

Risk-Based Remediation: More Than Just Numbers

Bill Phillips

Keith Johns

Ken Ogilvie*

Introduction

Contaminated properties and hazardous waste liability continue to threaten the financial health of the regulated community and local public economies. In addition, other stakeholders, such as land developers, lending institutions, insurance companies, political officials and regulatory agencies are directly and indirectly affected by future liability from uncontrolled and undiscovered hazardous wastes. However, the environmental remediation field is beginning to mature and the experience gained during the 1980s and 1990s provides an improving ability to forecast the costs of environmental liabilities and site remediation. For example, the emergence of the brownfields redevelopment market has depended on this improved forecasting ability. The experiences with brownfields redevelopment and other innovative cleanup programs have provided precedents that can be used to control the soaring costs of environmental remediation.

Initiatives that favor quick and efficient cleanups are beginning to replace the historical emphasis on state and federal cleanup programs of exhaustive site investigations, cumbersome feasibility studies and lengthy remedial design. Increasingly, the default assumption that a hazardous waste site will become a residential property inhabited by children is being replaced by the realization that the United States cannot afford to restore all industrial properties to standards comparable to edible dirt. Instead, regulatory programs are showing an increased willingness to use institutional controls to establish cleanup standards, as long as the effectiveness of these measures can be guaranteed.

For institutional controls on future land use to be an effective component of site remediation, the responsible parties must become more involved in guaranteeing their implementation and effectiveness. Effective use of institutional controls involves far more than merely placing a deed restriction on a property. This article discusses cleanup strategies that have successfully incorporated a range of institutional controls that reduced the cost of remediation at relatively complicated sites. However, successful negotiation of these projects requires much more than just numbers. It also requires an understanding of the political realities within which regulators must operate.

Political and Regulatory Trends

Two political trends over the last few decades have contributed to soaring environmental control costs in the United States: 25 years of detailed environmental legislation born from a sense of environmental crisis, and exponential growth in the size of environmental regulatory agencies. During the 1970s and 1980s, the public believed that we must act *immediately* to protect the environment, regardless of cost, even if we do not have all the information. In practice, public demands to do something about the “environmental crisis” relaxed the burden of proof on government to demonstrate the necessity of particular actions.

The fiscal realities of the 1990s led to a political reexamination of our previous assumptions about environmental regulations — should environmental concerns compete with other societal needs for limited resources? There is not enough money to go around, and Congress is deciding which programs win and which will lose. Perhaps for the first time since the beginning of the environmental movement, discussing the cost-effectiveness of environmental cleanup actions is no longer automatically considered taboo by environmental activists. After all, the United States is certainly considering cost in the current debate on national health care, even though it may mean that not all citizens will receive adequate medical care.

Suspicion that the U.S. Environmental Protection Agency (EPA) was overstating the extent of environmental problems was the cause of much debate in the 104th Congress regarding environmental issues. For example, the Federal Aviation Administration relies on actuarial data on airplane accidents and near misses to design our commercial air system, and the Department of Transportation has strong statistics on traffic flow and accidents to guide the design of highways. By contrast, the information EPA uses in site-specific risk assessments, which justifies annual expenditures of billions of dollars to remediate contaminated sites, does not let us know if diluted environmental contaminants are doing any more harm to human health than a cup of coffee (which contains more than a dozen rodent carcinogens).

The EPA has historically refused to accept that highly conservative estimates are not the way to address risk issues. The current risk assessment system layers conservative assumption upon conservative assumption until the calculated upperbound risk is in orders of magnitude greater than any probable exposure situation. In fairness to the EPA, Congress passed the statutes that created this problem, a fact that has been lost in the recent political rhetoric. However, the EPA was also slow to grasp the changing

budgetary realities and has been politically clumsy when trying to promote the good work it has done. In particular, the EPA has failed to place the relevant environmental protection issues into a public forum for open debate and has played into the hands of self-styled Congressional reformers.

Because there has been little open debate of the issues, public support for “reform” of environmental regulations remains tepid. The regulated community was probably naïve to allow itself to be portrayed as trying to roll back years of environmental progress and may have lost a unique opportunity to change the federal environmental regulatory culture. Pollsters have shown that environmentalism has entered the core values of the American public — a finding used to great advantage by the Democratic Party and President Clinton during the 1996 election. Public support for keeping or strengthening environmental laws has been constant through 25 years of oil shocks, recessions, inflation, economic problems of all kinds and other distractions. The public mood, which appeared anti-regulatory in 1995, quickly shifted in 1996 when Americans feared that important elements of the environment were at risk.

As a result, the regulated community still must demonstrate that its proposed actions are protective of the environment. Rightly or wrongly, regulators will continue to have enormous discretionary power over responsible parties who are often assumed to be guilty until proven innocent. At every site cleanup project, the responsible parties would be wise to accept the burden of proof and focus the regulators’ attention on the critical technical issues that must be defined to ensure that human health and the environment are being adequately protected.

One practical effect of the recent political turmoil regarding environmental regulation is a welcome questioning of old habits by state and federal regulators. Because regulators are now under intense pressure to quickly and efficiently move sites through the system, many programs must meet numerical progress goals. Many states have realized the economic impact of excessive site remediation regulations and have modified their programs. There are new opportunities to negotiate issues of concern and achieve results that provide mutual gain for the regulators, the public and responsible parties.

Institutional Controls

The intent of institutional controls is to provide some level of assurance that potential exposure pathways (*e.g.*, groundwater used as a domestic water source or children exposed to soil) remain incomplete. Rather than argue about numerical cleanup levels,

land use controls are used to ensure that certain activities do not occur in the future. For example, if measures are taken to guarantee that surface soils are clean or “capped” and that deeper subsurface soils are not disturbed, a slab-on-grade commercial facility can be placed on the site and connected to the municipal water supply without exposing site visitors to the residual contaminants. Instead of arguing whether 50 ppm of a compound in soil is protective, the remedial approach guarantees that site visitors will not be exposed to residual contaminants.

Institutional controls for environmental remediation programs have traditionally included deed restrictions, well restriction areas, land use restrictions, access controls, registry and transfer act requirements and contractual obligations. One of the few available discussions of institutional controls is presented in Appendix X4 of the American Society for Testing and Materials (ASTM) *Emergency Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (ES 38-94).

Under Superfund and RCRA, the use of institutional controls has been relatively uninspired; the controls are used to protect engineered caps on a site or to enforce long-term requirements for fencing and groundwater monitoring. The Preamble to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) contains an extensive discussion of institutional controls and land use policies. However, CERCLA & 121 establishes a preference for permanent treatment, allowing the use of institutional controls if permanent treatment is not feasible. While the NCP states very clearly that institutional controls should not be a baseline condition in the risk assessment, it also allows that a remedy based on institutional controls is an appropriate consideration for the feasibility study.

Recent initiatives, however, have included the use of institutional controls to convert waste sites to attractive facilities that provide value to the public, rather than a perpetually fenced and isolated parcel of land. Certain retailers, recognizing the favorable arbitrage play on contaminated property, seek out brownfield sites for constructing large retail outlets. Newporte Mall in New Jersey was built on a former manufactured gas site, leaving the bulk of the residual contaminants in the subsurface. Waste Management Inc. converted the Settlers Hill Landfill in Illinois to a golf course, as have private developments in St. Lucie County, FL, and Palm Beach County, CA. PACCAR Inc., the responsible party for a national priorities list (NPL) site in Renton, WA, remediated its site to industrial use standards and constructed a new truck manufacturing facility on the reclaimed property. When specific properties are inappropriate for commercial and

industrial development, they can be converted to parks and nature areas, approaches currently used by the Hackensack Meadowlands Development Commission.

Institutional controls on future land use have too often been a fallback rather than an obvious primary approach. However, the difficulties of maintaining institutional controls in perpetuity should not be underestimated. Many of the current NPL sites were created by a failure of land use controls (*e.g.*, at Love Canal, the school district built a school on a capped property it was specifically told should not be disturbed). Considering little more than a dozen states have strong Superfund programs, do the other states have the organizational ability to maintain effective institutional controls?

Zoning and land use planning are usually governing functions of local jurisdictions, but few local governments have the required expertise to effectively manage former hazardous waste sites. An informal telephone survey of several municipal planning departments revealed that none of the respondents was familiar with institutional controls. We were also told that local planning departments have no foolproof methods to identify restricted sites. Even when comprehensive zoning plans have been developed, a developer with funds can usually get zoning revisions. Fortunately, deed restrictions are somewhat more protective, since a legal restriction on a property cannot be overridden by a zoning change.

Assumed Future Land Use Policy in the Superfund Program

Because a risk assessment defines the areas of the site that present an appreciable risk (and therefore need to be remediated), it is a critical component for remedy selection and should not be underestimated in importance. Unfortunately, risk assessment practices in the United States are determined by regulatory agendas and use overly conservative assumptions. The more cynical among us would claim that technical risk assessment practices have been manipulated by regulatory program managers to meet predetermined goals.

The EPA Superfund risk assessment policies originally described in *The Superfund Public Health Evaluation Manual* (SPHEM) and updated in *The Risk Assessment Guidance for Superfund* (RAGS) are designed to ensure that the scope of cleanup at a site meets the requirements of the regulatory program. One of the flaws in the policies is the mixing of risk assessment and risk management policy, which is best illustrated by the typical assumption that every Superfund site has the potential to become a residential development. Superfund policy has historically required that the risk assessor assume the

near worst case situation, which contributes to a presumption of risk and makes it difficult to discern serious hazards from trivial ones.

Because Superfund has been a precedent for state cleanup programs, it is instructive to review the history of assumed land use policies within the program. One of the EPA's earliest clarifications for assumed future land use in the risk assessment process was in 1986:

Consider including the site itself as an exposure point, based on a reasonable future use scenario. Clearly, this consideration would be inappropriate at sites where future development is improbable, but some sites may have future human contact uses. Consult with local planning and zoning officials to determine a reasonable future-use scenario.

SPHEM, page 41, emphasis added.

Early Superfund policy recognized that by the time the Remedial Investigation/Feasibility Study (RI/FS) was being conducted, most Superfund sites had been stabilized and there was little current potential for exposure. However, the future uses of these properties had rarely been clarified and there was no national policy for redeveloping these sites. By 1989, Superfund policy had evolved from evaluating the potential for onsite exposure pathways to presuming that the site will become residential property and that most exposure pathways will be complete.

Assume future residential land use if it seems possible based on the evaluation of the available information. For example, if the site is currently industrial but is located near residential areas in an urban area, future residential land use may be a reasonable possibility.

RAGS, pages 6-7, emphasis added.

The revision of the NCP in 1990 further established the assumption of future residential land use at Superfund sites:

In general, the baseline risk assessment will look at a future land use that is both reasonable, from land use development patterns, and may be associated with the highest (most significant) risk, in order to be protective. *These considerations will lead to the assumption of residential use as the future land use in many cases.*

Preamble to the NCP, 55 FR:8710, emphasis added.

In 1991, the Office of Solid Waste and Emergency Response (OSWER) issued the following policy directive explaining how the assumption of future residential land use is often the basis of remedial action at Superfund sites:

Often the exposure scenarios based on potential future residential land use provide the greatest risk estimates (*e.g.*, reasonable maximum exposure scenario) *and are important considerations in deciding whether to take action.*

OSWER Directive 9355.0.30, Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, page 5, emphasis added.

However, also in 1991, Superfund program managers began showing an awareness that attempting to remediate all sites to residential use standards may actually deter the quick and efficient remediation of Superfund properties.

What circumstances indicate that industrial sites should be cleaned up for future residential use?...*How important is it to achieve site cleanups that allow for unrestricted use?*

Superfund 30-Day Task Force Report, page 21, emphasis added.

By 1995, the EPA established its current policy of assuming that future land use should probably be consistent with the current use of the property:

Future industrial land use is likely to be a reasonable assumption where a site is currently used for industrial purposes, is located in an area where the surroundings are zoned for industrial use, and the comprehensive plan predicts the site will continue to be used for industrial purposes.

OSWER Directive 9355.7-04, Land Use in the CERCLA Remedy Selection Process, page 6, emphasis added.

The EPA's revised policy for determining future land use is a crucial remedial component for sites that have economic development potential. As described in the following section, a large number of hazardous waste sites have the potential to be treated as brownfields redevelopment projects.

The Brownfields Redevelopment Model

The *Fact Sheet on Brownfields Pilots*, issued by the EPA in 1995 defines a brownfields site as:

...a site, or portion thereof, that has actual or perceived contamination and an active potential for redevelopment or reuse.

This definition can reasonably be extended to a wide variety of industrial properties that have been left vacant and contaminated because the cost of cleanup exceeds the value of the property. The ultimate question always involves the issue of how, and to what extent, to clean up a property without inhibiting the owner's ability to develop or sell the property at a profit down the line.

It is now a truism that industrial development of contaminated urban properties is good public policy; it checks urban sprawl, cuts traffic and air pollution, puts jobs in the inner city and uses the existing infrastructure. In addition, abandoned properties are an under-recognized form of urban blight that provide havens for crime and other societal problems. The societal benefits of brownfield development should help to counteract the perceived "costs" of less-than-perfect site cleanups.

The favorable cost-benefit comparison of these less-than-perfect site cleanups needs to be better communicated. Public concern about relatively small and implausible environmental risks forces the government to spend money regulating those risks, which means money may not be available for more serious social and medical issues. Public health analyses favor spending money on prenatal care, childhood immunizations and day care, rather than attempting to remediate shallow aquifers that will never be suitable sources of drinking water.

It is instructive to compare some of the basic parameters of the traditional Superfund site versus a brownfields redevelopment site:

Superfund Site

assumed residential
more stringent cleanup goals
more costly remedial design
unrestricted future use

no commitments to develop

Brownfield Site

assumed industrial
less stringent cleanup goals
less costly remedial design
deed restrictions and
institutional controls
development plan in hand

government command and control

private ingenuity

Brownfield redevelopment programs acknowledge local political realities. Municipalities need the tax income provided by redevelopment. In addition, it is an easier business decision for responsible parties to agree to practical industrial cleanup standards rather than restrictive residential use criteria. A brownfields redevelopment also acknowledges the realities of remedial costs: the bulk of the cleanup budget at a site is spent trying to recover the last 10% of the contaminant mass.

Presently, there is an increased willingness by regulators to consider cleanup plans that do not fit the strict confines of their programs — plans they would have previously dismissed without discussion. At perhaps the majority of waste site cleanups, because local and state agencies are the primary authorities in the cleanup action, it has been far easier to form a common vision with local authorities (make the site safe *and* speed redevelopment) rather than the stereotypical EPA vision that ends with “make the site safe.” Many states are administering voluntary cleanup programs where sites can be remediated by responsible parties with a reasonable degree of oversight and assurances that future liabilities will be limited.

In the absence of statutory reform of CERCLA in the 104th Congress, the EPA (particularly EPA Region 5) has signed Superfund Memoranda of Agreements with states instituting voluntary cleanup programs. These agreements provide that EPA will not initiate federal action under CERCLA with respect to sites that have successfully completed the state’s program. However, EPA headquarters and the states are currently caught in a debate over whether state voluntary programs should include highly contaminated, NPL-caliber sites, and how to define “NPL-caliber” sites. The states are taking the common-sense position that there is no valid technical reason to exclude complicated sites from their voluntary cleanup programs, except for enforcement reasons. Until this issue is resolved, there will be no national guidance from EPA headquarters on voluntary cleanup programs.

Site Cleanup Strategies

The precedents established by the EPA’s Brownfields Redevelopment Initiative can be helpful to negotiate familiar Superfund issues, such as the following:

- How clean is clean?
- Risk assessment methodologies

- Risk-based remedies v. permanent treatment
- Economic and technical practicability of remedies
- Role of future land use consideration in cleanup

A common theme in the above issues is the lack of consistent national policy regarding the use of institutional controls to allow residual contamination to remain onsite. Despite potential difficulties, however, attractive opportunities remain for responsible parties who are willing to do their homework and prove to regulators and citizens that the preferred site remedy is protective of human health and the environment.

1. Screening the Property

Not all hazardous waste sites are conducive to redevelopment, and it takes a lot of screening to ensure that a risk-based, redevelopment-based remediation strategy is sound. In addition, these projects can require sales and negotiating skills that are equal in importance to the engineering and technical tasks. At the onset of the project, the following considerations should be evaluated to determine if redevelopment-based remediation is appropriate for the site.

a. Do You Have the Required Expertise?

In addition to environmental expertise, a redevelopment project requires familiarity with commercial real estate, local government procedures, demographic planning and public relations. Market forces and access to financing are critical determinants of the investment potential for the property, which in turn guides the scope and cost of remediation. Most regulators and environmental managers find it counter-intuitive that the available cleanup budget, rather than default regulatory requirements, determines the remedial design. The project team, therefore, should also include developers and public relations personnel familiar with local governments and interest groups.

b. Can Cleanup Be Linked to Redevelopment?

The first issue regarding any property is, what is the value if one assumes there is no contamination on the site? If it appears to have inherent development value, one can begin to determine potential cleanup costs and the spread between the total investment needed and the targeted selling price.

If the commercial real estate value of the property is minimal, a second option is development as a recreational property. A variety of end uses can allow the effective use of institutional controls (and a smaller scope of remediation) to guarantee that exposure pathways will remain incomplete, even when residual contamination is left onsite. Contaminated properties have been developed as golf courses, driving ranges, ball fields and nature areas. When liability is retained by the responsible party, access agreements can be established with a local parks and recreation department, or the responsible party can establish a managing trust.

c. Know Thyself

Responsible parties cannot be defensive or secretive about the history of the site, as property redevelopment is conducted in a public arena. The responsible parties will be placed on the spot regarding previous practices at the site, reasons it took so long to remediate the property, and whether the public was placed at risk. Public meetings often lead to discussions that require the responsible parties to negotiate issues and make binding decisions with little warning. If the responsible parties are not accustomed to this arena and are evasive, the project will likely be doomed.

The project will be subject to a variety of masters, including the lead environmental agency, local government, citizen groups, local media and miscellaneous busy-bodies. As a result, the project staff must possess creativity, patience and occasional manic spurts of action to adjust to unforeseen setbacks. These types of projects are probably not appropriate for Superfund PRP Committees, highly bureaucratic corporate management and other governing structures that do not allow rapid decisionmaking or innovative strategies.

2. Controlling the Process

The initial project strategies must show an awareness of the remediation end points, particularly that contaminants that are likely to be of concern, their potential cleanup requirements, the regulatory agency's expectations, legal or liability concerns that must be addressed, and the data needed to resolve all of these issues. If the regulators have the strongest technical voice, their desires, no matter how grandiose, will often be incorporated into the cleanup. Therefore, it is essential that responsible parties support their position with sound science and good data.

Selecting a remedial alternative that is more extensive than necessary can result in excessive costs of millions of dollars with no additional protection of human health or the environment. Once it is clear that a party will be responsible for the cleanup activities, it is usually advantageous to be a proactive participant rather than a recalcitrant footdragger. Taking the initiative forces the regulators to respond to the responsible party's documents and analyses.

The responsible parties should determine the focus of technical arguments and frame the strategic discussions. Being a recalcitrant may delay the financial sting of cleanup, but it also concedes technical control to the regulators.

3. Community Involvement

Most regulatory cleanup programs require an opportunity for “meaningful public participation” in planning for remedial actions. Managers of redevelopment-based remediation projects can learn from commercial real estate developers, who typically meet with local citizens to resolve issues of traffic, noise and design compatibility and thereby minimize opposition to their project. No one should pretend, though, that community involvement is an easy task. It is not unusual for the first few meetings with local citizens to become forums for venting anger and disappointment.

Sophisticated responsible parties understand these dynamics and gradually draw their critics into the planning process. Local citizens' groups can be the most vociferous critics of proposed remedial plans. When involved in the planning process, however, they can appreciate and sometimes support critical initiatives. The critical issues for local residents are typically protecting health and maintaining the value of their homes. Small group discussions (not large public meetings) with nearby residents can identify the critical desires of the different stakeholders. Ensuring their issues are addressed by the remedial plan (or making sure they understand why their requests are not feasible) will increase the probability of their support. More importantly, regulators are hesitant to vote down a plan that is supported by local residents; it may be cost effective to give the residents a little extra to gain their support for the overall plan.

In situations where there are highly technical or contentious issues that are difficult to resolve:

- It can be effective for the responsible party to provide a small technical assistance grant that allows the stakeholders to obtain independent technical opinions from a

local university. If screened carefully for their practical knowledge of the issues, an independent reviewer can help to provide credibility during critical negotiations.

- Local public relations help may be required to provide critics with attention and ensure that the appropriate issues are identified and resolved.

4. Thorough Site Characterization

Many of the stakeholders involved in a redevelopment project are unfamiliar with environmental remediation and do not understand the uncertainties inherent to characterizing subsurface contamination. While environmental consultants and regulators are accustomed to finding previously undetected areas of contamination at a site, citizens' groups and local governments may interpret these situations less charitably. Therefore, the project manager must minimize surprises in site characterization, as credibility can be quickly lost.

A thorough site characterization is required to accurately interpret contaminant fate and transport and the potential risks to health and the environment, and to forecast the potential range of cleanup costs. When proposing innovative cleanup approaches, the responsible party must assume a higher burden of proof that the remedy will be effective and will protect the environment. As a result, groundwater modeling or the risk assessment are likely to require high quality, site-specific data that can provide the required level of comfort for citizens' groups, local media and regulators. The responsible parties must be able to immediately and convincingly answer the question, "Will it be safe?"

5. Innovative and Understandable Documentation of the Cleanup Plan

Typically, the project must be sold to a skeptical audience, and multi-volume, overly technical reports may not be sufficient to convince non-technical reviewers that the project strategy is sound. For example, a recent project that included Environmental Strategies Corp. (ESC) involved a 120-acre former wood preserving facility with about 300,000 cubic yards of impacted soil located next to a residential neighborhood. Due to a poor corporate business climate, the responsible party had severe corporate budget constraints and had to aggressively control remedial costs.

The initial plan was to redevelop the site for light industry, but the real estate market was depressed and the property had little commercial value. The fallback plan was to

construct an engineered containment cell at one corner of the site, excavate and contain the highly impacted soils, place clean fill over the residual subsurface contaminants, and redevelop the site as a golf course and nature area. Due to the history of the site, there were hard feelings by some of the stakeholders, and the technical team realized that the preferred remedy would be a difficult sell. Therefore, it was imperative to submit reports that were readable and sold the project, but provided strong technical justification for the proposed remedy.

Previous meetings with residents and the regulators had identified several critical concerns and each were specifically addressed in the report. In particular, the local residents wanted assurances that the institutional controls on land use and the maintenance of the containment cell could be guaranteed in perpetuity. Therefore, much of the report was designed to demonstrate the responsible party's commitment and ability to ensure the site would be properly maintained, including inspection plans and checklists, written contingency plans for repairs, and escrow funds and insurance policies to guarantee future financial viability. Once the protectiveness of the plan was demonstrated, the residents were able to appreciate the potential of the golf course for boosting the value of their homes. While still a difficult sell, the project is nearing the final stages of regulatory approval.

6. Long-Term Sustainability

As described above, resolving uncertainty about the sustainability of the project is critical for gaining approval for the use of institutional controls. Redevelopment of the project for a specified use can be a favorable starting point. Residents and regulators generally have a higher comfort level if the development plan addresses the entire site, rather than just the contaminated portion of the property. Responsible parties must clarify the details of a variety of property issues, such as:

- How can you guarantee the legal authority to maintain the land use controls?
- What is the source of the long-term funding for operation and maintenance of the site?
- How will future ownership of the site be defined and who will retain environmental liability?

- How will the property be inspected and what guarantees can be made regarding prompt repairs to damaged systems?
- What escrow funds, bonds or environmental insurance policies are you willing to implement?

The ability to provide prompt and detailed answers to these kinds of operational details inspires confidence in the responsible party's ability to follow through with its promises.

Conclusions

Strategic and technical paths for remediating hazardous waste sites can vary depending on the regulatory program that has precedence. However, definitive end points must be established for the responsible party to control the process to the maximum extent that is feasible. Particularly for property redevelopment-based remediation projects, any strategy that is chosen is surrounded by outside influences involving commercial real estate market forces, the experience of the regulatory agency staff and management considerations on the part of the responsible party. Given this variety of distractions, it is truly a challenge for the environmental manager to maintain an attitude towards compiling objective, defensible data that will help to sell the solution to all of the interested parties.