

Dr. McLaughlin:

Richard Hill asked me to email you my comments from the teleconference on monitoring in the area of the depleted-uranium contamination at JPG.

I briefly touched on two topics.

First, in the design of the monitoring system, I would like to see both attention to, and discussion of the rationale for, the eventual design of the system as it applies specifically to how it will effectively monitor ground water that moves through a system that is dominated by flow through secondary permeability pathways (fractures in the tills in the shallow system and dissolution pathways (karst or karstic) in the carbonate bedrock). Convincingly reliable ground water monitoring programs in systems dominated by secondary pathways are notoriously difficult to design and build. I will be very interested in the logic and technology that will be proposed and implemented in the design and installation of a monitoring system that will ensure, in 3-D, that contaminant migration doesn't "end run" the monitoring points.

My second comment relates to dynamics associated with the design of the monitoring system and of the results that are obtained from it. A monitoring system is only as good as the understanding of the geology and hydrogeology. The typical procedure is to develop an understanding of the site, design what is believed to be an appropriate monitoring system, and then install the system as designed. It is better if the monitoring system is itself considered a verification experiment of the site conceptualization. That is, the design of the monitoring system includes *predictive criteria that will be confirmed by the monitoring system if the understanding of the site is correct, and the monitoring system is measured against the criteria.* (Predictive criteria could include stratigraphy, anticipated interception of migration pathways, hydraulic properties, chemical signatures, head levels, etc.) If the predicted criteria are not observed, the underlying understanding of the site must be reworked and the monitoring system redesigned, and the cycle reiterated. Similarly, once a confirmed monitoring system is in place, the performance of the system should be tracking the chemical and hydraulic performance of the site, not just the presence or absence of a contaminant of concern. Trigger levels of other observational criteria should be set. These would generate a reassessment of the site and the monitoring program if there are significant changes in site chemistry or in patterns of seasonal or event-based head variation (as examples), independent of whether uranium was detected in the samples. If site conditions change, there is no longer an assurance that the monitoring system is still appropriately designed, and it should be re-evaluated.

Charles H. Norris
Geo-Hydro, Inc.
(847) 635-8335