
8.0 ALTERNATIVES TO THE PROPOSED ACTION

8.1 ALTERNATIVE MINING METHODS

Alternate methods of mining available for the Nichols Ranch ISR Project include underground and open-pit mining. Both of these methods were not considered for the project since they are not economically feasible for mining of the uranium because of the much larger capital investment required, the grade of the ore, and the size of the ore zones. Additionally the underground and open-pit mining methods result in greater environmental impacts to the area along with exposing employees and the project area to higher safety and health risks.

The overall impacts of in situ recovery (ISR) mining compared to conventional and open-pit mining result in several environmental and socioeconomic advantages in an NRC evaluation (NUREG-0925, 1983, Section 2.3.5). The advantages are as follows:

1. The amount of surface area disturbed by in situ mining is significantly less. The amplitude of disruption is also significantly less.
2. Tailings that result from the milling process are not produced. Additionally the amount of solid waste produced by the ISR mining method is generally less than 1% of that produced by conventional milling methods.
3. Air pollution problems caused by ore stock piles, overburden stockpiles, tailings stockpiles, and crushing and grinding operations in conventional and open-pit mining do not exist with the ISR mining method.
4. Radiation exposure at an ISR operation is significantly less than that associated with conventional mining and milling. Operating personnel are not exposed to the radionuclides present in and emanating from the ore and tailings. Conventional mills tailing can contain all of the radium-226 originally present in the ore whereas ISR operations may have less than 5% of the radium in the ore body being brought to the surface through the recovery process.
5. The entire mine site can be returned to its original land use more rapidly with ISR mining methods than those of underground or open-pit mining methods.

ISR mines can remove the solid wastes from the site to a NRC licensed disposal site preventing them from contaminating the surface and subsurface environment. This is not always possible with the size and extent of conventional mining.

6. Solution mining results in significantly less water consumption than conventional mining and milling.
7. Socioeconomic advantages of ISR operations include:
 - Ability to mine lower grade ore
 - Minimum capital investment
 - Less risks to miners
 - Shorter lead time in beginning production, and
 - Minimal staffing requirements

8.2 ALTERNATIVE SITES

The planned locations of the Central Processing Plant (CPP), Main Office Building, and Main Maintenance Shop for the Nichols Ranch Unit are shown in Figure 3-1 (see map pocket) of Chapter 3.0, Description of the Facilities. The Hank Unit Satellite Ion Exchange Plant, Office Building, and Maintenance Shop are shown in Figure 3-2 (see map pocket) of Chapter 3.0, Description of the Facilities. All of these facilities were located off of the ore zone on the most topographically suitable land within the project area. With these considerations, no realistic alternative site locations exist.

8.3 ALTERNATIVE RECOVERY SOLUTIONS

The alkaline recovery solution (lixiviant) consisting of sodium carbonate/carbon dioxide, dissolved oxygen or hydrogen peroxide, and groundwater is the preferred recovery solution to be used in the Nichols Ranch ISR Project. The solution was selected based upon its successful use in recovering uranium and aquifer restoration in several pilot plant projects and commercial operations in the Powder River Basin.

Alternate recovery solutions include ammonium carbonate solutions and acidic solutions. Both of these solutions have been used in the past in ISR mining operations, but are no longer used because of the difficulties in restoring and stabilizing the affected mining aquifers. Because of these reasons, the solutions were not considered for the Nichols Ranch ISR Project.

8.4 GROUNDWATER RESTORATION ALTERNATIVES

Uranerz Energy Corporation will utilize the combination of groundwater sweeps, groundwater transfers, and Reverse Osmosis for the restoration of groundwater impacted by the Nichols Ranch ISR Project. This method is the chosen method for aquifer restoration because of its successful, proven use in ISR mining groundwater restoration. It is also considered to be Best Practicable Technology (BPT) available by the NRC and state regulatory agencies. If future technology advances are made to produce better alternatives for groundwater restoration, then Uranerz Energy Corporation will consider incorporating these technologies into groundwater restoration.

8.5 LIQUID EFFLUENT DISPOSAL ALTERNATIVES

The proposed disposal of liquid effluents is through the injection of the effluents down a deep disposal well. This method was chosen over other alternatives such as evaporation ponds and land application (irrigation) facilities because of the environmental impacts that ponds and irrigation have on the project area. The deep disposal wells to be used will be drilled to a depth of at least 6,000 ft deep or deeper. This is consistent with other deep disposal wells located in the project region that are used by other ISR operations. Each disposal well must be authorized by the State of Wyoming and the EPA UIC Program to receive the liquid effluent wastes.

9.0 BENEFIT-COST SUMMARY

9.1 GENERAL

Uranium that will be recovered at the Nichols Ranch ISR Project will be used to replace the uranium consumed in the production of power from nuclear power plants. The Nichols Ranch ISR Project would also supply a domestic source of uranium that would help alleviate the need of nuclear power plant operators in the United States to seek uranium supplies from foreign sources. Currently, the United States imports approximately 30 million pounds of uranium from foreign countries, while only producing, approximately 5 million pounds per year. The Nichols Ranch ISR Project would have the beneficial effect of helping the United States offset this deficit in domestic production.

In evaluating the benefits of energy produced during reactor licensing, the environmental costs of the reactor are weighed against the energy produced by including a pro-rated share of the environmental costs associated with recovering uranium for fuel. The incremental impacts of mining uranium for the use in reactor fuel are justified in terms of benefits of energy generation to society. With that, the benefits and costs of an in situ recovery facility are evaluated in terms of benefits to the United States and society in general against local environmental costs for which there may be no directly related compensation.

9.2 QUANTIFIABLE ECONOMIC IMPACTS

The major potential benefits for the Nichols Ranch ISR Project include the added income and revenues to local communities in the area near the project area, the State of Wyoming, and the federal government through employee income, royalty income, and tax revenues generated by the mining operation. Some items that may go against these potential benefits involve the added costs and strains on schools, fire and medical response, and other community services, but these costs are relatively small since most of the workforce that will be used for the project will be pulled from the surrounding communities. Because of uncertainties in the market place and other

factors such as counties being able to alter various taxing rates, a numerical balance between the benefits and costs of any one community, or for the project cannot be arrived.

9.3 ENVIRONMENTAL COSTS

The Nichols Ranch ISR Project will basically have three types of environmental costs: 1) radiological impact, 2) disturbance of the land, and 3) groundwater impact. The radiological impacts of the project during its operation are minimal since all potential radiological containing materials will be confined in the process. During reclamation, any remaining solid radioactive wastes will be disposed of at an NRC licensed facility. This results in no long-term impact at the site from the radiological materials. The disturbance of the land is also a small environmental impact. All lands that are disturbed during the life of the project will be reclaimed, and after the project is decommissioned, will be returned back to the pre-mining use. Groundwater impacted by the Nichols Ranch ISR Project will be restored back to pre-mining conditions or class of use such that pre-mining use suitability of the groundwater is maintained.

9.4 SUMMARY

The economic benefits to local communities, the State of Wyoming and the federal government along with the minimal radiological impacts, surface disturbance, and groundwater impacts that result from the production of uranium to make nuclear power for the use of the general public, make the benefit-cost balance for the Nichols Ranch ISR Project favorable. Additionally, the domestic production of uranium for the use of producing nuclear power helps the United States reduce its need to import uranium from foreign sources. With this, issuing a source material license for the Nichols Ranch ISR Project, subject to the necessary license conditions, is the appropriate regulatory action.

10.0 ENVIRONMENTAL APPROVALS AND CONSULTATIONS

10.1 PERMITS AND LICENSES REQUIRED FOR THE NICHOLS RANCH ISR PROJECT

Various state and federal permits and licenses that are needed or are in-hand for the Nichols Ranch ISR Project are listed in Table 10.1. Prior to the start of mining (the injection of lixivant into the ore body aquifer), Uranerz Energy Corporation will have obtained all the necessary permits, licenses, and approvals required by the Wyoming Department of Environmental Quality and the Nuclear Regulatory Commission.

Table 10-1 Permit and Licenses for the Nichols Ranch ISR Project.

Permit, License, or Approval Name	Agency	Status
Source Material License	NRC	Pending
Permit to Mine	WDEQ-LQD	Pending
Permit to Appropriate Groundwater	SEO	Existing wells are approved, new well permits will be filed prior to drilling
DEQ Drilling Permit	WDEQ-LQD	In Possession, No. 336DN-TFN 4 5/276
BLM Drilling Permit	BLM	In Possession, W-169662
Wellfield Authorization Permit	WDEQ-LQD	In Preparation
Deep Disposal Well Permits	WDEQ-WQD	In Preparation
WYPDES	WDEQ-WQD	In Preparation
11(e)2 Byproduct/Waste Disposal Agreement	N/A	In Preparation
Permit to Construct Septic Leach Field	County	In Preparation
Air Quality Permit	WDEQ-AQD	Not Needed

Notes: NRC - Nuclear Regulatory Commission

WDEQ-LQD - Wyoming Department of Environmental Quality Land Quality Division

WDEQ-WQD - Wyoming Department of Environmental Quality Water Quality Division

WDEQ-AQD - Wyoming Department of Environmental Quality Air Quality Division

SEO - State Engineer's Office

BLM - Bureau of Land Management

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