

**PINYON PLAIN MINE**  
**Aquifer Protection Program Permit No. P-100333**  
**Place ID 827, LTF No. 95297**  
**Minor Amendment**

## **I. Introduction:**

The Arizona Department of Environmental Quality (ADEQ) is issuing an Individual Aquifer Protection Program (APP) Permit for the subject facility, including operational, closure, and post-closure periods unless suspended or revoked pursuant to Arizona Administrative Code (A.A.C.) R18-9-A213. The requirements contained in this permit will allow the permittee to comply with the two key requirements of the Aquifer Protection Program: 1) meet Aquifer Water Quality Standards (AWQS) at the Point of Compliance (POC), or if an AWQS has been exceeded in an aquifer at the time of permit issuance, that there will be no additional degradation of the aquifer relative to that pollutant, as determined at the applicable POC, as a result of the discharge from the facility; and 2) demonstrate Best Available Demonstrated Control Technology (BADCT). BADCT's purpose is to employ engineering controls, processes, operating methods or other alternatives, including site-specific characteristics (i.e., the local subsurface geology), to reduce discharge of pollutants to the greatest degree achievable before they reach the aquifer or to prevent pollutants from reaching the aquifer.

## **II. Permittee & Facility Location:**

Energy Fuels Resources (USA) Inc. (EFRI)  
Pinyon Plain Mine  
Hwy 64 mm 226.75 FSR 305  
Tusayan, AZ 86023

## **III. Facility Description:**

The Pinyon Plain Mine is an underground uranium mine currently being developed by Energy Fuels Resources (USA) Inc. ("EFRI") in Coconino County, Arizona, on mining claims on U.S. Forest Service ("USFS") land within the Tusayan Ranger District of the Kaibab National Forest. The Mine operation encompasses approximately 17 acres located 150 miles north of Phoenix, 45 miles north of the Town of Williams, and 6 miles south of the community of Tusayan.

The Mine includes accessing the uranium ore from the main shaft, driven approximately 100 feet to the northeast of the breccia pipe to a depth of up to 1,997 feet below ground surface. The uranium ore is hosted in a geologic feature called a breccia pipe. A cylindrical to conical, vertically-oriented, mineralized breccia pipe formation containing naturally-concentrated uranium deposit predominates the site topography and laterally truncates layered geologic units down to the Redwall Formation. Drift adits will be constructed from the main shaft to the ore body to access the ore. A ventilation shaft will be drilled within the breccia pipe to exhaust air and provide an additional emergency point of access to the Mine workings. Excavated non-ore material is stockpiled on the Development Rock Stockpile and stored for use in reclamation. Ore material will be stockpiled on the lined Intermediate Ore Stockpile. No processing of ore will occur at the facility. Ore material will be periodically hauled off-site for milling and beneficiation at the White Mesa Mill near Blanding, Utah. Groundwater seeping from the Kaibab and Coconino Formations harvested from the shaft collection rings will be used for dust control and other beneficial uses such as stock watering for local ranchers. Groundwater harvested from the mine shaft for dust control may be used if treated using a water treatment system, which is designed to treat to 0.05 mg/l for arsenic and to 0.03 mg/l for uranium. Water from the lined mine shaft sump will be pumped to the lined non-stormwater impoundment or a water storage tank. As needed, an enhanced evaporation system is used to reduce the volume of water in the lined

Non-Stormwater Impoundment. Beneficial use of groundwater and water stored in tanks are not regulated under the APP per A.R.S. § 49-250(B)(6), (21), and (22).

### **Hydrogeology and Groundwater:**

Groundwater occurs in two separate aquifers beneath the site: the shallower, perched unconfined Coconino aquifer, and the deep, confined regional Redwall-Muav aquifer. Depths to these aquifers are approximately 941 feet and 2,870 feet below ground surface, respectively. Although hydraulic pressure in the confined regional aquifer has caused water in the onsite Redwall-Muav water supply/monitoring well to rise to a depth as shallow as 2,525 feet, the depth to the top of the confined regional aquifer beneath the site is approximately 2,870 feet. The groundwater flow direction and the extent of the cone of depression generated by drainage from the mine shaft in the Coconino will be evaluated in accordance with Permit Sections 2.7.4.2 and 3.0, Compliance Schedule Item 6. The groundwater flow direction in the Redwall-Muav aquifer is to the southwest based on regional studies.

Based on review of the hydrogeologic report and other sources, ADEQ concludes that the natural hydrogeologic protections at the mine site are expected to prevent any potential impacts to groundwater resulting from mining operations. These natural hydrogeologic factors include:

1. Simple, 'layer cake' geology, the aridity of the site, and structural simplicity are conducive to greater predictability in assessing and controlling potential impacts to the subsurface;
2. The southwesterly regional dip of the layered geologic section in the vicinity of the mine directs groundwater flow southwest away from the Grand Canyon coupled with the groundwater divide present between the mine site and the Grand Canyon. A groundwater divide acts as hydrogeologic control and provides an element of natural protection by preventing northward migration of groundwater.
3. The demonstrated absence of large geologic structures such as faults, open joints, fractures, or solution cavities that would increase permeability and enhance circulation of water within the subsurface at the Mine site. This conclusion is supported by the ancient age (> 10,000 years) of perched groundwater encountered within the Coconino and of groundwater within the regional Redwall-Muav aquifer beneath the site, and is consistent with the measurements of relatively low hydraulic conductivity and transmissivity obtained from hydraulic tests in site wells, and with the conclusions from aerial overflights and field mapping that such features are not present within approximately 2 miles of the site;
4. The low permeability of the geologic formation (Moenkopi) directly underlying all surface features of the site which will minimize the potential for any surface impacts to be propagated into the subsurface and protect the Coconino Formation from any potential discharge from surface facilities;
5. A significant degree of natural protection exists from thick layers of low permeability rock. Expert examination of mine site drill cores conducted during previous investigations indicate very low permeability and absence of significant secondary porosity, and the examiners conclusion that no water from the surface has impacted the breccia pipe ores for millions of years.
6. The abundance of iron oxide rich sediments throughout the stratigraphic column which have the ability to sorb dissolved metals that may be present in the water.
7. A 'double layer' of protection between the bottom of the Mine shaft (the Mine sump) and the regional Redwall-Muav aquifer consisting of:
  - a. over 200 feet of low permeability Lower Supai Formation (considered a 'confining' unit) that underlies the workings; and
  - b. the confinement of the regional aquifer to the Muav Limestone which is protected, successively, by approximately the upper 90 feet of the Muav; more than 100 feet of overlying Temple Butte Formation; and hundreds of feet of overlying Redwall Limestone. As a result, the Mine workings will bottom in nearly impermeable rock, and will be

separated from the regional Redwall-Muav aquifer by at least 500 feet of nearly impermeable rock;

8. The near impermeability of the breccia pipe and surrounding rocks beneath the Coconino and the confined nature of the regional Redwall-Muav aquifer, which would essentially prevent any potential contamination originating from site operations from ever mixing into the Redwall-Muav aquifer, due to the hydraulic pressure within the aquifer, and the nearly impermeable rocks capping the aquifer. The rocks capping the confined aquifer are of necessity nearly impermeable otherwise the hydraulic pressure within the aquifer could not be maintained.

#### **IV. Amendment Description**

The purpose of this Minor Amendment is to:

1. Satisfy previous permit (LTF 84446) Compliance Schedule Item No. 4 which states, “The permittee shall submit an APP “Minor” amendment application which includes an ambient groundwater monitoring report to establish Alert Levels (ALs) and Aquifer Quality Limits (AQLs) for POC #4 (Redwall-Muav aquifer). At a minimum the report shall contain analysis of background sampling data, statistical approach to setting an AL and AQL for arsenic and an AQL for uranium, copies of all ADWR documents related to the wells, as-built diagrams of wells, and latitude and longitude of each well. The report shall be sealed by an Arizona Registered Geologist or other qualified registrant.”

As a result of this amendment, the AQL for arsenic will be set to at the AWQS of 0.05 mg/L and the AL will be set to 0.04 mg/L for POC #4 (Redwall-Muav aquifer) in Table 9: Compliance Groundwater Monitoring. The AQL for uranium will be set to 0.03 mg/L for POC #4 (Redwall-Muav aquifer) in Table 9: Compliance Groundwater Monitoring. The remaining parameters in Table 9 will be established upon completion of ambient groundwater monitoring in accordance to Permit Section 3.0, Compliance Schedule Item No. 3.

2. Remove previous permit (LTF 84446) Compliance Schedule Item Nos 3, 4, and 11 which have been completed.

#### **V. Regulatory Status**

The Facility was last inspected on 4/14/2021, the lined Non-Stormwater Impoundment, Development Rock Stockpile and Intermediate Ore Stockpile were in compliance at the time of inspection and no potential deficiencies were issued.

**VI. Best Available Demonstrated Control Technology (BADCT):**

The permittee has met the requirements of BADCT as described under Permit Section 2.2: Best Available Demonstrated Control Technology and Table 7: Permitted Facilities and BADCT (reproduced below).

Table 6: PERMITTED FACILITIES AND BADCT

Facility Name	Latitude (North)	Longitude (West)	Facility BADCT
Lined Non-Stormwater Impoundment	35° 52' 57.14"	-112° 05' 44.24"	<p>The impoundment has been constructed to contain and evaporate water collected in the Mine shaft sump, stormwater runoff from a large portion of the site as well as runoff from the Development Rock Stockpile and Intermediate Ore Stockpile are directed to the Impoundment.</p> <p>The impoundment is currently utilizing four floating APEX enhanced evaporation (EE) systems. Three of them currently use heated pond water and one uses ambient pond water. The permittee may install additional heated or unheated pond water EE systems in the future, if needed. The use of APEX EE systems has been approved under previous general permits.</p> <p>BADCT: Lined non-stormwater impoundment 60-mil High Density Polyethylene (HDPE) liner overlying Geosynthetic Clay liner (GCL), compacted subgrade. Engineered anchor trench securing liner.</p> <p>A minimum 2 feet of freeboard is required to be maintained in the Non-Stormwater Impoundment.</p>
Development Rock Stockpile	35° 52' 56.43"	-112° 05' 49.07"	<p>This stockpile will manage all non-ore material excavated from the shaft and other Mine workings throughout the active life of the Mine. This material will be used as backfill in the underground Mine workings consistent with the Mine Clean Closure Plan and the APP exemption in A.R.S. § 49-250(B)(5).</p> <p>BADCT: set on 12-inch pad of screened native fill material, drainage to Lined Non-Stormwater Impoundment through HDPE culvert. Protected by 3-foot high perimeter berm; graded to minimize ponding.</p>
Intermediate Ore Stockpile	35° 52' 58.11"	-112° 05' 43.71"	<p>This stockpile will manage all in-process ore material prior to its loading and removal from the Mine for off-site milling and processing.</p> <p>BADCT: 30-mil PVC liner over prepared subgrade. Protected by 12-inch pad of on-site crushed and sized material (as per Iron Rock Drawing dated 10/29/2020), drainage to the Lined Non-Stormwater Impoundment through HDPE culvert. Protected by 3-foot high perimeter berm; graded to minimize ponding.</p>
Lined Mine Shaft Sump	35° 52' 59.96"	-112° 5' 45.12"	<p>The liner at the bottom of the Mine Shaft Sump contains aquifer water seeping from the sides of the mine shaft and, following future development, may contain water collected from the ventilation shaft and stopes.</p> <p>Mine shaft sump -- The sump collects water accumulating in the Mine workings. The sump has been designed and constructed with a lining system over the host rock to provide an effective barrier against seepage of Mine water from the sump. The main shaft sump has a double liner system at the bottom of the shaft sump. The bottom 12 feet of the shaft walls and floor have been sealed with a spray-applied poly urea seal to provide a</p>

Table 6: PERMITTED FACILITIES AND BADCT

			<p>nearly impermeable liner in the sump. The liner was constructed by first compacting a layer of mine run material on the floor of the shaft to provide an even surface for the application of the poly urea liner. A 250-mil thick layer of poly urea was then applied in even coats over the floor and bottom 12 feet of the shaft. A single layer of GCL was installed above the poly urea liner and lapped 12-inches over the base of the Mine shaft wall. A 4-inch protective sand layer was placed on the GCL and 32-inches of pea gravel placed above the sand layer to provide a protective cushion at the base of the shaft. If the shaft is deepened consistent with the USFS-approved Plan of Operations, a similarly protective designed, constructed, and operated sump will be installed in the bottom of the deepened shaft. If mining activities go to a depth below the bottom of the lined shaft sump consistent with the USFS-approved Plan of Operations, pumping facilities will be installed so seepage water will be collected and pumped to the main shaft sump. During non-operating conditions, the sump will have two (2) pumps installed to pump the sump water in case the other pump is down. During mining operations, there will be one pump on standby and available for immediate replacement, as practicable, to pump the sump water in case the other pump is down. Each pump will have sufficient capacity to pump water from the sump. The pumps will be provided by two (2) sources of electric power or a stand-by auxiliary power (generator) to limit disruption to the pumping of the water accumulating in the sump in case of a power outage. Upon notification of the power outage, standby personnel will be dispatched to switch the power source and resume pumping of the water from the sump. A water meter will be provided to measure water pumped from the sump for water budget purposes. The sump will have an alarm with light and audio to alert if the water in the shaft reaches the top of the liner.</p> <p>The water level in the sump will be maintained no higher than the top of the liner.</p>
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**VII. Compliance with Aquifer Water Quality Standards (AWQS):**

**Groundwater Monitoring:**

Groundwater monitoring is required at four POC wells, one existing well for the Redwall-Muav aquifer and three recently installed Coconino aquifer monitoring wells that will be used to establish groundwater flow direction and the extent of the cone of depression generated by drainage of perched groundwater into the mine shaft, to ensure compliance with AWQS. Upon completion of ambient monitoring to establish baseline levels (Compliance Schedule Item 3), the permittee shall begin groundwater monitoring to ensure compliance with AWQS during operations. ADEQ uses groundwater quality data to make regulatory and enforcement decisions.

The POCs are established at the following monitoring locations, listed in Table 2: Points of Compliance of the Permit:

Table 1: POINT(S) OF COMPLIANCE (POC) MONITORING WELLS

POC #	POC Location	ADWR Registration Number	Latitude (North)	Longitude (West)	Aquifer	Screen Interval (ft bls)
POC #1	East Well (Hole ID: CYN-MON-01)	55-924769	35° 53' 00.0801"	-112° 05' 41.3282"	Coconino	920-1,148
POC #2	North Well (Hole ID: CYN-MON-02)	55-924770	35° 53' 02.5022"	-112° 05' 47.5984"	Coconino	920-1,130

POC #3	South Well (Hole ID: CYN-MON-03)	55-924771	35° 52' 55.2988"	-112° 05' 47.1674"	Coconino	920-1,145
POC #4	Located North of the Non-Stormwater Impoundment	55-515772	35° 53' 00"	-112° 05' 48"	Redwall-Muav	2,584-2,960

Monitoring requirements for each POC Monitoring Well are listed in Section 4.2, Table 8: AMBIENT GROUNDWATER MONITORING and Table 9: COMPLIANCE GROUNDWATER MONITORING. The Director may amend this permit to designate additional POCs, if information on groundwater gradients or groundwater usage indicates the need.

**Discharge Monitoring:**

Discharge Monitoring of water from the Mine Shaft Lined Sump to the Lined Non-Stormwater Impoundment is listed in Permit Section 4.2, Table 7: Routine Discharge Monitoring. The sampling point for discharge monitoring is located at the outflow pipe of the Lined Mine Shaft Sump water to the Lined Non-Stormwater Impoundment. Discharge monitoring will include monitoring for daily and monthly total flow, quarterly monitoring for nitrate+nitrite, total dissolved solids, alkalinity, sulfate, pH, specific conductance, total metals, and radionuclides.

**Operational Monitoring:**

Operational Monitoring will be required under Permit Section 4.2, Table 10: Facility Inspection and Operational Monitoring (reproduced below):

Table 10: FACILITY INSPECTION AND OPERATIONAL MONITORING			
The permittee shall record the inspection performance levels in a log book as per Section 2.7.2, and report any exceedances as per Section 2.6.2. In the case of an exceedance, identify which structure exceeds the performance level in the log book.			
Facility Name / Pollution Control Structure / Parameter	Operational Requirement / Performance Level	Inspection Frequency	Reporting Frequency
POC Wells	Well cap and seals are intact. No discernable damage or deterioration of the well(s). Wells should be secured with a lock.	Monthly	See Section 2.7.2 and 2.5.3.1
Non-Stormwater Impoundment	No mechanical damage, seam failure, and maintenance of freeboard two feet.	Weekly	See Section 2.6.2.1 and 2.7.2
	Address accessible vegetation and debris.	Monthly	
	Remove bulk of accumulated residues, sediments, debris, and vegetation to maintain the integrity of the liner and the design capacity of the impoundment.	Annually	
Water Capture Rings	Maintain pumping records for the combined water rings in the main shaft when personnel are onsite.	Daily	See Section 2.6.2.1 and 2.7.2
Mine Shaft seeps	When the mine shaft is accessible during operations, observe the seeps in the saturated portion of the Coconino Formation for qualitative purposes.	Quarterly	See Section 2.6.2.1 and 2.7.2
Mine Shaft Sump Pumping System	Inspect pumps, when the mine shaft sump is accessible during operations, and power supply for proper operation, capacity, redundancy and structural integrity, refer to Table 7: PERMITTED FACILITIES AND BADCT.	Weekly	See Section 2.6.2.1 and 2.7.2



Table 10: FACILITY INSPECTION AND OPERATIONAL MONITORING			
Mine Shaft Lined Sump Water Level	Inspect water meter measurement system for water pumped from sump and alarm monitoring system for proper operation.	Weekly	See Section 2.6.2.1 and 2.7.2
On-site Dust Control	Maintain records of water treatment system maintenance	Monthly	See Section 2.6.2.1
Ventilation Shaft	<p>Permittee shall construct the ventilation shaft so it drains any seepage water to the main shaft.</p> <p>If parts of the ventilation shaft or any stopes are developed lower than the bottom of the main sump, or have obstructions that prevent drainage and collection of the seepage water from these places to the main shaft sump, pumping facilities shall be installed so seepage water shall be collected and pumped to the main shaft sump.</p>	Monthly	See Section 2.6.2.1 and 2.7.2

### VIII. Operational Limitations

Section 2.1.1 of the Permit includes the following operational limitations:

1. Mining shall not occur above 5340 feet above mean sea level and below 4508 feet above mean sea level.
2. Groundwater harvested from the mine shaft for on-site dust control may be used if treated using a water treatment system, which is designed to treat to 0.05 mg/l for arsenic and to 0.03 mg/l for uranium.

### IX. Closure Plan

The mine currently has in place a Clean Closure Plan, which has been approved by the USFS under the mine's approved Plan of Operations, which has formed the basis of the surety for the mine, and which ADEQ has reviewed. Within 90 days following notification of closure, the permittee shall submit for approval to the Groundwater Protection Value Stream, an updated closure plan which meets the requirements of A.R.S. § 49-252 and A.A.C. R18-9-A209(B)(3), which may be the existing Clean Closure Plan with any amendments or additions thereto that may be needed to ensure that those requirements are satisfied at the time of submission. The updated closure plan shall provide an estimate of the material removed from the ore body using 3-D mapping where accessible which shall include plan and cross-sectional views showing the void spaces and geologic structures in place in the ore body. The updated closure plan shall include an evaluation of the mapping results as it relates to stability. The updated closure plan shall provide a summary of the primary sources and amount of water pumped from the mine workings as a monthly average and the water quality of the water pumped from the mine sump to the Lined Non-Stormwater Impoundment using the information collected pursuant to the routine discharge monitoring requirements for the mine sump in APP Permit Section 2.5.1.1 and Section 4.2, Table 7.

Regardless of whether the updated closure plan achieves clean-closure immediately, the permittee shall continue to conduct post-closure groundwater monitoring and reporting at the POCs, including SMRF submittals for a period of 30 years in accordance with the conditions of the permit. If the closure plan contains a schedule for bringing the facility to a clean-closure configuration at a future date, ADEQ may incorporate any part of the schedule as an amendment to this permit.

**X. Compliance Schedule Items**

Under Permit Section 3.0 Compliance Schedule, Table 5: Compliance Schedule Items (reproduced below) for each compliance schedule item listed below, the permittee shall submit the required information to the Groundwater Protection Value Stream.

Table 2: COMPLIANCE SCHEDULE ITEMS			
No.	Description	Due By:	Permit Amendment Required?
1	The permittee shall submit a demonstration that the financial assurance mechanism listed in Section 2.1, Financial Capability, is being maintained as per A.R.S. § 49-243.N.4 and A.A.C. R18-9-A203(H) for all estimated closure and post-closure costs including updated costs submitted under Section 3.0, No. 2 below. The demonstration shall include a statement that the closure and post-closure strategy has not changed, the discharging facilities listed in the permit have not been altered in a manner that would affect the closure and post-closure costs, and discharging facilities have not been added. The demonstration shall also include information in support of the Performance Surety Bond demonstration as required in A.A.C. R18-9-A203(C)(2).	April 28 <sup>th</sup> , 2028 and every following six years.	No
2	The permittee shall submit updated cost estimates for facility closure and post-closure, as per A.A.C. R18-9-A201(B)(5) and A.R.S. § 49-243.N.2.a.	April 28 <sup>th</sup> , 2028 and every following six years.	Yes
3	The permittee shall submit an APP “Minor” amendment application which includes an ambient groundwater monitoring report to establish ALs and AQLs for the POCs for the perched Coconino aquifer and any remaining parameters for the Redwall-Muav aquifer where limits have not been previously established. At a minimum the report shall contain analysis of background sampling data, statistical approach to setting ALs and AQLs, copies of all ADWR documents related to the wells, as-built diagrams of wells, and latitude and longitude of each well. The report shall be sealed by an Arizona Registered Geologist or other qualified registrant.	Within 90 days of completion of ambient groundwater monitoring under Section 4.2, Table 8: AMBIENT GROUNDWATER MONITORING.	Yes (“Minor” Amendment)
4	Begin Compliance Groundwater Monitoring in POC Wells, as required under Section 4.2, Table 9: COMPLIANCE GROUNDWATER MONITORING.	First quarter after ALs and AQLs have been established.	No
5	Submit Annual Report in accordance with Section 2.7.4.1.	Annually by January 30th	No
6	Submit Groundwater Monitoring Demonstration report in accordance with Section 2.7.4.2. The report shall be sealed by an Arizona Registered Geologist or other qualified registrant.	Every two years, beginning April 28, 2024, through post-closure.	No
7	Submit as-built plans for the Intermediate Ore Stockpile (IOS)	Within 90 days of completion of the construction.	No
8	Submit a Significant Amendment if the mine shaft or declines are planned below the level 1,997 feet below ground surface.	180 days prior to planned construction.	Yes



**XI. Additional actions required under this permit include but are not limited to:**

1. Maintain a liner at the bottom of the Mine shaft sump (refer to Permit Section 4.1, Table 6: Permitted Facilities and BADCT).
2. Replace Mine shaft sump liner in the case of deepening the Mine shaft (refer to Permit Section 4.1, Table 6: Permitted Facilities and BADCT).
3. After completion of Ambient Groundwater Monitoring, EFRI agrees to set a numeric AQL for Uranium in the POC Wells at 0.030 mg/L if the ambient results are less than 0.030 mg/L or if the ambient results are higher than 0.030 mg/L then EFRI will set an AQL for Uranium based on Statistical Analysis of the Ambient Groundwater Monitoring data (refer to Permit Section 2.5.3.5).
  - a. A narrative Aquifer Water Quality Standard (A.A.C. R18-11-405) was considered however a numeric Aquifer Quality Limit (A.A.C R18-11-406) was decided upon because it will be more protective of human health and the environment.