Toxic chemicals leak into a lake, killing fish and other wildlife. Oil seeps into an ocean bay, closing public beaches. Radioactive waste escapes from a holding pond and into a stream.

Such incidents often make headlines and draw attention to environmental issues. Most people recognize the need to limit pollution, and they understand it often is necessary to take action to control contamination already present at industrial sites and other locations.

However, there are wide differences of opinion about how to address these goals and who should pay the costs. Many types of contamination can be left in place as long they are effectively contained.

One low-key approach doesn’t often make the news, but in many situations it can be an efficient and cost-effective option for controlling contamination.

"When it is possible, and when allowed by control agencies, locking polluting materials in place almost always is safer and more cost efficient than removing them for treatment, and there often is no on-going maintenance expense," says Richard Berry, chairman of Rembco Engineering Corporation, Knoxville, TN.

Rembco specializes in sealing off and preventing migration of contamination by the use of various types of grout compounds. Rembco projects have been successful with diverse contaminants in a variety of situations.

Successes
In Pennsylvania, Rembco used grouting to contain oil leaking under an oil refinery’s sea wall. The concrete wall had been constructed on top of old wharf piling. Over time, tidal action caused erosion, resulting in leakage at the wall’s base.

"At high tide," says Berry, "water seeped under the wall, picked up oil, and as the tide went out, carried the oil into the Delaware River. Grouting with a combination of time-release bentonite and cement-based grout with chemical grouts as set control agents solved the problem along approximately 550 feet of sea wall."

Grout was pumped through pipes installed behind the sea wall by wash boring and driving pipes to positions below the tide’s lowest level. Spot leaks from joints and pipe penetrations were sealed with urethane-based grout.<br><br>Sealing off pollution can be an effective option when radioactive materials are involved, says Berry.
"If you can lock any radioactive material away long enough," he says, "it degrades to a point where it no longer is harmful."

At Tennessee’s Oak Ridge National Laboratory, Rembco used three types of grout to address leakage of low-level radioactive and chemical materials buried in waste trenches. Cement based, microfine cement based, and chemical solution grouts were applied to encapsulate contents of the trenches, reducing leaching of contaminants to the nearby stream to an almost insignificant level.

"This was accomplished with little hazard to personnel by driving sleeve port grout pipes, instead of drilling them in, and controlling overflow water from the trenches during operation," says Berry.

The cost of the program was $2.4 million, says Berry. An additional $1.6 million was spent on monitoring, radiation safety, engineering and field administration. The $4 million total of both was under the project budget by nearly $1 million and was about 10 percent of the $40 to $50 million which would be have required for the next-best alternative.

"The economics were driven," says Berry, "by the fact that these four trenches were responsible for about 90 percent of the polluting leakage into this particular stream."

On another project at Oak Ridge, grout stopped leakage of radioactive waste from a contaminated wastewater pond. Escaping material was entering a storm sewer system and flowing into a surface stream.

A cured-in-place lining placed inside the sewer failed to stop the radioactive drainage with contaminated waste.

"Grouting outside the pipe with acrylic-based chemical water-stop grout corrected the leakage, retaining waste in the pond," says Berry. "The project was handled safely and at very low cost."

At an old mine in Virginia, coal fines broke through clay seals placed along old underground drifts, and began contaminating the adjacent river.

"Depth of the fines from an impoundment dam had reached about 30 feet above the leaking zone when the breach of the seals was discovered," says Berry. "By setting casing from a bench above the leaking areas, the seals were renewed by grouting with a time-release bentonite material. This allowed the facility’s washing plant to stay in production while the fix was accomplished."

**Of Technology**

Berry says modern environmental grouting techniques have their roots in the mining industry.

"Water has always been a problem in underground mining operations," he says. "Grouts were developed to contain water and to divert its flow. Mining companies have grouting crews working full time."

The technology expanded to other industries. Berry has 25 years experience with grouting projects. He formed Rembco in 1982, and the company’s first environmental grouting project was two years at Oak Ridge.
Berry says there currently are only about a half dozen firms in the United States providing environmental grouting services.

"We’re a geotechnical grouting company," says Berry. "We work underground in the soil, so we’ve developed a special niche inside a specialized field."

Expectations of what environmental grouts should accomplish have changed over the last 20 years.

"When we first began making presentations to prospective clients and agencies," he says, "they wanted assurances that grouting would be 100 percent effective stopping a flow or sealing a contaminant. And that’s not always possible."

What grout can do in many situations is reduce the spread of contamination to an acceptable level. If pollution entering a river can be reduced by 95 percent, the river can accommodate the remaining pollution and will remediate itself naturally.

Berry says regulatory agencies are currently more inclined to approve less-than-100 percent solutions because of extreme costs of removal and treatment. Such a posture should encourage more frequent consideration of contamination containment by economical grouting methods.