

The study concluded that three key things needed to be done. The first is to forge partnerships and agree on where you are going. Here in Washington, the greatest bureaucracy in the world, you want to ask the federal agencies to partner? Recently, there was a maritime listening session hosted by the U.S. Coast Guard, Maritime Administration, U.S. Army Corps of Engineers (USACE), and a variety of other folks, but not the Environmental Protection Agency (EPA). Does the EPA not believe, or do others not recognize, that the EPA is part of the maritime industry? Federal agencies, particularly the EPA, need to learn how to partner within their own organization as well as with other agencies.

I want us to consider laws, regulations, and practices. Practices are what I want to see, because I like to see action. I am tired of having the environment compartmentalized. That was fine when we were writing laws in the late 1960s and early 1970s that said, essentially, "We will deal with air, we will deal with water, we will deal with contaminated sediments." We must recognize that it is a closed system. If you take something out of here and put it over there, then it is still here with us. If it comes off the China coast, then it will be here sooner or later. It is a closed system. We need to work together to look at the risks to the system, to ourselves, and to other critters that share the planet.

We need to have flexible, practical ways of dealing with these problems in my industry, because that will give us the opportunity to gauge the business risk of getting involved. As someone said earlier, "You touch it, you own it." Nowhere is this more true than in the port industry. I have about two floors of lawyers telling me, "Don't touch it." That is of no help if I have ship coming in drawing 47 ft (14 m). Nor is it cheap.

What does the port industry need? We need to agree on the objectives of this work. More reports will not cut it, at least not for me. We need to identify what the risks are to the best of our abilities, decide what it will

cost to meet those risks, and then decide on what the benefits are, because someone is going to pay. I would prefer to see the people who benefit from the activity pay for it, but those who created the problem also should pay a share. The idea that the Port Authority of New York and New Jersey is the source of all goodness and cream is over. Partnering, to me, is not coming in with your hand out saying, "Give me money." The federal and state governments are also players, along with the ports.

I want to see action. Demonstration projects are necessary because this is a trial-and-error type of reality. The certainties of how contaminants partition in biological organisms and ultimately end up in humans is really a stochastic process. There is no deterministic equation of which I am aware that tells me exactly how much mercury I will get. There is also a need to think about the recycling component. Sediment comes from the mountains down into the bays, and if we do not move it, then we become a meadow instead of a harbor. Let us think about how to recycle it, the way any other industry now looks at recycling technologies.

In my view, developing partnerships is also a trial-and-error process. We do not have adequate models for how to develop partnerships. Mathematical equations are lousy at predicting what you will do, because we are value-driven creatures. Maybe a stochastic model will work, but it is still not deterministic.

There is a need to consider new laws and regulations that are based on risk. This is a tough challenge, particularly when you tell someone there is a one-in-a-million chance they will get cancer. Of course, the family that had the one-in-80-million chance of getting \$100 million is very happy right now. I also want us to stop compartmentalizing the world and begin writing and applying legislation in a fashion that gets the maximum return on investment instead of the best press.

INDUSTRY PERSPECTIVE

John Haggard

I have been involved in a number of "meat and potatoes" sediment problems and may have a different perspective than other presenters do. I want to thank the NRC for convening this symposium on what is a very important topic from many different perspectives. The 1997 NRC report provides a thorough, concise, and thoughtful review of what we as a country are doing to deal with contam-

inants in sediments within our waterways. It also lays a foundation, based on risk management principles, for evaluating objectively both the potential risks that may be posed by contaminated sediments and the methods of controlling those risks.

In reviewing the charge to the panelists, Frank Bohlen asked that we offer our unique perspectives as stakeholders and try to comment on the report's conclusions and recommendations. He also encouraged us to "get the juices flowing" by not avoiding controversy. I will try my best to do just that.

My perspective is that of an industrial company trying to manage sites where there are contaminated sediments

that have been attributed to us and are derived primarily from past operations. The fact that these problems are a result of past practices as opposed to post-1970 practices is an important distinction that other stakeholders need to understand. We cannot turn back time.

My comments will focus on issues related to the management of contaminated sediments from the perspective of environmental restoration, which differs from that of port management and navigation. In my view, the unifying principle embodied in the NRC report is that risk analysis should guide the management decision, and I firmly agree with this. This is sound policy that allows the maximum use of existing science and allows site-specific information to guide decisions. This should be the basis of how we manage sites.

It now appears that not only the NRC, but also the EPA, in its recently issued contaminated sediment strategy, advocates this approach for managing contaminated sediments. There is an important concept that seems unique to sediment sites: The remedy that we impose on these sites can have a significant impact on the very things we are trying to protect. As a result, we must have a full accounting of both the benefits that might accrue from our action as well as of the impacts of our action. From my perspective, this is extremely encouraging and forms a basis of what should be a sound national policy.

I would like to be more specific about what I believe it means to use risk assessment in a remedial decision-making process for contaminated sediment sites. For many sites containing contaminants and sediments, the management decisions and sometimes confusing phraseology can be collapsed into a small number of simple questions—"simple" only in that they embody the risk-based concepts in a small number of fairly direct questions. If we can answer these questions for a given site, then risk managers can make reasoned decisions about what to do. The problem, as pointed out earlier, is the great difficulty of answering these questions at times. It is hard work, but in the end it is worth the effort.

The first question is: What are we trying to do? What are we concerned about? What is the end point we are trying to protect? This should be a risk-based end point. It should be one that has a fairly direct relationship to the protection of human health and a population of ecological receptors. The second question relates to the recognized fact that natural recovery is occurring at many of these sites. The question is: If we let the natural recovery processes continue, then how long will it take to reach the risk-based end points that we are trying to achieve?

The third and fundamental question is: Is there anything we can do to materially accelerate the achievement of those standards? This is critically

important to the process. When we look at questions two and three, we are making time into a decision point. No matter what we do, we will not reduce the risk to acceptable levels at any of these sites by tomorrow. Interim actions may be taken, but there will be an element of time. Accordingly, if we take an action and reduce the length of time required to achieve these standards by a year at a tremendous cost, will it be worth it? What if it reduces the time by 100 years? That may be worth it. We never will see a real issue that is so black and white, but time becomes a critical management decision point.

The next two questions deal with rare events, such as floods. In situations where, even with natural recovery, there is concern about a traumatic event setting back the clock, such events have to be considered. More importantly, you have to consider whether you can do anything about it. It is appropriate to worry about the problem, but you also have to figure out what to do about it. When we look at sites where this issue has come up, we often find there is no evaluation. It is like having a 1,000-pound gorilla in a closet and hoping it does not escape. We need to start using what we know about sediments—both cohesive and noncohesive sediments—in terms of how they move and how that affects the impact of an extreme event. We have the technology to do that and should use it.

Lastly, we need to look at the impacts of these projects. How do we balance them? How do we account for them? We will see movement of material from one compartment to another as a result of actions, and we will see direct impacts on aquatic systems; all of these impacts must be accounted for.

There is a growing consensus, as evidenced by the EPA sediment strategy and the NRC report, that risk analysis should guide remedial decision making. The state of practice is basically out of step with this. As a result, there is an inability to address the key risk questions and determine whether a remedy was appropriate, and, more importantly, whether the expenditure of resources is having any real benefit at all.

Over the last five years, we have undertaken a systematic review of projects around the United States in which contaminated sediments were evaluated for removal. We found a number of interesting things. One, there has been relatively little technical and regulatory experience with the evaluation of contaminated sediment sites, particularly with risk-based concepts. However, there have been about 20 reasonably sized projects from which we can draw conclusions.

Fundamentally, we are finding that, when remedial actions have been selected, it is almost impossible to figure out why they were selected. What is the relationship between what we are doing and the risk we are trying to control? Ultimately, was there any hope at the

start that the chosen remedy actually would control the problem? Trying to reconstruct this process becomes very frustrating.

In some cases, projects appear to be based on the misguided belief that the removal of a mass of contaminants will translate directly into the control of risk. This is a critical assumption, the validity of which is not addressed by the proponents of mass removal. It often is couched in, or dressed up as, the term "hot spot." When I hear, "We are going to deal with hot spots," I instantly translate that to: "This is a mass-removal project." The concept of hot spots needs to be dissected into risk, and that seldom happens.

As discussed earlier, the questions we must address to determine the proper course of action are relatively simple. The process of doing it, however, is hard work. This work seldom is done, and this is wrong. We also found that valuable project information seldom is generated or made available. Project documentation is extremely poor, making the independent evaluation of projects nearly impossible. More importantly, we are losing the opportunity to learn from experiences at other sites. What types of remedial approaches are working? Are we successfully controlling risks? What impacts accrue because of these remedies? What are the real costs? How long did it take, versus how long we thought it would take, to do these projects? The sharing of best practices is simply not occurring.

Given the potential social, public health, economic, and ecological concerns that arise during the remediation of these sites, it is strongly recommended that an independent policy and technical evaluation be undertaken of sediment sites for which remedial decisions have been made, to ensure that the use of risk methods is consistent with the NRC and EPA approach. Where remediation has occurred, it should be evaluated to determine what was learned about the capabilities and limitations associated with various techniques. If we cannot learn from our success, then we will have to learn from our failures, and we are missing a golden opportunity here.

Although I strongly agree with most of the conclusions and recommendations of the NRC report, there is

one with which I strongly disagree. The report recommends, in the interests of economics and fairness, that the polluter pay and that ports be given more leverage over the polluter. Although this concept initially may appear to be appealing, I suggest that it is not necessarily fair; moreover, as a result of the disagreements that would occur, it would not result in a timely resolution of the problems facing our ports. This brings me back to the fact that most of the problems we have as an industry are based on historical actions that were legal at the time, performed and often done with government acceptance and knowledge.

In many ports, there are multiple contaminants and multiple sources of contaminants. The allocation of responsibility in these situations would be extremely complex and result in endless controversy, particularly, as is often the case, when a few high-profile industrial sources are attacked and the more-difficult-to-find, yet often more pervasive, sources are let go. Contaminants from sewage outflows are one good example. The fairness issue is at the center of this controversy.

The standards that ports are required to meet to manage or dispose of their dredged material are extremely stringent. The relationship between these risks and reasonable science is elusive. If the problems of ports are to be managed efficiently and in a cost-effective manner, as they need to be, then trying to bring actions against industries for long-abandoned practices will not be an effective solution. It will not be fair from the perspective of the industrial stakeholders, because we will be asked to foot the bill for an action over which we have little control. This will generate controversy, and it will not result in a timely solution to the problems.

In summary, I think the NRC report provides a sound policy framework for maximum use of the developed science and efficient allocation of resources. However, the state of practice is markedly out of step with the ideal. Too much emphasis is placed on mass removal versus risk control and on simplistic analysis. To advance the field, a review should be conducted by an organization independent of those performing projects, and changes should be implemented to ensure that the expenditure of our resources has a real benefit.
