Land Quality Division, District 2. January 2014 (with subsequent revisions and amendments).

Energy Fuels Resources (USA) Inc. (Energy Fuels), 2014b. "2014 Annual Report, Permit to Mine 381PT, Sheep Mountain Project, Fremont County, Wyoming." Submitted to WDEQ/LQD. 15 August 2014.

Energy Fuels Resources (USA) Inc. (Energy Fuels), 2013. "2013 Annual Report for Permit 381C, Sheep Mountain Mines, Fremont County, Wyoming." Submitted to WDEQ/LQD. 15 August 2013.

Engineering Analytics Inc. (EAI), 2014. "Sheep Mountain Project, Heap Leach Facility Design Report." Prepared for Energy Fuels Resources (USA) Inc. 2 May 2014.

Girard, J.M., 2001. "Assessing and monitoring open pit mine highwalls." *Proceedings of the 32nd Annual Institute of Mining Health, Safety and Research*.

Lytle Water Solutions, LLC (LWS), 2013. "Evaluation of Hydrologic Connection Related to the 28:40 Criteria for Ground Water Wells in the North Platte River Basin for Proposed Dewatering Operations at Energy Fuels Resources (USA) Inc.'s Sheep Mountain Project, Fremont County, Wyoming." Letter issued to Mr. Matt Hoobler, North Platte River Coordinator, Wyoming State Engineer's Office. 16 December 2013.

Lytle Water Solutions, LLC (LWS), 2015. "Preliminary Mine Dewatering Plan, Sheep Mountain Project, Fremont County, Wyoming." Prepared for Energy Fuels Resources (USA) Inc. Project No. 1307-13. Revised February 2015.

National Institute for Occupational Safety and Health (NIOSH), 1998. "Criteria for a Recommended Standard, Occupational Noise Exposure." Revised Criteria 1998. U.S. Department of Health and Human Services. June.

Stephens, J.G., 1964. "Geology and Uranium Deposits at Crooks Gap, Fremont County, Wyoming, Geological Survey Bulletin 1147-E." Prepared on behalf of the U.S. Atomic Energy Commission. United States Government Printing Office, Washington.

Tetra Tech, 2015. "Sheep Mountain Mine, Preliminary Water Treatment Design Report." Prepared for Energy Fuels Resources (USA), Inc. 26 June 2015.

Trenter, N.A. 2001. *Earthworks: A Guide*. London: Thomas Telford Publishing.

U.S. Department of Energy (DOE), 1989. "Technical Approach Document: Revision II, Uranium Mill Tailings Remedial Action Project." Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC), 2008. "Regulatory Guide 3.11 – Design, Construction, and Inspection of Embankment Retention Systems at Uranium Recovery Facilities." Revision 3. November 2008.

U.S. Nuclear Regulatory Commission (NRC), 2003. "Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978." NUREG-1620, Revision 1. June 2003.

U.S. Nuclear Regulatory Commission (NRC), 1996. "Compliance with the Rule 'Timeliness in Decommissioning of Material Facilities'." 5 November 1996.

U.S. Nuclear Regulatory Commission (NRC), 1980. "Regulatory Guide 4.14 – Radiological Effluent and Environmental Monitoring at Uranium Mills." Revision 1. April 1980.

Western Nuclear Inc. (Western Nuclear), 1973-1983. "Permit to Mine 381C." Sheep Mountain Project. Submitted to State of Wyoming Department of Environmental Quality, Land Quality Division, TFM 1 6/31, and subsequent amendments.

Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD), 2015. "Approval of Major Revision to Permit 381C – Expansion of Surface and Underground Mining at the Sheep Mountain Project, TFN 6 4/053, Change No. 20." Letter to Harold Roberts, Energy Fuels Resources (USA) Inc., from Kyle Wendtland, LQD Administrator. 8 July 2015.

Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD), 2013. "Guideline No. 12, Standardized Reclamation Performance Bond Format and Cost Calculation Methods." October.

Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD), 2006. "Chapter 3 – Noncoal Mine, Environmental Protection Performance Standards." April.

Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD), 2005. "Guideline No. 8, Hydrology, Coal and Non Coal." March.

Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD), 1999. "Noncoal, Standard Operating Procedure 2.1, Subject: Interim Mine Stabilization for Noncoal Mines." October.

Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD), 1997. "Guideline No. 2, Vegetation." November.

Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD), 1994. "Guideline No. 1, Topsoil and Overburden." August.

WEBSITE REFERENCES

U.S. Department of Labor, Mine Safety & Health Administration (MSHA). 2013. http://www.msha.gov

U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS). 2013 www.nrcs.usda.gov