

IN-SITU URANIUM MINING WELL FIELD DESIGN CONSIDERATIONS¹

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Abstract: Production from uranium mines supplies 64 percent of the current nuclear power utility requirements (World Nuclear Association, July 2008). To sustain current and future uranium demands, world mine production must expand. While increasing mine production will feed the requirements of civil and industrial sectors, the potential for contaminating groundwater supplies and local ecosystems must be addressed.

In 1990, 55 percent of world's uranium production came from conventional mining operations, but by 1999 the volume had decreased significantly to 33 percent (WNA, July 2008). Conventional mining methods produce tailings, run-off, and significant land disturbance—all requiring significant rehabilitation. With in-situ leach mining methods, disturbance is reduced because only multiple boreholes are drilled for recovery. Rehabilitation is much simpler, resulting in the steady increase of in-situ uranium mining operations.

Other than a site's uranium reserves, hydrologic characterization of the formation is probably the most important consideration in studying the economic feasibility of an in-situ uranium mining operation. Once characterization is complete, engineers need to address three major aspects in order to increase the economic feasibility of the operation and minimize the associated environmental effects. These key steps include recovery process design, well field design, and monitoring program. The recovery process design influences how efficiently the minerals can be recovered and minimizes the time and cost to complete the recovery. A proper well field pattern with the optimum areal sweep efficiency reduces costs and duration of the operation, provides better control of lixiviant flow, and minimizes the area of potential leakage. Lastly, a groundwater monitoring program provides baseline data and detects potential leakage from the site. This paper will discuss these topics in detail.

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