Computer predicts migration of toxic wastes through soils

William Heimbach

Migration of hazardous wastes through the soil has posed a major dilemma for scientists trying to mitigate damage to the environment.

Now, a computer model developed at Los Alamos National Laboratory can help predict how fast and far waste will travel through soils.

"The model does not always give absolute answers, but it's a very good tool to evaluate migration systems," said Everett Springer, a hydrologist in Los Alamos' Environmental Science Group.

Working with Springer is Chester Porzucek, a chemical engineer and postdoctoral fellow in the same Lab group.

The computer model focuses on movement of organic hazardous wastes—carbon-based solvents and fuels—through the subsurface.

"We can make a 20-year simulation with the computer operating for 36 hours," said Springer. "The only real limitation of the model is the computer capacity and computational speed."

Many of the model's predictions are based on the fact that most common hazardous wastes—fuels like gasoline or solvents such as TCE, or trichloroethelyne, a common degreaser—vaporize in the soil.

"Most of these wastes are disposed of in liquid form, but because of their high volatility and the dry nature of soil, they will rapidly turn into vapor," Springer said.

Vapor can diffuse 100,000 times faster than liquid. So, earlier computer models using water movement as a basis for waste migration predictions may have overlooked a potentially important contaminant pathway.

"We feel these early models predicting chemical migration were ignoring the vapor phase, which distorted the predictions," he said.

"A liquid will generally sit there with very little migration in dry soil," Springer said. "A vapor, on the other hand, can poten-

tially move about one-fifth of a mile in 20 years."

Springer and Porzucek have been working on their model for about 18 months. The computer predictions will be cross-checked with actual chemical-migration patterns being researched in a laboratory setting.

"This is a relatively new area with limited knowledge available," said Springer. "We are trying to understand the basic physics involved in the process."

Growing Numbers of Canadian Electric Utilities are Developing Formal Environmental Auditing Procedures

A growing number of Canadian electrical utilities are becoming increasingly interested in environmental auditing, according to Gilbert Hedstrom of Arthur B. Little Inc. Speaking to the annual meeting of the E&O Division, Hedstrom noted that many medium to large utilities are in the process of developing formal environmental audit procedures.

Environmental auditing, Hedstrom told his listeners, is a methodical examination, involving analyses, tests and confirmations, of a facility's procedures and practices to verify whether it is in compliance with legal requirements and internal policies, and evaluating whether it conforms with good environmental practice. There are a growing number of reasons to conduct such audits including increasing regulatory requirements, public pressure, support for auditing from government agencies and increasing corporate liability.

The process of environmental auditing is becoming well entrenched in utilities in the United States. In one example, Hedstrom