LINKING LAND USE AND SUPERFUND CLEANUPS:

Uncharted Territory

INTERNET EDITION

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EXECUTIVE SUMMARY

Congress is once again considering major changes to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), better known as Superfund. As the 105th Congress debates revisions to Superfund, one of the most important changes it is likely to make is to require the U. S. Environmental Protection Agency (EPA) to take into account the expected land use at a site when selecting a site remedy.

Linking land use and remedy selection in the Superfund program is in many ways a simple, appealing, and rational concept, with something in it for everyone. Land use-based remedies hold the promise of reducing the cost of cleanups, helping local governments redevelop sites that have sat idle, and encouraging more public deliberation in cleanup decisions. For many in the Superfund policy community, linking land use to remedy selection would add a reasonable pragmatism to a program widely viewed as inefficient.

But if we are to embark on a policy that links cleanups at Superfund sites to future land use, it is important to understand from the outset the complications that may follow. First, in the context of remedy selection, land use categories (such as, residential, commercial, and industrial) serve as proxies for exposure. Yet, the relation between land use and exposure is often not known and may vary widely. Second, anticipating the likely future use of a site is no easy task. Often, there are competing interests who want different land uses at a site, just as there are often a variety of parties seeking different cleanup remedies. Third, assuring that local land use controls are maintained and enforced over time at sites where residual contamination precludes unrestricted uses is a task outside EPA's traditional authority. Local land use restrictions are typically the province of local government and private property law. Fourth, and finally, to the extent that land use controls are necessary to assure protection at a site, the effectiveness of these land use controls becomes a crucial component of the remedy.

Our research suggests that two major challenges will result from a cleanup policy linking land use to remedy selection: first, how to involve the public more effectively in cleanup and reuse decisions; and, second, how to ensure the effectiveness of property use restrictions when the legal authority for such controls stems from the police powers of local governments and the private property laws of each state.

We set forth our findings and recommendations below.

Findings

1. Agreement about the future use of a site may not lead to agreement about the appropriate remedy—or cleanup standards—for that site.

The debate about land use often involves discussion about different categories of land use—such as residential, commercial, or industrial. There can, however, be considerable variation in routes of exposures within any of these major land use classifications depending on the types of activities that occur at a site.

2. It is often not possible to determine the "anticipated future use" of a site, and, in fact, the remedy selection process can lead to unanticipated land uses at Superfund sites.

At small industrial Superfund sites, surrounded by industrial activities, it is not difficult to anticipate the likely future site uses. But at nearly 80% of Superfund sites, there are adjacent residential areas. In these situations, it is much more difficult to identify the future use. Predicting future land use is an inherently risky business. Local land use designations are made as part of a politicized process involving a range of stakeholders with competing legal and economic interests. Zoning decisions, for example, face continual pressure from rezoning proposals and administrative decisions to grant variances. Although the courts have traditionally deferred to the zoning decisions of local legislative bodies, judicial attacks on local land use regulations are not uncommon. Finally, the anticipated use of a site often evolves in tandem with the site remedy. Changes in the use of a site can result from decisions made in the remedy selection process.

3. Institutional controls are: (a) often critical to ensuring long-term protection; (b) often neglected and left to the end of the remedy selection process; and (c) subject to legal, administrative, and social pressures that may limit their effectiveness.

At many sites, institutional controls are central to the success of the remedy to ensure protection of public health. In cases where the technical elements of a remedy are fully implemented, the remedy is not protective unless the institutional controls—in whatever form—are in place, function as anticipated, and are enforced.

While the need for institutional controls is recognized early in the cleanup process, often they are not drafted with any specificity until after a record of decision (ROD) has been issued. Institutional controls are more typically developed at the latter stage of the remedial process, during negotiations between EPA and potentially responsible parties (PRPs) that lead to a settlement agreement, and are set down in a consent decree, a legally binding document. Often the general public has little opportunity to get involved in this process, since the negotiations are private.

When institutional controls are used to assure protection of human health and the environment, the technical adequacy of the remedy becomes dependent on a number of non-technical factors over which EPA has little influence. These include: the efficacy of local government administration; the consistent application of zoning ordinances; the ability of private property restrictions (such as easements and restrictive covenants) to bind both current and successive users of the site; and prompt enforcement.

4. Linking cleanup decisions to land use considerations places an even heavier responsibility on EPA to effectively involve the public in the remedy selection process.

Few operations of local government are more subject to public controversy and political machinations than land use. Land use decisions and land use controls at Superfund sites may become controversial for reasons that have little to do with cleanup. Returning Superfund sites to industrial or commercial uses can create economic windfalls for some members of the community (such as PRPs, site owners, and workers) that may be borne by others (such as nearby residents or neighboring towns) in the form of contamination left on-site, noise, and increased traffic. One of the most difficult challenges will be to assure sustained public involvement in reuse and cleanup decisions over what can literally be decades. While PRPs and the regulatory agencies have the institutional capacity to engage in cleanup discussions for years (this is, after all, their full-time job), much of the public does not.

Where economic reuse becomes a central theme at a Superfund site, and the impacts of cleanup and reuse extend to other communities, the need for more aggressive public involvement becomes even more pronounced. Unlike cleanup, the economic and social impacts of reuse can readily extend beyond the site boundaries to a much larger region. Such impacts are not limited by hydrology, erosion, air deposition, or other physical properties but can, instead, be readily diffused throughout the region and appear in such forms as taxes, congestion, economic competition, highway construction, shrinking open space, and the demand for water.

Recommendations

The use of institutional controls—no matter what their flaws—is here to stay in the Superfund program. Indeed, EPA has been selecting remedies that leave contamination on-site at a large number of National Priorities List (NPL) sites since the program began in 1980, and the reasons for doing so—limitations of remedial technologies, the large extent of contamination at some sites, and the policy choice in the 1980s to prefer on-site treatment of hazardous substances—are still factors that inform cleanup decisions, and are legitimate ones. Given these circumstances, it is critical that the remedy selection process be structured to make the choices about alternative remedies more transparent, to better anticipate at what points and under what circumstances institutional controls may fail, and to provide opportunities for those who are most affected by institutional controls to participate more fully in cleanup decisions.

The findings of our research lead us to make recommendations that fall into two categories. The first category pertains to revisions to the regulatory underpinnings of the Superfund program—the requirements of the remedy selection process as articulated in CERCLA and the National Contingency Plan (NCP). CERCLA and the NCP should be revised to clarify the role of land use in the remedy selection process, integrate the development of institutional controls into the cleanup process, specify the enforcement mechanisms for land use controls, and, finally, invigorate EPA's public outreach and involvement program. We focus here on specific recommendations for changes to the NCP, although arguably these same changes could be made to CERCLA as well.

The second category of recommendations is, of necessity, much more general because it stems from a more complex set of issues—federalism, property rights, and the evolving institutions and culture of local land use regulation. These issues become part of Superfund cleanups when land use considerations, notably institutional controls, become more central to site remedies.

1. EPA should revise the National Contingency Plan to address the role of land use in remedy selection, including incorporating the development of institutional controls into the formal remedy selection process.

It is critical that the NCP identify specific actions that the agency must take when linking land use and remedy selection. These include: (a) discussing future use possibilities with local officials and the public; (b) specifying the type and legal basis of institutional controls in the ROD; (c) identifying what entity will have the responsibility for enforcing the institutional controls; and (d) identifying the type of process required if a site owner desires a change in the selected land use and/or institutional controls. Including these provisions in agency guidance, as is now the case, is not sufficient, and not good public policy. Agency guidance documents are not binding on EPA and do not have the force of law.

2. In consultation with state and local governments, EPA should develop a strategy (ultimately codified in the NCP) for ensuring effective long-term regulatory oversight of Superfund sites where contamination remains at levels that present a risk to public health even after the remedy is "complete."

Hundreds of sites on the NPL are categorized as "construction complete," and are not expected to be deleted from the NPL. These sites will require long-term operations and maintenance activities to ensure protection of public health and the environment. In other words, it will not be possible to "walk away" from many of the sites on the NPL.

It is unclear what institution, or institutions, will be responsible for ensuring that institutional controls are maintained at Superfund sites. There are many alternative arrangements that could promote more effective implementation and enforcement of institutional controls. The critical next steps are for EPA to develop and evaluate a full range of options for assuring long-

term oversight of sites where institutional controls are required to protect public health, and then put in place those that seem most promising. Two key issues need to be addressed to assure that institutional controls do in fact afford protection: (a) what organization should be responsible for monitoring, evaluating, and enforcing institutional controls? (b) who will pay for the staff to conduct these activities?

Chapter 1:
INTRODUCTION

Congress is once again in the process of considering major changes to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), better known as Superfund.[1] In the 103rd and 104th Congresses, liability relief (or reform, depending on your political orientation) was at the top of the legislative agenda. While some of those potentially liable under Superfund, referred to in the Superfund vernacular as "potentially responsible parties" or "PRPs," are still seeking changes to the liability scheme, the legislative and lobbying spotlight has shifted. In the 105th Congress the major focus is on those provisions in Superfund that govern the selection of cleanup remedies.[2]

There are two central issues in the reauthorization debate on remedy selection. First, should new legislation end Superfund's preference for cleanups that treat and permanently remove contamination? For those in favor of such a change, the key question then becomes on what basis should the U.S. Environmental Protection Agency (EPA) set cleanup standards at Superfund sites—site specific risk assessment, national standards, or numerical cleanup goals for contaminants at sites that are specified in other federal and state environmental statutes. Second, if CERCLA is amended to give equal footing to remedies that contain contamination, how can sites be managed to ensure that these remedies will be protective over the long-term?

These issues are not new. Since Superfund was last amended in 1986, it has become evident that at many sites on the National Priorities List (NPL) permanent remedies are not possible. For some types of contamination, the necessary treatment technologies do not exist; and at some sites, permanent remedies are not feasible because of the huge volume of contaminated soil or groundwater. Of the 423 sites where construction is complete, only 124 have been deleted from the NPL. Most of the remaining sites (70%) are likely to require some kind of long-term management and monitoring.[3] Many of these sites are likely to require what EPA refers to as "operations and maintenance" activities, which often include long-term pumping and treating of contaminated groundwater. In addition, when hazardous substances are left on a site at levels that present risks to human health, legal restrictions are often needed to prevent people from coming into contact with residual contamination. Since the program's inception, EPA has relied on legal mechanisms such as deed restrictions, well drilling bans, and other forms of property use restriction—known as "institutional controls" in Superfund parlance—to control the types of activities and land uses that can occur at NPL sites.

Over the past several years, representatives of industry, citizen groups, and government agencies from around the country increasingly have called for setting cleanup standards and selecting cleanup remedies at federal Superfund sites in accordance with the intended future land uses at the sites. Tailoring cleanups more closely to the expected land use at sites, proponents argue, would lower cleanup costs and still afford protective remedies. Instead of cleaning up sites for residential use, less stringent cleanups could be undertaken at sites where there is likely to be an industrial or commercial use. In addition, some claim that incorporating land use con-

siderations in remedy selection may promote local economic development and enhance local participation in the cleanup process. This seemingly straightforward proposition, linking land use and remedy selection, has gained tremendous currency. All the major proposals to reauthorize the Superfund law in the past few years have included language on land use in the section governing remedy selection.

While land use has been described as "a cool and neutral term that covers a multitude of highly charged and even dangerous matters,"[4] little of the heat and controversy associated with land use and property rights has made its way into discussions of making Superfund cleanups more consistent with expected future land use. Indeed, as one commentator has put it, "Discussions of land use-based remedies frequently reflect oversimplified notions of how land-use considerations may bear on the remedy selection process and how land-use decisions are really made."[5] The reason, in part, is that land use has been made into something of an abstraction. In the reauthorization debate, land use has been seen as a *starting point* for risk assessment—with the key question being how can EPA make better assumptions about the future use of a site—and as an *end point* in the remedial process where the crucial concern is to maintain controls on property use over the long-term so that sites cleaned to a level consistent with industrial or commercial use will not one day, without additional cleanup, become a suburban subdivision, exposing future residents to unsafe levels of toxic chemicals. Obscured in the reauthorization debate is the fact that land use is an unpredictable process that can influence cleanup decisions at many points in the remedial process.

If we are to embark on a policy that seeks to link cleanups at Superfund sites to anticipated future land uses, we must understand from the outset that land use is not simply a set of assumptions, reducible to simple designations such as "residential," "commercial," and "industrial." First of all, these categories are in fact quite crude and do not necessarily account for the full range of activities at a site. Second, anticipating the likely future use of a site is no easy task. Often, there are competing interests who want different land uses at a site, just as there is often a variety of parties seeking different cleanup remedies. Third, assuring that local land use controls are maintained and enforced over time is a task outside EPA's traditional jurisdiction. Local land use restrictions are typically the province of local government and private property law. The use of these controls brings a diverse set of institutions into the cleanup process: zoning boards, planning departments, redevelopment authorities, and local land use enforcement agencies. Fourth, and finally, to the extent that land use controls are necessary to assure protection at a site, the effectiveness of these land use controls becomes a central component of the remedy selection process. These then are the kinds of issues that must be addressed to successfully link land use and remedy selection at Superfund sites.

In this report, we attempt to describe the intersection between land use and remedy selection and explore how these two processes become interconnected and indeed entangled when pressures for site reuse and restricted cleanups bring to the cleanup process a more diverse set of interests than is typically the case at a Superfund site. We hope that this report contributes to the policy debate on Superfund reform in two ways. First, we aim to clarify the role that land

use currently plays in remedy selection, a subject that is often misunderstood. Second, we hope to provide a more detailed account of how land use considerations and the institutions that are involved in local land use regulation are likely to influence site cleanups.

The Policy Context

As the 105th Congress debates revisions to Superfund (and the first shot has been fired in the recently introduced Chafee-Smith Bill, S. 8), one of the most important changes Congress is likely to make to the remedy selection provisions of CERCLA is to set cleanup standards on the basis of an assessment of the activities and future land uses likely to take place at Superfund sites. Indeed, during the past four years, representatives of industry, local governments, state regulatory agencies, and EPA among others, have argued that the appropriate level of cleanup at a typical NPL site should *follow* from the decision made early in the remedy selection process—by EPA or a lead state regulatory agency, in conjunction with the local community—that identifies the most likely future use of the site. All three of the major reauthorization bills of the past few years—H.R. 3800, the Clinton administration's bill in the 103rd Congress, as well as H.R. 2500 (the Oxley Bill) and S. 1285 (the Smith Bill), both introduced in the 104th Congress—included language that would explicitly require EPA to take into account the reasonably anticipated future uses of land at Superfund sites in selecting a remedy.

The idea of tailoring cleanups to anticipated land uses has been supported by industry as well as by environmental groups and was endorsed by the 1994 consensus report of the National Commission on Superfund, whose members represented the full panoply of interested parties.[6] Absent new legislation, EPA attempted to clarify the role of land use by issuing a policy directive on land use in May 1995.[7] The directive specifies that EPA should consult with local land use planning officials and the local public early in the remedial investigation to help develop a clearer sense of the "reasonably anticipated future uses" of the Superfund site and that the reasonably anticipated future land uses should be taken into consideration when developing cleanup objectives.

The diverse support for land use–based remedies is, in fact, no conundrum. In part, the support stems from long-standing criticisms of the remedy selection process that have been leveled at the program since Congress passed the Superfund Amendments and Reauthorization Act (SARA) in 1986 and required that preference be giving to "permanent" cleanups.[8] SARA establishes a preference for cleanups based on "treatment which permanently reduces the volume, toxicity, or mobility of hazardous substances"[9] and stipulates a preference for treatment rather than containment, as well as favoring on-site rather than off-site remedies. In addition, SARA requires EPA to set cleanup standards on the basis of federal and state standards for ambient water quality, groundwater, and soil.[10]

For many, these requirements have become a hindrance to less costly, or more cost-effective, Superfund cleanups. As Milt Russell, a noted expert on Superfund, succinctly put it, since the 1986 amendments were enacted, many experts working on hazardous waste cleanup issues have come to share four observations: contamination is far greater than was envisaged;

the technology to accomplish CERCLA-mandated cleanup goals is inadequate; the health and environmental risks posed by site contamination are less than was originally thought; and the cost of cleanup is far greater than anticipated.[11] In short, remedy selection requirements of the current law, it is claimed, do not correspond to the experience of Superfund cleanups.

Land use–based remedies have become an acceptable, and even attractive, policy option in the Superfund reauthorization debate because many believe that such remedies can promote the types of wholesale reforms that many feel are needed. Over the last few years, a number of reports and congressional testimonies have claimed that incorporating land use more prominently in remedy selection could lead to reduced costs because land use–based remedies impose restrictions on the uses of contaminated sites in place of more comprehensive and costly cleanups.

Two reports by Clean Sites, a nonprofit organization that analyzes hazardous waste issues, suggest that a decision to make future land use a primary focus of the remediation process would strongly affect all aspects of site decision making.[12] Such a decision would establish clearer goals for site cleanup at the outset, which, in turn, would help remedies at different sites to be more consistent with each other and more transparent. Clean Sites' 1990 report suggests that focusing on expected land use could help define the applicable standards for cleanup and provide better information to the risk assessment (the expected land use would drive exposure assumptions). Both of these are perceived as being inconsistently applied and as being notably weak elements of the remedy selection process.

Researchers at the University of Tennessee and the General Accounting Office suggest that linking remedies to expected land uses can help speed the cleanup process at contaminated sites.[13] When EPA allows restrictions to be placed on the future uses of a site, in lieu of a more stringent cleanup (for example, prohibiting residential use and requiring cleanups to levels suitable for industrial uses), site owners, responsible parties, and/or municipalities may find an incentive to pursue a faster cleanup to return the site to an income-generating use more quickly (or at least benefit from the removal of a disincentive to do so). In some cases, preparing a site for a new use could be accomplished while the site remediation is being carried out.

Because land use planning and land use regulations are typically under the jurisdiction of municipalities, designing cleanups to be consistent with future land uses is seen as a means to bring the levers of decision making at NPL sites closer to the grasp of state and local governments and to better satisfy the demands of local communities.[14] For those who advocate devolution of the Superfund program from the federal to state governments or, as some would have it, to local governments, land use–based remedies can lead to greater involvement on the part of communities directly affected by site cleanup and reuse plans and enable communities, rather than Washington, to decide "on different mixes of economic growth and environmental cleanliness."[15]

Land use–based remedies are also attractive for reasons that go beyond risk reduction, more transparent cleanups, devolution of the program to state and local governments, and less costly cleanup measures. The flurry of legislative initiatives in the past two Congresses to revamp CERCLA have emphasized Superfund sites as potentially valuable properties, rather

than focusing on the more customary view of them as sinks of contamination and threats to human health. There are precedents to bolster this view of NPL sites as potential engines for economic development. Before they were stigmatized as hazardous waste sites and listed on the NPL, Superfund sites were properties that were once able to attract private investment. Mining operations, industrial and commercial activities, and waste disposal facilities were drawn to these locations for a number of reasons. In many instances, the sites were close to sources of labor, or to suppliers and markets; many were close to major transportation routes and thus were easily accessible to waste haulers; and from other sites industrial firms could extract valuable natural resources such as metallic ores. Thus, in addition to contamination and cleanup costs, Superfund sites are now associated with possible forgone benefits to localities.

During the Superfund reauthorization discussions in the 103rd and 104th Congresses, a number of parties involved in hazardous waste cleanups have argued that while CERCLA has burdened responsible parties with excessive cleanup costs, it has also indirectly placed an economic burden on local communities with NPL sites that are not developed due to fears of liability, to the unpredictability of the remedial process, and to the high costs involved in site remediation. The implication is that present cleanup policies contribute to unemployment, depressed property values, an eroding tax base, increased segregation along class and racial lines, and other societal ills. EPA has not discounted this argument. One EPA official stated that "although certainly not the sole cause of urban industrial abandonment and blight, we believe Superfund and related state statutes to be a major contributor to the problem."[16]

EPA is not alone in trying to use the resources available for site cleanups to help stimulate local economic development. At the federal level, the Department of Defense (DOD) and the Department of Energy (DOE) are trying to coordinate site cleanups with the redevelopment of former bases and installations. At the state level, voluntary cleanup programs often include incentives to encourage developers to remediate sites to acceptable levels, such as liability protection and tax credits. Increasingly, government agencies responsible for hazardous waste cleanups at both the federal and state levels are playing a more significant and direct role in local economic development activities. Nowhere is this more evident than in the current legislative proposals to stimulate redevelopment of abandoned or underused industrial sites, so-called "brownfields." These proposals would authorize more brownfield pilot projects (in addition to those EPA has already funded), provide loans to states to fund environmental cleanup of sites in distressed areas, and allow liability exemptions for municipalities that acquire brownfield sites.

In summary, the policy contours and motivations that have made an issue of land use and remedy selection are exceedingly varied and complex, running from technical considerations of risk assessment and remedial alternatives through social welfare policies tied to local economic development.

Methodology

The debate about linking land use and remedy selection at Superfund sites has been going on for the past few years. There has, however, been little investigation and analysis of what

happens at NPL sites when land use plays a prominent role in the remedy selection process and of what institutions are involved in making land use decisions and maintaining these restrictions over time. This report was written to try to fill these gaps. In particular, in this report we examine three central facets of linking remedy selection and land use. First, we examine the current role of land use in the remedy selection process as set out in CERCLA and in EPA regulations and guidance documents. This section of the report is based on interviews and on a review of pertinent documents. Second, we examine the practices and institutional framework in which land use decisions are made and the tools available to regulate land use. This research is again based on interviews and a review of the relevant literature. Third, we present case studies of three NPL sites to get a more complete picture of how these two forces—remedy selection and land use—interact on the ground. Our three case study sites are: Abex (Portsmouth, Virginia), Industri-Plex (Woburn, Massachusetts), and Fort Ord (Monterey, California). The case studies are summarized in this report, but are available in a more lengthy version as individual discussion papers. They are based on interviews with representatives of the full range of stakeholders at each of the sites, as well as a review of relevant site documents, public transcripts, and newspaper articles. The three case studies were distributed in draft form to all those interviewed in order to assure that we had accurately represented the issues at each of the sites. Because we promised those persons interviewed for the case studies confidentiality, the case studies do not attribute specific remarks to identified individuals. Finally, we distributed this report in draft to over forty Superfund experts, to gain the benefit of their input on our work.

Caveats

We are well aware that our three case studies are not representative of the over 1,300 sites on the NPL—no three sites could be. We purposefully selected the three sites *because* they are recognized as having interesting land use dimensions, something that can not be said of all NPL sites. Indeed, we specifically chose these sites after lengthy discussions with EPA, environmental organizations, representatives of DOD, PRPs, and other stakeholders in which we asked them to alert us to sites where land use issues had an important bearing on the remedy selection process. The sites we discuss in this report, therefore, are quite visible to the respective local communities and EPA, and in these cases, the role of land use in remedy selection may well be more contentious than at the majority of NPL sites.

Our three sites do, however, represent the range and types of sites on the NPL. Industri-Plex, for example, has been the location of chemical operations of one type or another for decades, making it representative of industrial facilities, which comprise 38% of nonfederal NPL sites.[17] Both Abex and Industri-Plex are PRP-lead sites, which comprise the majority of NPL sites. In terms of the number of PRPs, the three case study sites are well within the bounds of typical NPL sites. Abex has a handful of PRPs, making it typical of the NPL, where 42% of sites have from two to ten PRPs. Industri-Plex, with twenty-plus PRPs, falls in the next most common set of sites, those having from eleven to fifty PRPs.[18] Fort Ord, while in many ways a unique site, is a federal facility; federal facilities comprise 13% of the NPL.[19]

What makes our sites unusual is the fact that two of them, Industri-Plex and Fort Ord, are huge, and that the remedies selected at these two sites are much more expensive than average. Most NPL sites, in fact, have remedies that cost much less. While these two large sites are certainly not the most common types of sites on the NPL, they are by no means atypical. They represent an important subset of sites on the NPL, often referred to as "mega-sites." Abex, with its smaller land area and less costly remedy, represents those sites found more frequently on the NPL.

There are important ways, however, in which our three case study sites are *not* typical of the NPL. Although all three sites have groundwater contamination and some potential for off-site groundwater contamination, at none of the sites has groundwater appeared to be the major factor in remedial decisions. The fact that we do not have a site with a lot of attention being paid to remediating groundwater may again exaggerate the role of land use in remedy selection. At a site where contaminated groundwater is the main focus, designing a remedy in accordance with the anticipated future land use is unlikely to affect the choice of the preferred alternative to the degree it would at a site where the focus is soil contamination. Finally, because we were looking for sites where land use considerations influenced remedy selection, we purposefully chose sites where the record of decision had been signed. The result, however, is that at all of our sites, the ROD was signed before EPA's recent focus on land use.

With these caveats in mind, can we generalize from our three case studies? The three case studies summarized in this report are illustrative of what happens when land use considerations influence remedy selection. Because we wanted to examine both the promises and pitfalls of linking land use and remedy selection we chose sites identified by EPA and others as having interesting land use "stories." As such, they provide important evidence that enables us to examine the complicated relationship between land use and remedy selection and allow us to investigate the phenomenon of land use-based remedies in three real-world settings.

A second important caveat is that we do not deal explicitly with costs in the case studies or elsewhere in this report. We found the available cost information on the case study sites to be inadequate. While the public record often provides cost estimates of alternative remedies, and these could conceivably be linked to different land use assumptions, the estimates even within a single record of decision are often neither reliable nor consistent. Moreover, observed costs are available only for those remedies that are chosen and implemented, by definition. To construct relevant counterfactual alternatives for purposes of comparison may not be impossible, but to do it well would require a sophisticated and long-term investigation with no guarantee of success.

A third caveat is that we have chosen in this report to focus exclusively on the relation of land use and the remedy selection process. The result of this choice is that we have not delved into an equally important and interesting topic, the role of liability as it affects determinations about future land use and remedy selection. Clearly, liability influences the decisions PRPs make about what level of cleanup is appropriate and whether a site should be reused, and for what types of uses. While we believe it is an important element in the decision-making process, it is an issue we do not address either in the case studies or in the body of this report. The reason for this omission was simply to keep our task manageable.

The fourth and final caveat is that we do not address the role of state regulatory agencies in this report. Many states, of course, implement cleanups under the federal Superfund program, and many states have their own Superfund programs.

Organization of this Report

The organization of the report is straightforward. In the next chapter, we provide an overview of the remedy selection process in Superfund and describe how it works, and how cleanup standards are determined. After this broad orientation to the remedy selection process, we then describe the role land use plays in site risk assessment, a subject that has been prone to considerable misunderstanding. We note how the ambiguous language of CERCLA and the National Contingency Plan (NCP) gives EPA considerable discretion in the choice of a remedy. It is the exercise of this discretion, in large part, that enables land use, as economic activities and social practices, to become entwined with EPA's cleanup decisions.

Chapter 3 considers how cleanups at three NPL sites—Abex Corporation, Industri-Plex, and Fort Ord—have become caught up in the skeins of land use. For each case study, we describe the site's physical traits and contamination; the development of remedial alternatives; intergovernmental relations; and the maneuvering among PRPs, local residents, and regulatory agencies when land use considerations come to the fore. In this chapter, we consider how land use functions both as a tool in site risk assessment and as an economic motivator, underlying the actions of PRPs, local governments, and community groups in the context of three real cleanup situations.

Chapter 4 focuses on what is perhaps the key element of linking land use and remedy selection at Superfund sites, namely, the use of institutional controls. Institutional controls are restrictions placed on land and groundwater use that are intended to protect the public from residual contamination. At sites where restrictions apply after remediation, they are almost always an important feature of the remedial strategy. In this chapter, we discuss the legal authority for these controls, explore questions related to their enforcement, and provide a detailed analysis of the reliability of local land use regulatory systems to maintain the viability of institutional controls.

The fifth and final chapter includes our major findings and recommendations.

Chapter 2:

THE ROLE OF LAND USE IN THE REMEDY SELECTION PROCESS

Introduction

This chapter provides an overview of the remedy selection process in Superfund and describes how it works, how cleanup standards are determined, what groups are involved in site cleanups, and the extent to which the statutory framework of Superfund enables the Environmental Protection Agency (EPA) to exercise discretion in selecting a remedy—especially as this applies to land use.[20] After this broad orientation to the Superfund remedy selection process, we then describe the role land use plays in site risk assessment and examine at what other points in the cleanup process land use considerations currently influence the selection of remedies. In this chapter, we also address the following questions: What information and approaches are used by the EPA to anticipate future land use at a site and at what stage in the remedy selection process are these assumptions made? What impacts do different land use assumptions (for example, residential versus industrial) have on cleanup requirements? What is the relative importance of land use in remedy selection vis-à-vis other factors such as costs, technology, and community acceptance? Finally, we examine how land use considerations related to economic activities and social practices can become entwined with EPA's cleanup decisions.

The Superfund Statute: Permanent Solutions and ARARs

The cleanup provisions for the Superfund program appearing in Section 121 of CERCLA[21] say little about the role of land use in remedy selection. The statute mentions land use directly only insofar as potential use of the surface water and groundwater at a site may be considered in determining whether water quality criteria under the Clean Water Act are relevant and appropriate. Section 121 stipulates the broad cleanup goals for Superfund and establishes a statutory preference for site cleanups that rely on treatment that "permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances" and that is "protective of human health and the environment."[22] The law clearly states that the off-site transport of contaminants and the disposal of hazardous substances without treatment should be the "least favored alternative remedial action where practicable treatment technologies are available" and mandates the agency to address "the long-term effectiveness of various alternatives."[23] Under the existing statute, many of the strategies associated with less stringent cleanups when sites are remediated for restricted uses—capping, containment, the use of institutional controls (that is, deed restrictions, drinking water permits, zoning restrictions, and so forth)—seemingly run counter to the intent of the law.

The statute, however, provides EPA and other parties involved at National Priorities List (NPL) sites with justification for remedies that do not use permanent solutions, including land use–based remedies designed for restricted uses. While the statute underscores the importance of

the use of treatment and permanent solutions, it also states that remedial actions should be cost-effective and that permanent solutions and treatment should be the goals of cleanup "to the maximum extent practicable."[24] Despite CERCLA's preference for treatment and permanent cleanups, the majority of Superfund remedies have traditionally relied on some degree of engineering or institutional controls. According to a report by the U.S. General Accounting Office (GAO), operations and maintenance activities are necessary at two-thirds of the 275 NPL sites GAO examined where EPA had implemented a remedy. In the GAO study of 275 NPL sites, these operations and maintenance activities include land and water use restrictions at 8% of the sites, monitoring caps at 22%, pumping and treating groundwater at 22%, and a combination of monitoring and treating groundwater at 11% of the sites.[25] With land use-based remedies, then, we are not looking at a fundamental shift from all "permanent" to all "containment" remedies, but rather an increased reliance on land and water use controls at sites with containment remedies.

If the language of the statute does not specifically mention land use–based remedies, CERCLA does, however, include specific standards to be achieved by site cleanups that can limit the importance of land use in remedy selection. Section 121 requires remedial actions for each hazardous substance found at sites to attain the level of any "legally applicable" or "relevant and appropriate" standard.[26] This provision requires EPA to review other federal and state environmental laws to determine the "applicable or relevant and appropriate requirements" (ARARs) that could be used to set cleanup standards at Superfund sites. ARARs can be grouped into three categories: (1) chemical-specific requirements limiting the amount or concentration of chemicals that may remain on-site, such as Maximum Contaminant Levels under the Safe Drinking Water Act; (2) location-specific requirements restricting activities within specific locations, such as floodplains or wetlands; and (3) design or performance requirements for particular treatment and disposal activities at hazardous waste sites, such as landfill designs.[27] As part of the remedy selection process ARARs are identified on a site-by-site basis.

ARARs have been used extensively in Superfund.[28] According to a GAO study of 139 Superfund sites where a cleanup decision had been reached, EPA used site-specific risk assessments at only forty sites (28%) to determine cleanup levels.[29] For the remaining sites, the agency based cleanup levels on federal and state standards (that is, ARARs) that set quantitative limits for the concentration of hazardous substances that can remain in soil, air, surface water, and groundwater.[30] The prominence of ARARs as a driver of cleanup goals for NPL sites indicates that remedies are *not* necessarily based on site-specific risk assessments and often do not incorporate land use considerations. In the reauthorization debate, many parties have argued that the reason to eliminate ARARs is to allow site-specific risk assessments to drive remedy selection more clearly. [31]

Because ARARs are determined in other environmental statutes and were not intended to be applied to Superfund sites, critics argue that ARARs are fundamentally maladapted to the needs of the program. The most often voiced criticism is that the ARARs that come from the Safe Drinking Water Act were intended to apply to water coming from the tap, a standard that is

not readily transferable to the problem of groundwater contamination found at many Superfund sites. In addition, critics claim that ARARs do not take into account the costs of reducing risk in the context of site cleanups, nor do ARARs consider the natural background levels found at a site.

The Regulatory Blueprint

As is typical of many environmental laws, CERCLA provides EPA with a broad mandate—in this case to clean up sites contaminated with hazardous substances—but offers little specific guidance on the details of how that is to be accomplished. This discretion is left to EPA, which sets out detailed program requirements in federal regulations that have the force of law. In 1990, the agency revised its major regulation governing the procedures for implementing the Superfund program as part of the revised National Oil and Hazardous Substances Pollution Contingency Plan—referred to as the National Contingency Plan, or the NCP—in order to incorporate the changes made in the Superfund Amendments and Reauthorization Act of 1986 (SARA). The NCP, in accordance with Section 121 of CERCLA, states that the national goal of the program is to "select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste."[32] The NCP reflects CERCLA's emphasis on treatment and on permanent solutions, but it also takes into account that such an aggressive approach might not work at sites with extensive contamination or where remedial technology is unable to effectively treat wastes on-site. The language of the NCP grapples with the problem of how to redefine CERCLA's goal of "long-term protection" when hazardous substances are left on-site, a problem that had become more pressing by the time the NCP was revised. Between the 1986 amendments and the publication of the revised NCP, the agency's experience with site cleanups had made it increasingly clear that at a large number of sites treatment remedies are not possible and that long-term protection might involve a mix of tools to contain contamination and reduce exposure to contamination left on-site (caps, slurry walls, institutional controls). In many ways, this dilemma of what constitutes long-term protection when contamination remains on-site prefigures the issues surrounding "land use."

The NCP sets out the types of remedies that EPA expects to result from the remedy selection process. The following "expectations" clearly provide a justification for linking land use more closely to remedy selection.

- "EPA expects to use treatment to address the principal threats posed by a site, wherever practicable."[33] Principal threats include areas contaminated with high concentrations of toxic compounds, contaminated media that pose significant risks, and highly mobile materials.

- "EPA expects to use engineering controls, such as containment, for waste that poses a relatively low long-term threat or where treatment is impracticable."[34]

- "EPA expects to use a combination of methods, as appropriate to achieve protection of human health and the environment."[35] In other words, remedies will combine treatment of the principal threat with containment of low-level contaminated material.

- "EPA expects to use institutional controls such as water use and deed restrictions to supplement engineering controls as appropriate for short- and long-term management to prevent or limit exposure to hazardous substances, pollutants, or contaminants." Moreover, "institutional controls should not substitute for more active measures (e.g., treatment or containment) unless such measures are determined to be impracticable when remedial alternatives are considered."[36]

The NCP attempts to define the extent to which treatment is practicable under CERCLA. To balance the statute's preferences for treatment and permanent solutions with cost-effective cleanups, EPA devised nine criteria in the NCP to be used to evaluate cleanup alternatives and to select a final remedy that accorded most closely with the statutory requirements of Section 121 in CERCLA. The nine criteria are grouped into three categories: threshold criteria, balancing criteria, and modifying criteria.

To satisfy the threshold criteria, a remedial alternative must achieve overall protection of human health and the environment and comply with ARARs, or satisfy grounds for an ARAR waiver. Once over this hurdle, the remedial alternatives put forward at a site are compared with each other based on the five balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. By comparing each remedial alternative against the criteria, EPA selects the preferred alternative for the site and issues a proposed plan for public comment. After the public comment period, EPA considers the views of the community and the state as part of the modifying criteria, and if need be may reevaluate the preferred alternative.

Although this is a simplified treatment of the goals and expectations of the remedy selection process, the drawbacks of the nine criteria are readily apparent. In certain instances, the balancing criteria may conflict with one another (for example, cost versus long-term effectiveness and permanence). Without a system that can explicitly weight the criteria (for example, permanence is assigned a weight double that of cost), it is difficult to assess their relative value or importance in remedy selection. The NCP provides no guidance regarding the basis for making tradeoffs among the criteria. Thus, in theory, a remedial project manager (RPM) can weight the balancing criteria any way he or she wants.

One Superfund commentator concluded that "any kind of bias, priority, or goal can be manifest easily by emphasizing one or more of the balancing criteria over others."[37] The influential Lautenberg-Durenberger report of 1985 seized upon an issue that remains important more than ten years later: "The criteria remain without sufficient detail to provide regional staff and other participants in the process with a firm understanding of the boundaries within which they may operate. Such boundaries would assist regional staff in better understanding the scope of their decision-making authority. This will also aid the public and the potentially responsible parties and their representatives in knowing what to expect and what is negotiable, as well as what is not."[38] Linking land use to remedy selection, arguably, will blur the boundaries of

remedy selection and make the question of what is negotiable all the more pressing. To illustrate why this may be so, we need to consider how land use currently influences the remedy selection process.

The Remedy Selection Process

To help explain the cleanup process in a less abstract manner, we discuss each step in the context of a hypothetical NPL site cleanup and consider how assumptions about current and future land use help the agency determine who may be at risk at a site, how much risk these individuals may bear, and how much contamination should be removed, treated, or contained to ensure protective cleanup, as called for in the Superfund law.

Under CERCLA, Superfund cleanups can be implemented by EPA or the appropriate state regulatory agency or by responsible parties. In the early years of the program, EPA undertook the majority of site cleanups, but this has changed. Recent data indicate that potentially responsible parties (PRPs) are now taking the lead for more than 75% of site cleanup activities.[39] At "fund-lead" sites, EPA or the appropriate state authority typically hires contractors to perform the site investigation, monitoring, and actual cleanup work. At PRP-lead sites, the PRP may undertake response actions directly or hire contractors if they are unable to do so. When PRPs direct the remedial investigation, EPA or the state exercises the right to both monitor and approve whatever cleanup measures the PRP contractors perform and has the ultimate responsibility to select a remedy. Whether a site is fund-lead or PRP-lead, the cleanup process typically consists of four steps as outlined in the NCP: the remedial investigation, the feasibility study, the selection of a remedy, and the remedial design/remedial action phase. Under the law PRPs may take the lead for all of these steps *except* the actual selection of a remedy.

At each step, land use considerations enter into the remedy selection process. In the remedial investigation, risk assessors make assumptions about future land use in the baseline risk assessment in order to determine who may be at risk and by what pathways exposure may occur. In the feasibility study, land use designations are used to help EPA devise remedial goals, that is, numerical concentration limits for various site contaminants.[40] And in the latter stages of the feasibility study, institutional controls are put forward in those cases where contamination above acceptable limits will remain on-site.

Our example of the XYZ site describes how land use considerations become part of cleanup decisions and is thus meant to show the range of land use issues that may emerge at a site. Our hypothetical site was created to illustrate the intersection between land use and remedy selection and thus raises a number of issues that are not found at all NPL sites.

The Site

The XYZ site is located on fifteen acres in a suburb of a large eastern city. There are residential and commercial areas within a quarter mile of the site, and they include a day care center and a convalescent home. From 1958 to 1976, XYZ, a waste oil recycling facility, placed sludge generated in the oil recovery process in on-site lagoons. Spring floods in 1972, however, washed the contents of the lagoon into a nearby stream and the remaining sludge in the lagoons was removed and landfarmed on the site. The lagoons were filled and seeded. About four hundred leaking drums, containing a variety of process wastes, were stored on the site. Site investigations revealed that on-site groundwater and soil were contaminated with various heavy metals, volatile organic compounds (VOCs), and polychlorinated biphenyls (PCBs), and that these substances had drained into nearby Chartiers Creek, a small stream that flows through a residential area. Persons who accidentally ingest or come into direct contact with contaminated soil, groundwater, or surface water are likely to be at risk. Twenty households downgradient from the site rely on private wells for drinking water. Four public water systems that rely on groundwater may be affected by site contamination. The site is currently fenced, and in 1992 XYZ signed an agreement with the EPA to undertake remedial activities and to provide alternative water supplies.

Step 1: The Remedial Investigation

In the **remedial investigation (RI**), EPA or the PRP(s) conducts field investigations to characterize the types of contamination at the site, the concentration levels of the various contaminants, and the physical distribution of hazardous substances. This often involves extensive monitoring and sampling of the soil, groundwater, and surface water. During this stage of the investigation, a baseline risk assessment is also conducted to identify the current and potential risks to human health and the environment. With this information, preliminary remedial goals are then identified based on the site risk assessment or ARARs.[41] We describe here these aspects of the RI—especially the risk assessment—where land use is a key component.

Anticipating Future Use at the XYZ Site

Our hypothetical XYZ site presents something of a problem in this regard. There are no residential properties abutting the site, but the nearest private residence is only a quarter mile away. When the waste oil recycling facility was built in 1958, the site was surrounded by fields. At that time, the site was located at the edge of an unincorporated town and the town had no zoning ordinance. For the next two decades, the area experienced strong development pressure. Although the town was incorporated and passed a zoning ordinance, subdivisions were built with little comprehensive planning to guide site location. Although the town passed a zoning ordinance, requests by property owners to rezone their properties to more intensive uses (commercial/high-density residential) were invariably granted by the zoning board of appeals, upon which sat a local property developer and two bank managers, strong advocates at the time for the town's economic growth. To serve this growing population, retail and commercial establishments were constructed along the two highways that intersect near the site. Within twenty years, the industrial enclave had become surrounded by mixed uses. Over the last decade, however, the bottom has fallen out of the housing market and a number of businesses have closed. It is difficult to predict if the local economy is going through a short-term slump, or if there are more fundamental structural changes at work that will make an economic renaissance unlikely. Such a heterogeneity of uses and fluctuating economic trends make it difficult to predict future use at the site.

The assumptions EPA makes about land use, and the activities associated with each land use, provide the basic framework for modeling risk at Superfund sites. The core of this modeling is part of the baseline risk assessment. After the collection and analysis of soil and water samples at the beginning of the remedial investigation, the lead agency, in the baseline risk assessment, evaluates the toxicity of the chemicals found on the site and employs land use assumptions to map out the ways in which persons on or near the site may come into contact with these substances. For example, at our XYZ site, risk assessors would delineate exposure pathways from groundwater, soil, and surface water contamination that could apply to workers, trespassers, current residents drinking contaminated water, persons ingesting contaminated fish, and future residents and workers. Typically EPA considers a range of scenarios in the baseline risk assessment.

Although EPA has been lambasted by critics who claim the agency invariably chooses to clean all sites to support residential uses, the agency has flexibility under Superfund's regulatory framework to remediate sites for other uses. The NCP preamble states, "The assumption of residential land use is not a requirement of the program, but rather is an assumption that may be made, based on conservative but realistic exposures, to ensure that remedies that are ultimately selected for the site will be protective."[42] Moreover, the NCP enables the agency to base site cleanups on restricted future uses in certain cases: "An assumption of future residential land use may not be justifiable if the probability that the site will support residential use in the future is

small."[43] Indeed, according to EPA, approximately 60% of EPA's records of decision (ROD) include a land use other than residential.[44]

According to EPA's 1995 land use directive, during the remedial investigation a site manager is expected to gather detailed information about current land use both on and adjacent to a site and to consult a wide variety of existing information, such as zoning maps, comprehensive plans, census population projections, and recent development patterns, as well as have discussions with the public to consider the likely future use of a site.[45] This information is intended to help the site manager identify the "reasonably anticipated land use" of the site for the purpose of making "realistic" exposure assumptions and to more clearly focus the design of remedial alternatives to the eventual future use of a site.[46]

Land use assumptions in the baseline risk assessment can help determine whether a site cleanup is deemed necessary and, if remediation occurs, the amount of residual contamination that can remain on-site. In this regard, the classification of a site as residential or industrial/ commercial is important to the baseline risk assessment because each land use category, in the absence of site-specific data, carries with it standard values for the frequency, duration, and contact rate for an individual's assumed exposure. These estimates of exposure vary for each land use scenario. For residential use, for example, the standard values for soil and dust ingestion for adults is one hundred milligrams (mg) per day for 350 days per year, with a duration of thirty years. For commercial and industrial land uses, an exposed individual is assumed to ingest fifty mg of soil and dust per day for 250 days per year, over the course of twenty-five years.[47] Similarly, for residential use, the default exposure factor for ingestion of potable water is two liters per day for 350 days per year over thirty years. For industrial use, however, the daily intake rate drops to one liter per day over the course of 250 days per year with a duration of twenty-five years. Land use assumptions, then, help site risk assessors link site contamination to current and potential future human health impacts via exposure pathways. These exposure pathways model both the movement of contaminants on and off site and the activity patterns of hypothetical individuals (a worker, a child, a trespasser, and so forth) that bring them into contact with these contaminants.

The XYZ Site: Potential Pathways of Exposure

At the XYZ site there is potential exposure to site contamination. The risk assessment done by consultants for the PRPs has identified three possible sources of exposure to hazardous substances: groundwater, surface water, and soil/dust. According to the risk assessment, nearby residents, workers, and recreational users of Chartiers Creek are likely to come into contact with contamination through ingestion and dermal contact. These are the primary routes of exposure. There is no disagreement between EPA and the consultants about the risk assessment for the site's current use. The risk assessors took into account a wide range of activities that might occur on the site, based on their discussions with the site remedial project manager and other local officials. The risk assessment, however, must also considers potential future exposure and here there is less agreement. The appropriate future exposure assumptions are highly uncertain at the XYZ site. EPA emphasizes the possibility of a residential scenario; the PRPs, on the other hand, point to the commercial land use patterns around the site and the fact that the site is presently zoned industrial to argue for a commercial/industrial scenario. The PRPs believe a commercial/industrial scenario will result in lower risk estimates, although there remains a possibility that the highest risks from contaminated soil will be tied to occupational exposures (for example, workers excavating soil at the site during construction), a possibility that suggests less restrictive future uses (industrial) may not result in less costly cleanups at XYZ.[48]

The purpose of the baseline risk assessment is essentially twofold. First, by describing the magnitude of risks at a site, it helps EPA risk managers make decisions about whether remedial action is warranted. Second, if cleanup action is necessary, it "provides a basis for determining levels of chemicals that can remain on-site and still be adequately protective of public health."[49]

To determine if site cleanup is warranted, EPA compares the results of the baseline risk assessment with a target risk range, specified by the NCP, of one in one million ($1x10^{-6}$) to one in ten thousand ($1x10^{-4}$) lifetime excess cancer risks. These numbers refer to the incremental lifetime cancer risk an individual would bear from exposure to carcinogens on the site, assuming the exposure criteria used in the risk assessment. If the baseline risk estimate falls within the target range, site managers are given considerable discretion under current guidance to decide whether remedial action is warranted, with the final decision owing much to "site-specific considerations."[50] Remedial action is generally required if the baseline risk estimates for either current or future uses, summed over all exposure pathways for each scenario, are greater than one in ten thousand.[51] For risk estimates of less than one in one million, remedial action is unlikely unless there are adverse environmental impacts.[52]

For noncancer health threats, results from the baseline risk assessment are used to calculate a "hazard quotient" for each chemical of concern. The hazard quotient is in the form of an equation and equals the estimated exposure or intake of a chemical from a particular pathway divided by the chemical's reference dose (RfD). The RfD is an "estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effect over a lifetime."[53] For two or more chemicals from a pathway, EPA calculates a pathway hazard index by adding the hazard quotients for each chemical when the chemicals affect the same target organ or share a similar effect (such as neurotoxicity). If one chemical compromises the immune system and a second impairs the kidneys, for example, they are not added together.[54] The hazard index thus serves as a threshold. When it exceeds one, there is a greater likelihood of an adverse health effect and, according to EPA guidance, remedial action is generally warranted.[55]

How does this admittedly arcane discussion relate to land use? It is plausible that more restrictive land use scenarios in the baseline risk assessment would lead to more no-action decisions at NPL sites. For example, at the XYZ site, if exposures associated with commercial/ industrial uses were substituted for residential exposure, the overall cancer risks might drop one order of magnitude, from one in one million (10^{-6}) to one in ten million (10^{-7}). As the result falls outside of the target risk range, EPA would likely decide to take no further action at the site. Alternatively, industrial exposure assumptions could shift cumulative site risks at a given site from one in one thousand, a point at which cleanup is generally warranted (at least in principle), to one in ten thousand, where a site manager has broader discretion about the need for further remedial action. Land use assumptions, then, not only can limit the extent of cleanups at a site but also can play a critical role in the agency's decision on whether remedial action is even warranted.

Although the baseline risk assessment provides a "basis" for determining the level of cleanup needed, ***it does not establish a particular cleanup standard or even identify a preferred remedy***. Indeed, according to EPA guidance, "It is not the responsibility of the risk assessment team to evaluate the significance of the risk in a program context, or whether and how the risk should be addressed, which are risk management decisions."[56] Rather, the role of the baseline risk assessment, as "baseline" suggests, is to provide an estimate of the potential risk to human health from an unremediated site, with no institutional controls in force.[57] Once remedial action is triggered, however, land use assumptions in the baseline risk assessment also help risk managers make decisions about the levels of chemical contamination that can remain on-site. The initial goals are refined in the feasibility study.

Step 2: The Feasibility Study

The information from the remedial investigation is then used in the **feasibility study (FS)** to develop and screen a range of cleanup alternatives. This involves first setting remedial action objectives that specify the acceptable concentration of each contaminant by individual media by pathway of exposure. EPA (or the PRPs) will then identify potential cleanup technologies that

can satisfy the remedial goals of the cleanup. Typically, a range of cleanup scenarios is developed at this stage. These alternatives vary according to the emphasis on treatment (removing, treating, or destroying hazardous substances that pose risks to human health and the environment) or containment (immobilizing wastes on-site). EPA may develop options that combine treatment of principal threats or hot spots with long-term management of other areas of the site where contamination remains. In addition, the NCP directs the lead agency to develop an alternative that relies primarily on containment options (for example, clay caps, engineering controls to immobilize soil contaminants), with little or no treatment, and a "no action" alternative. All the alternatives are then evaluated. Those that, in the view of the lead agency, do not sufficiently reduce risks, cannot be readily implemented, or that lead to excessive costs are eliminated from further consideration. The alternatives that surmount this hurdle are then examined in greater detail and analyzed against the threshold and primary balancing criteria stipulated in the NCP. The contending alternatives are then compared against one another to assess their respective strengths and weaknesses. The results of these comparisons are used by EPA's remedial project manager or the state to decide on a preferred alternative.

Early in the feasibility study process, preliminary remediation goals (PRG) are developed. Typically, the same land use assumptions are used as those employed in the baseline risk assessment concerning current and future land uses of a site. As new site information is gathered pertaining to land use and other considerations (for example, toxicity, fate, and transport), these PRGs can be, and often are, modified. The final remedial goals are set forth when the feasibility study is made final and the agency issues a proposed plan summarizing and comparing remedial alternatives. PRGs specify acceptable concentration levels for each contaminant, in each medium, and for each exposure pathway.[58] For example, a PRG for cancer risks from benzo(a) pyrene (BAP) in soil will combine toxicity information about the chemical with exposure parameters for residential land use (for example, exposure frequency, exposure duration, intake rate, body weight, and averaging time) to derive the concentration of BAP (in parts per billion) that can remain in the soil that corresponds to a specified target risk.[59] The key point here is that while the baseline risk assessment describes *risks* to exposed individuals, PRGs are used to quantify the *standards* that remedial alternatives must meet under the threshold criteria of the NCP and thus are used to help identify and evaluate the effectiveness of cleanup options.[60] In this way, land use scenarios are incorporated into cleanup standards.

In summary, land use assumptions may well have a bearing on the extent of cleanup required. As we have seen, different land use assumptions carry with them different exposure parameters. Less conservative parameters, such as those associated with industrial use, may limit the scope of remediation required to meet a specified risk target. For example, at a site where the soil is heavily contaminated with toluene, a remedial goal that corresponds to a risk level of one in one million, based on an industrial exposure scenario for the site, might be set at five hundred parts per million (ppm). But under a residential use scenario, a similar target risk level might be achieved only with a residual concentration level of 300 ppm, due to different activity patterns and exposure parameters used in the risk equations. Clearly, more soil would

need to be treated if the site were cleaned for residential use. In this regard, current guidance suggests that land use assumptions, in the development of remedial goals, may have a considerable impact on the cost and duration of site cleanup and, by extension, directly influence the choice of remedies.

The XYZ Site: Modifying Remedial Goals

In the latter stages of the feasibility study, a range of engineering and institutional controls is considered by XYZ's consultants in developing remedial alternatives. To eliminate exposure to contaminated groundwater, remedial alternatives include well-drilling bans, the provision of alternative sources of drinking water, and continual monitoring as a safeguard to those persons who continue to drink well water. The company also argues that by paving a large portion of the property and constructing a new warehouse, the link between contaminated soil and human exposure will be severed. This would justify excavating less soil in the company's view, while still assuring a protective remedy. For surface waters, the company will install an oil and water separator in the catch basin of Chartiers Creek and place fish advisory bans along the length of the creek. All of these measures, according to the PRPs, satisfy the criteria of the NCP in providing cost-effective alternatives that offer long-term protection.

Step 3: Selecting a Remedy

With the completion of the feasibility study—in essence an engineering report that examines the costs and benefits of a variety of remedial alternatives—the agency proceeds to select, in the parlance of Superfund, the "preferred alternative." This remedy, in the view of the agency, is the one that best satisfies the two threshold criteria—overall protection of human health and the environment and compliance with ARARs—and the weighing of all of the balancing factors (for example, long-term effectiveness and permanence, reduction of toxicity, volume and mobility through treatment, short-term effectiveness, technical and administrative implementability, and cost). At this point, EPA issues a proposed plan for public comment that makes the case for the agency's selection of the preferred alternative in lieu of competing remedial strategies that were identified in the feasibility study. This is an important formal decision point in the remedial process for it is only with the release of the proposed plan that input from the public on the proposed plan as a whole is formally required.[61]

A thirty-day public comment period is required under the NCP to allow the public to review and comment on the agency's proposed course of action.[62] In addition, the agency is required by CERCLA and the NCP to distribute fact sheets and letters to the community and publish a news release in a local paper to inform members of the local community that the RI/FS

and proposed plan are available. The agency is also required to convene a public meeting, record the proceedings, and provide transcripts as part of the administrative record.

The public comment period can be a time of lively debate, as the public and PRPs argue the merits of all alternatives, not just the preferred alternative. EPA is required to take these views into account and possibly modify the preferred remedy in light of new information or public sentiment. Of course, the community and the PRPs are likely to engage in informal discussions with EPA at other points in the remedial process, such as during the remedial investigation, but neither CERCLA nor EPA guidance specifies how EPA should take this type of information into account. In contrast, after the public comment period, EPA must provide a "responsiveness summary" in the ROD that describes the views of the community and the PRPs concerning the proposed remedial action and any alternatives and explain how and why the agency has responded to public comments in selecting a remedy.

After the public comment period, EPA determines whether, in view of the information and opinions received, the preferred remedy is the most appropriate. That decision is formally announced in the ROD, wherein EPA publishes its final decision on remedy selection and establishes the final remediation goals for the site cleanup.[63] The ROD, according to EPA guidance, is the "centerpiece of the administrative record against which the agency's decision making may be judged by the courts."[64] The ROD also includes a "summary of the problems posed by a site, the technical analysis of alternative ways of addressing those problems, and the technical aspects of the selected remedy that are later refined into design specifications."[65]

The XYZ Site: Selecting a Remedy

The agency's proposed plan addresses soil and surface water contamination but does not propose a cleanup alternative for the site's groundwater contamination. This aspect of cleanup—the most technically complex—will continue to be studied. After lengthy discussion with the PRPs, the agency's preferred alternatives for the soil and surface water cleanup incorporate elements of the PRPs' reuse plans with more extensive soil and surface water treatment. In view of the site's soil chemistry and its hydrologic characteristics, EPA requires excavation of contaminated soil (where concentrations of VOCs, PCBs, and heavy metals exceed certain levels) to the water table to prevent further contamination of the site's groundwater and reduce the risk to downstream residents from ingestion. This alternative, the agency argues, is sufficiently stringent to protect future residents from contact with contaminated soil, a possibility the agency could not discount in view of the mixed uses surrounding the site. Clearly, this alternative rejects the PRPs' suggestion that alternative sources of water could be supplied to residents who rely on groundwater as their sole source of drinking water and rejects the notion of capping the contaminated soil with a warehouse.

The XYZ Site: Selecting a Remedy

For the cleanup of Chartiers Creek, the agency opts for the oil and water separator that the PRPs suggested, and the posting of signs to warn local residents of a fish advisory ban. The agency also requires the PRPs to erect fencing along the creek to prevent public access.

During the comment period and at public meetings, it is clear that both the PRPs and local residents have reservations about the plan. A consultant hired by the PRPs challenges EPA's groundwater model and data-gathering methods and suggests that the likelihood of soil contaminants leaching into the groundwater has been exaggerated. The PRPs put forward a revised plan that requires excavating contaminated soil to a depth that protects current workers, rather than future residents, and offers to pay to provide alternative sources of drinking water to local residents dependent on groundwater. For their part, the local community believes that fences along Chartiers Creek are unacceptable, and that the stream should be cleaned up to allow fishing and recreation. Before issuing the ROD, the agency reviews the study conducted by the PRP consultant but in the ROD, the agency does not revise its preferred alternative for the soil or surface water remedies.

Step 4: Remedial Design/Remedial Action

Once the record of decision is approved by EPA, **the remedial design/remedial action (RD/RA)** phase of the cleanup can begin. This phase begins with a more detailed design of the technical measures specified in the ROD—the remedial design—and is followed by the actual work of site cleanup—the remedial action. If, however, in the course of the RD/RA, the technology selected in the ROD proves ineffective, or if new information opens up other possibilities for cleanup (such as the use of institutional controls), the lead agency can decide that the remedial activities should differ from the remedy selected in the ROD. If this difference "fundamentally alters" the remedy selected in the ROD, EPA must prepare a ROD amendment that carries with it requirements for additional public comment periods and review.[66]

Once all cleanup activities to implement a remedy are completed, the site is included in EPA's "construction complete list." This does not mean that the cleanup goals for the site have been achieved, but rather that an operating remedy is in place and all the construction associated with cleanup (such as pump and treat measures to address contaminated groundwater) has been completed. Many sites will remain on this list for years, even decades. For fund-lead sites, the state is financially responsible for the operations and maintenance activities, which could include continued treatment of ground- and surface waters, inspection and maintenance of containment barriers, and oversight of institutional controls.[67] At PRP-lead sites, the responsibility for operations and maintenance of a remedy will, in most cases, remain with the responsible parties.

Under Section 121 of CERCLA, the lead agency is required to review remedial actions at least every five years if residual contamination is left on-site. When all cleanup goals for a site have been met, EPA deletes the site from the NPL. If the review demonstrates that for any reason the remedy is not protective of human health and the environment, EPA can change the remedy and issue an amended ROD for the site.

Cleanup Dynamics

CERCLA is fundamentally a process-oriented statute. It eschews standards, apart from ARARs, for process and sets out explicit requirements for the roles of different stakeholders in the decision-making process. In other words, the cleanup objective is not a firm goal set at the beginning of the remedial process to guide site cleanup, but rather becomes a function of available technology, costs, implementability, and, arguably, the political, economic, and legal pressures that stakeholders can exert in the course of the remedy selection process.

While we have characterized remedy selection in this chapter as a linear process, with a series of steps each following the other in an orderly fashion, this bears little resemblance to the dynamics of the remedy selection process that takes place at most NPL sites. The cleanup process can be delayed, and the remedy redefined, because of new information about the nature and extent of contamination at a site, technical complications, or disagreement about the likely pattern of future activities (and therefore exposure) at the site. Sometimes, whole steps in the process are repeated, such as when EPA determines that a new RI/FS is needed or that there needs to be a formal amendment to the ROD. In addition, the precise technical specifications of a remedy are often not determined until the remedial design stage, which occurs very late in the formal remedy selection process.

Further complicating the cleanup process is the fact that sometimes EPA (or the state) has the lead for major steps in the remedy selection process, and sometimes the PRPs do. The proposed plan, the responsiveness summary, and the record of decision are the only part of the remedy selection process reserved to the government. At the majority of NPL sites, in fact, PRPs take the lead for site cleanup. This places the local citizens in the position, at some sites, of being the only group not intimately involved in all phases of the decision-making process. While EPA and PRPs often conduct far more extensive outreach than current regulations require, the legal requirements for public involvement are quite meager.[68] For example, according to current regulations, there is a thirty-day comment period once the proposed plan is issued. This is quite late in the site study and evaluation process, and is an extremely short period for commenting on the major decision document at the site.[69]

CERCLA's process-oriented approach has the strength of giving the agency flexibility to tailor remedies to specific site situations, but there are a number of drawbacks to this approach. First, it makes it difficult to predict the outcome of the process. This uncertainty has been decried by industry and environmentalists alike, although probably for different reasons. One concern is that the lack of specificity can lead to inconsistent results. Without national cleanup standards for specific contaminants, and with vague statutory and regulatory guidelines in

CERCLA and the NCP respectively, it is hard to assess how EPA weights the criteria under the NCP to reach a cleanup decision. Second, a process-oriented approach puts those with fewer resources, typically the local citizens, at a disadvantage in comparison with those with deeper pockets, typically the PRPs. This is because participating in the remedy selection process takes time. In addition, the PRPs often have the resources to conduct their own studies, whether or not they have the "lead," which places them in a much better position to comment on the agency's assessment of contamination and proposed remedial alternatives. While there are no limits set on community involvement or public outreach in the remedy-selection process, local citizens rarely have the financial resources to do the same.

The dynamics of the remedy selection process lead in some way to a negotiated remedy. This is because PRPs, in addition to their desire to have protective remedies, also are motivated by financial self-interest and understandably seek to keep costs down. While this tension between EPA, on the one hand, and PRPs, on the other, has led to better remedies at many sites, the result is a remedy selection process that is less transparent than would otherwise be the case, and more subject to the vagaries of the specific people and organizations involved. This is a major policy concern for the program, and a problem that is likely to be exacerbated when land use considerations come to the fore in remedy selection.

Chapter 3:

EVIDENCE FROM THE FIELD: THREE CASE STUDIES

Introduction

In this chapter, we look at the interplay of land use and remedy selection at three sites on EPA's National Priorities List (NPL): Abex Corporation, Industri-Plex, and Fort Ord.[70] This demands a willingness on the part of the reader to hold two distinct and competing processes in mind: the formalized remedy selection process, described in the previous chapter, which is set down in federal regulations and guidance documents, and the altogether more diffuse, but no less important, activities and values attached to land use. This chapter provides real-world examples of how the cleanup process can be influenced by land use considerations.

The three sites we examined present three very different pictures of how land use and remedy selection become entwined. In none of our three case studies is there a firm boundary that isolates land use pressures from the remedy selection process. At the **Abex** site in Portsmouth, Virginia, for example, one year after the U.S. Environmental Protection Agency (EPA) selected a remedy for cleaning up lead-contaminated soil on the site, the potentially responsible parties (PRPs) (which include the city of Portsmouth) proposed an alternative, less costly plan that would require them to excavate less soil and, instead, buy out a group of local homeowners, demolish their houses, rezone the properties from residential to industrial/ commercial, and build a municipal structure on the properties to serve as a protective cap on the contaminated soil. EPA ultimately agreed to this course of action and issued an amended record of decision (ROD) two years after the initial ROD. At Abex, land use issues burdened the remediation process as many in the community came to believe that their standing and ability to influence the cleanup decision were circumscribed when land use controls became more central to the remedy. Abex highlights difficult questions related to the public's trust in government institutions when a local government PRP makes land use decisions that figure prominently in the remedy.

At **Industri-Plex**, the prime location of the site has made it one of the hottest large properties on the Boston real estate market in some time. Even as the remedy is being implemented, redevelopment proceeds and is being actively championed by the Industri-Plex Custodial Trust. This trust, which was given title to about one-half of the site and is charged with selling the land it owns and distributing the sale proceeds to the local government, EPA, and the PRPs as partial reimbursement for costs associated with the remedy, has energetically promoted development over the entire site. Industri-Plex shows how reuse considerations can further complicate cleanup decisions. It also provides an example of the lack of integration between the technical aspects of the remedy and the development of institutional controls. These controls are still in draft form more than ten years after the ROD for the site was signed.

At the third site, **Fort Ord**, the Army is currently devising cleanup strategies for a closed Army base on the NPL—a massive 28,000-acre tract in Monterey County, California, where more than seventy years of military control have preserved large and ecologically valuable swaths of habitat from intensive development. In addition to being responsible for cleaning up soil contaminated with lead and unexploded ordnance and volatile organic compounds in the soil and groundwater, the Army is required by Congress to transfer ownership of most of the former base, after remedial measures have been in place, to public and private entities. For Monterey County, the municipalities in the vicinity of Fort Ord, and other institutions (such as the California State University System, which has secured land on the former base), the site has been something of a modern-day gold rush, bringing to discussions of site cleanup and acceptable cleanup standards a range of communities with different interests in site reuse and thus different views about what level of stringency constitutes an acceptable standard. At Fort Ord, we examine how the creation of two constituencies (one for reuse and one for cleanup) has influenced site cleanup and what lessons this bifurcated approach to federal facilities cleanup might offer remedy selection at nonfederal NPL sites.

Although each of these sites is characterized by different cleanup and reuse pressures, there are some basic commonalities. At Abex, Fort Ord, and Industri-Plex, land use places in the foreground of remedy selection many fundamental political and legal questions that are often not fully articulated in the cleanup decisions EPA makes at contaminated sites:

- If a remedy calls for a cleanup to less than residential standards based on the site's expected use, by what process should the future use of a site be established? This is an obvious but perplexing problem, with no simple resolution. At issue are profound questions concerning societal "rights" on private property, the extent to which governments have the authority to constrain individual property rights (for example, those of the site owner or PRP) in the name of the public interest, and the constitutional difficulties that may follow from an expanded federal role in local land use decisions at NPL sites, an area of considerable legal and political tension.[71]

- How should EPA define the boundaries of the local community and identify the range of public interests that are likely to be affected by cleanup decisions when reuse issues are more prominent in remedy selection? How can EPA effectively solicit and sustain the participation of what may well be a more varied set of constituencies when land use considerations become more central to remedy selection?

- If institutional controls are used to prevent exposure to residual contamination, how can their selection be better integrated into the remedy selection process and by what means can they be monitored and enforced?

- If containment remedies fail in the long-term, thereby shifting risks from the present to the future, to what extent will the federal government have the authority to act when certain provisions of the remedy, tied to institutional controls, may be enforceable only under state property law, and not under CERCLA?

To address these questions, we developed each case study from a common framework consisting of (1) an overview of the contamination found at the site, the selected remedy, and the parties involved in the cleanup; (2) a discussion of how land use considerations informed this decision; and (3) conclusions, in which we describe the lessons learned from the case. Before turning to the individual case studies, it is important to note that this chapter, for the sake of brevity, provides a summary of the salient points of each site. A more detailed treatment of each case study is available as a separate discussion paper.[72]

Abex Corporation (Portsmouth, Virginia)

Introduction

Abex serves as a useful example of how "land use" can be used by different stakeholders to further what are essentially competing interests. For EPA and the Virginia Department of Waste Management (the lead agency at the site until 1992), land use initially referred to exposure assumptions used to assess potential risks to both current and future residents, a primary consideration in the development of cleanup goals at the site. For the responsible parties, the Abex Corporation, the city of Portsmouth, and the Portsmouth Redevelopment and Housing Authority, land use has had a different focus in the course of the remedial investigation. In the cleanup plan they submitted to EPA in 1993, and which prompted a ROD amendment the following year, the central land use issue is not the estimation of potential risks to individuals based on hypothetical land uses but the degree of protection afforded local residents by a rezoning plan. And for the third point of the triangle at Abex, the local community, land use has taken on a more troubling and politicized set of meanings. While land use controls such as zoning have enabled EPA and the PRPs to agree on a less costly remedy, these controls have become for some community members a marker of their inability to influence decisions directly related to cleanup and reuse.

Background

The Abex site in Portsmouth, Virginia, is located in one of the city's oldest urban neighborhoods, less than a mile from the U.S. Navy's extensive shipyards. The property itself is characterized by mixed uses and includes public housing projects, single-family homes, a playground, vacant lots, a drug rehabilitation center, and commercial properties. The surface and subsoil of the site are contaminated with lead, the legacy of fifty years of foundry operations and the associated disposal of some 3,500 cubic yards of lead-laden furnace sands in a one-acre parcel adjacent to the foundry. Over the years, much of this contaminated sand was used as fill material for residential and commercial development that occurred near the foundry. In 1964, the Portsmouth Redevelopment and Housing Authority, unaware of the contamination, constructed a 160-unit, federally subsidized, low-income housing project, known as Washington Park, on lead-contaminated fill. Ten years later, the city of Portsmouth sold seventeen

freestanding parcels of land south of the foundry to private buyers. Private homeowners of the houses that were constructed on these parcels, known as the Effingham residences, as well as the Washington Park tenants, were predominantly African Americans.

Health problems from lead exposure were first noticed in local children during the early 1980s, a few years after the foundry closed. In 1982, local doctors reported that some children from the Washington Park projects had elevated blood lead levels. After physicians continued to report high blood lead levels, EPA sent a team to the site in early 1983 to conduct an assessment. In the following year, several soil samples were taken but, for reasons that are unclear, it was not until 1986 that extensive soil sampling was carried out. This sampling, as well as the earlier preliminary sampling, indicated lead concentrations ranging from 450 to 12,800 milligrams per kilogram (mg/kg) of soil.[73] In response to the test results, the Abex Corporation entered into a consent order with EPA to perform an emergency cleanup of the former sand disposal area. Later that year, Abex removed soil ranging in depths from six to eight inches from parts of the row homes and Effingham playground.[74] After further investigation, EPA proposed the site for the NPL in June 1988, and the listing was finalized in 1990.

From 1991 to 1994, parties at the site proposed five different cleanup plans, all aimed at protecting the Effingham residents and tenants at Washington Park from coming into contact with lead-contaminated soil. The proposed remedies differed in the volume and location of contaminated soil that would be excavated, in the protective cap that would be placed on portions of the site, and, perhaps most fundamentally, in the reliance on institutional controls. The amended ROD issued by EPA in 1992 required soil excavation down to the water table, which was three to four feet below the surface across the site, and took a firm line against the use of institutional controls, such as zoning, to limit exposure to the contamination. However, two years after issuing the initial ROD, EPA released an amended draft ROD in 1994 that did rely centrally on such controls. This ROD combined elements of the 1992 ROD—excavation down to the water table in residential areas—with those advanced by a PRP plan in 1993, which had called for rezoning part of the site from residential to industrial/ commercial use and relocating private homeowners (but not the tenants from public housing). After the city proposed the zoning change, EPA signed the amended ROD in 1994 and the city, the Portsmouth Redevelopment and Housing Authority, and Abex agreed on the terms of this ROD under the consent decree signed in September 1995 and made final in federal court in April 1996.[75]

The Role of Land Use

Much of the early infighting between PRPs and regulatory agencies in selecting a remedy for a site typically centers on the land use assumptions employed in the risk assessment because, as noted in the previous chapter, these assumptions help shape remedial goals. At Abex, however, there was no disagreement between PRPs and the regulatory agencies about current or future land use at the site. The PRPs and regulatory agencies agreed to base the site's risk assessment on the assumption that current land uses were not expected to change significantly; residential areas would remain residential and other parcels would continue to support industrial or commercial uses. Rather, the disagreement among EPA, the PRPs, and the local community centered on different premises about how residents might come into contact with contaminated

soil and subsoil when residential use was assumed. The PRP-lead risk assessment posited that public exposure to subsoil contamination was minimal. During the early stages of the investigation, the Abex Corporation sought to maintain a distinction between the risks posed to local residents from surface contamination and the risks from subsoil contamination. However, EPA maintained that both surface soil and subsoil posed risks to local residents. The agency believed that routine activities on the part of the residents, such as installing decks or fence posts and digging in the garden could expose residents to subsurface soils, and it emphatically rejected the use of institutional controls. For their part, residents were concerned that their children were likely to dig in the soil and inadvertently expose themselves to lead-tainted soil. Thus, early in the remedial investigation, exposure assumptions to calculate potential risks were sharply contested even though the PRPs and EPA agreed on the future use of the site.

Land use considerations at Abex have pulled and pushed remedy selection in two ways. First, as just noted, successive cleanup proposals called for various levels of cleanup depending on what activities (excavation, digging, and so forth) were considered plausible. Who defined "plausible activities" and, ultimately, site cleanup standards was a more vexing question, pitting, to some degree, the Washington Park tenants and the majority of private homeowners against the risk experts of EPA and the PRPs. This disagreement was only nominally concerned with exposure assumptions, however. The real differences between the community and EPA were more deeply rooted and raised questions about how risks were to be defined and to what extent local residents had a say in determining the site remedy. For EPA, risk assessments based on exposure assumptions were necessary to determine an acceptable level of cleanup. For a number of local residents, however, the power of the PRPs and EPA to establish cleanup standards for them, a point often made in the public meetings, and the fact that residual contamination would remain on-site meant that the EPA characterization of exposure was ultimately unacceptable.

Land use considerations played a second and more central role in EPA's cleanup decision, as is evident from the agency's decision to issue a ROD amendment. The initial ROD issued by EPA required the excavation of contaminated soil down to the water table in residential areas. Subsequently, PRP and private homeowner interests became joined when the PRPs proposed to buy out the private homeowners, demolish their houses, and rezone their residentially zoned property to commercial use. This buyout and subsequent land use change would require less excavation and a less costly remedy, and, in theory, achieve the same protection as the remedy selected in the 1992 ROD. It also enabled the private homeowners to be relocated and to be compensated for the value of their property. The city, in turn, promised to adopt institutional controls for the rezoned property, including excavation permits, deed restrictions, and building code revisions, and Abex would give the city deeds for the cleaned-up lots, thus transferring the entire area to municipal government control.

Lessons Learned

Making land use considerations more central to cleanup decisions, as Abex suggests, can change the dynamics of site cleanup and make the question of "what level of cleanup is protective and who decides?" much more ambiguous. Before the rezoning plan and the amended remedy, the 1992 EPA remedy provided similar levels of protection for all residents of the site.

With the 1993 PRP proposal to rezone the site and to relocate private homeowners but not the housing complex residents, EPA faced an intractable problem: How could the agency make what it considers a protective remedy acceptable to those public housing tenants who—like the private homeowners—sought relocation? For some of the Washington Park tenants, the amended remedy only confirmed their view that the Abex cleanup served a range of interests for groups more powerful than themselves.

The lessons from Abex for linking land use and remedy selection are at once simple and complex. When the ROD was issued in 1992, current land use was not expected to change significantly at the site; residential areas would remain residential, while other portions of the site would continue to support industrial/commercial uses (this was before the rezoning of the residential areas). The real debate regarding land use did not center on the future use of the site, but rather on the proper exposure assumptions to employ for residential use. This was not a disagreement about land use, but about what specific activities might take place under a given land use (in this case residential).

The example of Abex alerts us to an important distinction. Exposure assumptions are highly dependent on land use, yet the two are not synonymous. At best, land use designations are an inexact proxy for exposure. Thus, even at a site where EPA posits an unrestricted future use (that is, residential), disagreements can occur about how local residents may come into contact with on-site contamination. While there was initially no disagreement about the future use of the site, local residents at Abex disagreed with some of the assumptions made about their activities in the early PRP plans. A technical question related to risk was seen by local residents as a dismissive political gesture. The fundamental disagreement leading up the 1992 ROD about exposure assumptions was never resolved. Both the 1993 PRP proposal and the amended ROD, in essence, sidestepped the problem by rezoning the private residential areas to commercial/ industrial, thereby enabling EPA and the PRPs to agree on a new set of exposure assumptions within a new land use designation. Based on Abex, linking cleanup levels to an agreed-upon future land use will not necessarily make risk assessment and, hence, cleanup requirements at Superfund sites less problematic or controversial. Indeed, land use can be a clumsy and inexact measure to describe the range of activities that could occur on any given parcel of land.

The second lesson one can draw from Abex regarding land use and remedy selection derives from the political nature of local land use decision making. These issues become even more complex at sites where the local municipality is a PRP, and thus is able to influence remedy selection by promoting the use of a specific institutional control, such as rezoning. As we noted in Chapter 2, when PRPs undertake the remedial investigation and draft the feasibility study they can frame many of the cleanup options available at the site, although EPA typically specifies the remedial options for consideration. The general public, of course, does not have this option. At a public meeting about Abex, an EPA official perhaps too clearly highlighted this imbalance in responding to a question of a local resident who wanted to know what responsibilities the PRPs were likely to bear for cleaning up the site. "We have," the EPA official said, "a limited amount of money. We are guided by policy that says we cannot clean it up using this money until we negotiate with these parties to get them to clean the site up."[76] While the remedial project manager may have been alluding to the agency's enforcement first policy—in which the agency

tries to get PRPs to do the work before trust fund money is spent—it is clear from the transcripts that local residents interpreted this statement and agency actions as indications that the remedy was negotiated, with land use a prime bargaining chip for the PRPs and EPA. In this way the cleanup raised issues of political exclusion and led to deep public cynicism and anger.

For more than a decade, disagreements about the Abex cleanup have stemmed from contested exposure assumptions, the financial self-interest of the parties paying for cleanup, and the local residents' perception that risks from site contamination were both a political and a health matter. The Abex site clearly demonstrates that local land use processes do intrude on remedy selection and that they are by nature political, driven by economic considerations, and often partisan. At Abex, land use issues—from exposure assessments to institutional controls—have affected the remedial selection process and have exacerbated conflicts embedded in the site cleanup.

Industri-Plex (Woburn, Massachusetts)

Introduction

Industri-Plex has been held up as an example of how a revamped Superfund program could promote redevelopment of CERCLA sites and help remove obstacles to reuse that affect a site once it is placed on the NPL. For EPA, Industri-Plex offers a success story of how land use considerations enabled EPA to accommodate local and regional development objectives in a federal cleanup program. For the PRPs, incorporating land use concerns into the remedy has, by many accounts, reduced remediation costs and cast the PRPs in a more favorable public light as PRP initiatives for reuse have been instrumental in creating development interest at Industri-Plex. Industri-Plex also offers a model for the creation at the site of a separate entity, a custodial trust, whose primary mission is redevelopment, rather than remediation or oversight. And perhaps most importantly, and on a quite different note, Industri-Plex provides a vivid example of how a remedy that relies on institutional controls can have, as it were, feet of clay.

Background

The Industri-Plex site occupies a partially developed 245-acre tract in Woburn, Massachusetts, twelve miles north of downtown Boston. The Boston-Lowell commuter rail line runs through the property, while Interstate 93 lies immediately east and Route 128 (Interstate 95), roughly one mile to the south. The site borders one of the busiest intersections in the state of Massachusetts. Largely because of these transportation arteries, the site is a prime location for economic development, attractive both to large private retail and commercial developers and to state transportation agencies interested in siting a planned regional transportation center in a corner of the property.

From the mid-nineteenth century until the late 1960s, a succession of manufacturers at the Industri-Plex property have variously produced chemicals for the textile, leather, and paper industries; insecticides; munitions; organic chemicals; and from the 1930s, glue and gelatin,

products made from animal hides and flesh from the hides. The site first received EPA attention in the late 1970s, when the agency joined the U. S. Army Corps of Engineers in halting development of the site as an industrial park. EPA's soil and water tests showed high levels of arsenic, chromium, and lead in sludges at the site; and, in late 1979, the county court issued an injunction and development stopped. In October 1981, EPA proposed the site for listing on the NPL, finalized this listing in 1983, and signed the ROD in 1986.

The remedy outlined in the 1986 ROD and refined in subsequent remedial designs includes structural components and relies heavily on institutional controls. On the structural side, it has three distinct parts, the first two of which are largely in place. The soil remedy is designed to prevent exposure to the soils contaminated principally with arsenic, lead, and chromium and entails a geotextile/soil cover and cover equivalents (that is, existing buildings and parking lots). The air remedy captures and treats noxious odors from the degeneration of animal waste piles. And finally, the third element of the cleanup is meant to treat groundwater contaminated with benzene and toluene. This action was presented in the ROD as an interim remedy and required additional surface and groundwater investigations to be undertaken at the site and beyond the site boundaries to provide a more complete picture of the groundwater problem. More than a decade after the ROD was signed, the groundwater remedy has still not been implemented. No adequate remedy has yet been designed and implemented for the benzene and toluene, nor for chromium and arsenic groundwater contamination that ongoing investigations have recently discovered.

In addition to these engineering measures, the cleanup at Industri-Plex depends on a somewhat unusual set of institutional controls that will prescribe what activities can take place across the site, as well as outline the conditions by which landowners can disturb and actually breach and reinstate the engineered soil caps. Because the buildings and roads on the site, in effect, seal residual contamination, the institutional controls will also direct how these cover equivalents are to be maintained or renovated over time, since their integrity bears directly on the long-term reliability of the remedy. The controls themselves are likely to include deed restrictions and restrictive covenants that would run with the land, as well as new zoning regulations by the city.

A final unusual feature of the site is the custodial trust, which was set up under the 1989 consent decree. This trust, which holds title to about 120 acres of the site, is not itself a PRP nor liable for cleanup costs, but rather it has as its primary mission the sale of its landholdings (the proceeds from which will go to the city of Woburn, the two major PRPs, Monsanto and Stauffer-ICI, and EPA) and the encouragement of site reuse. To this latter end, throughout its history, the custodial trust has worked intensively with federal, state, and local officials, as well as with local residents, to promote redevelopment at Industri-Plex, on both its property and other property at the site. In addition, the trust has played an active role in the development of institutional controls.

The Role of Land Use

The city of Woburn, private investors, state agencies, and EPA have much to gain from close attention to land use at Industri-Plex. The city coffers stand to benefit from site development, both from sale proceeds of custodial trust land to satisfy tax arrears and from increased industrial and commercial tax levies and property tax collections from appreciated and newly developed property. Private investors will be able to take title to property that is well situated in a large and diverse market and have available to them prospective purchaser agreements that protect them from liability for cleaning up past contamination. State agencies, for their part, will be able to satisfy some of their obligations under the Clean Air Act if the transportation center goes through. EPA can point to Industri-Plex to show its critics in Congress and elsewhere an example of how a highly contaminated NPL site can be brought back to life and become an asset to the community. And clearly, Industri-Plex offers a compelling example of how reuse can occur on a Superfund site and how competing social objectives of economic development and hazardous waste cleanup can be structured with the help of new institutions, such as the custodial trust.

Unlike Abex, many of the issues concerning land use at Industri-Plex have centered on promoting site development. This development, in turn, hinges on the use of institutional controls. Despite this central role, however, the 1986 ROD and 1989 consent decree left the exact nature of the institutional controls largely unspecified. The legal authority of the institutional controls, for instance, which determines which parties can enforce the controls, was ill-defined, as were the types of institutional controls that were likely to be most effective given the complexity of the site remedy. Moreover, even as remedial activities for much of the site near completion, the controls remain elusive and are still in draft form. At the time of this writing, EPA and the state plan to circulate the draft of the institutional controls document to the public for review, but the actual ongoing design of the document is largely restricted to a working group of legal and technical representatives from the EPA, the state Department of Environmental Protection, the custodial trust, and the PRPs, with no direct involvement from the city or the broader public.

According to recent communication from EPA, the controls will include a provision that will allow anyone to request an amendment to the institutional controls if site conditions change or certain aspects of the controls are not effective. The unremarkable language of this provision obscures a remarkable deployment of institutional controls. Property owners or developers will be permitted, in essence, to breach a permanent cap as long as they acceptably reinstate it. It is unclear, at this point, how prominent a role EPA or the state Department of Environmental Protection will play in approving such actions. While these two entities would need to give final approval to any amendment to the institutional controls, the controls themselves will likely take the form of private, self-administering deed restrictions that will run with the properties in perpetuity and be enforceable under the state's property laws rather than federal statute.
Land use pressures at Industri-Plex are illuminating. They show how such pressures at an NPL site can expand the boundaries of the remedial process by involving powerful public and private economic interests in cleanup deliberations and by affecting a wider circle of communities beyond Woburn. For instance, the planned regional transportation facility has been the focus of

considerable attention from state transportation agencies and stakeholders outside Woburn and throughout the region. Moreover, since redevelopment at the site is tied to the use of institutional controls that have yet to be made final, the long-term reliability of the controls is an open question that forces us to consider the ways in which the integrity of the remedy may be vulnerable over time, as property owners renovate or expand their buildings and as developers devise new uses for portions of the site and subdivide existing parcels.

Lessons Learned

A number of features of the Industri-Plex site and the cleanup process have made it a prime example of EPA's efforts to show that it is possible to return Superfund sites to a productive use. These features include: the prime location of the site near major transportation arteries; the large amount of relatively uncontaminated land at the site available for commercial or retail development; and the important role given to institutional controls as a mechanism for allowing existing businesses to operate and new uses to locate at the site. Yet, probably the most important feature contributing to the successful reuse has been the custodial trust. This legal entity, created by large, corporate PRPs, has been an effective and innovative force that has brought to the cleanup process the development interests of local government, state agencies, and the private sector.

In creating the custodial trust, the consent decree effectively severed liability from the trust's redevelopment activities. The removal of liability has allowed the trust the opportunity to create private/public partnerships to attract large-scale retail outlets to the site; to build support for substantial public infrastructure investments in the site, a typical precondition for many large-scale development projects; and to encourage the public and their elected officials to discuss reuse options. This work has provided an important service to the agency and, arguably, to groups in the local community interested in economic development. Large-scale redevelopment, we now know, can take place at a heavily contaminated NPL site. At the same time, however, it bears noting that the high value of the Industri-Plex property—the cost per acre for a recently marketed thirty-acre parcel is four times the unit price of other available land in the area—is an anomaly, and most other NPL properties are unlikely to match the scope of reuse options and the likely redevelopment benefits offered by Industri-Plex.

Industri-Plex also provides an example of a successful public involvement effort centered on land use. Certainly, the site has gained considerable public attention from those interested in the large potential payoffs anticipated from site reuse, and these players are legitimate members of the public that merit representation in any public involvement process. This case study, however, points to the problem of sustaining public involvement in cleanup decisions over what can be many years. In the early stages of site discovery, investigation, and remedy selection, the local environmental group (FACE) actively commented on site documents. But as site investigation and remedy design have given way to the construction of the remedy and to site development, the participation of FACE in cleanup discussions has floundered and the group is no longer active. The group's Industri-Plex technical assistance grant (TAG) expired in January 1996 and no members have reapplied for it.

Land use considerations, undoubtedly, have made defining the public and the public interest more difficult at Industri-Plex. In the mixed currents of reuse and cleanup at the site, there is no ready template available to EPA to direct public involvement efforts or to help it resolve possible conflicts between cleanup and reuse. This is no small task, but it is a critical one to secure an equitable process to discuss and resolve what may be competing public agendas. To an outside observer, for example, the ponderous pace of the groundwater remediation at Industri-Plex—the interim groundwater remedy still has not been satisfactorily implemented and the long-term remedy is years away—may well be due to the fact that no strong constituency appears to be pushing for the groundwater remedy. Such difficulties hardly obviate the need for public involvement; they suggest that more diligence is needed to ensure continued public deliberation on the full range of cleanup and reuse issues.

Finally, perhaps the most disconcerting aspect of Industri-Plex is the lack of integration between the structural aspects of soil remediation and the development of institutional controls that are meant to ensure the long-term integrity of the remedy. More than a decade after the ROD was signed, there is still no final document describing the types of institutional controls to be used at the site, the legal basis of authority for the controls, and what entity will be responsible for overseeing their effectiveness. How should we explain this long delay in developing institutional controls, and what consequence does this failure have for the structural aspects of the remedy? Clearly having many landowners of the site, the range of current and possible future uses, and the multiple types of soil covers make the development of institutional controls a terribly complex undertaking. This is because at Industri-Plex one of the stated goals of institutional controls is to allow owners and operators at the site the flexibility to change or expand their operations in the future—even if this involves disturbing the remedy. The institutional controls being developed at Industri-plex are performance standards intended to guide the way in which operators and owners are permitted to breach and restore the cap. As noted by one commentator, the flexibility of exploring different combinations of land uses and remediation options is hindered when institutional controls are separated from other parts of the remedy. This separation, of course, can inhibit economic reuse of the site; it may also hinder the remedy's effectiveness to provide adequate long-term protection for human health and the environment.

Fort Ord (Monterey, California)

Introduction

The former Fort Ord Military Reservation occupies nearly 28,000 acres of land and, unlike any other Superfund site we know of, includes some 900 acres of coastal dunes. Fort Ord is the responsibility of the Department of Defense (DOD), with the Army taking the lead for cleanup and reuse at the site. The base employed roughly 14,000 military personnel and 4,000 civilians prior to its closure in 1994, and its economic shadow touches at least eight neighboring municipalities, several of which, along with Monterey County, have devised plans to bring a part of the former base into their political and economic orbit.

As a downsized base under the Base Closure and Realignment Act, the transfer to nondefense entities of some 27,000 acres of this Monterey peninsula property, much of it with little or no serious contamination, has led to intense interest from local municipalities and from less expected quarters, such as the California State University System. The fact that the former base is a federal Superfund site and its cleanup thus governed by CERCLA has attracted considerably less attention than the reuse possibilities. And yet, Fort Ord, for all of its unique attributes, provides us with a fascinating example, a cornucopia of sorts, of how economic development pressures, local politics, planning, competing social interests—all part of the land use dynamic—become entwined with statutory cleanup requirements and the institutions devised to manage cleanup.

Background

The Fort Ord site sprawls across more than forty square miles of contiguous land to the north and east of Monterey, California. The former base runs for nearly four miles along Monterey Bay, but the bulk of its land lies inland in unincorporated portions of Monterey County and within the borders of the cities of Seaside and Marina. Other municipalities in the surrounding area include Carmel, Del Rey Oaks, Sand City, Monterey, Pacific Grove, and Salinas.

In the mid-1980s, concerns by the state of California that training activities at a fire drill area on the then-active Fort Ord Army Reservation might have contaminated soil and groundwater in the area prompted preliminary investigations, and these efforts detected residual organic compounds in the groundwater. Subsequent studies of a 150-acre landfill on the base led to the detection of volatile organic compounds (VOCs) in Fort Ord and Marina Coast Water District water supply wells. Largely in response to the detection of these VOCs, EPA placed Fort Ord on the NPL in February 1990.

In the preliminary site study process, the Army identified forty-three sites across the 28,000-acre base that potentially required remediation. In addition to the fire drill area and the landfill, these include areas with high lead concentrations, unexploded ordnance, and surficial soil contamination of petroleum hydrocarbons, solvents, oils, metals, and pesticides. Currently, an estimated eighteen of the forty-three sites are designated as “no action” sites; that is, sites where existing contamination poses no current or potential threat to human health or the environment, as defined under CERCLA. Another estimated fourteen sites have a limited extent and volume of surficial soil contamination that can be addressed with an “interim” action of excavation and treatment. At the remaining sites where CERCLA cleanup is required, a series of remedial investigation/feasibility studies (RI/FS) and RODs are being developed.

Ultimately, remediation across the base will include capping, soil excavation and treatment at an on-site treatment facility (as well as disposal off-site), and groundwater pumping and treatment. For the most severe contamination problems (lead in the coastal dunes, the landfill, and the unexploded ordnance), the reuse potential is limited by residual contamination that will remain after remediation activities are completed. Reuse is also limited because of habitat requirements for species preservation. More than one-half of the site will be devoted to conservation areas and habitat corridors. For most other areas, however, the residual risk after

cleanup is expected to allow unrestricted residential use (typically the use with the highest exposure potential), although other uses (for example, airport, retail use, light industrial) are planned for most of the nonconservation acreage.

The Role of Land Use

Of our three case study sites, Fort Ord is perhaps the one that presents the clearest model of the interplay between reuse and cleanup. In large part, this is due to the long reuse planning experience DOD has had closing military bases, as well as its experience with Superfund cleanups at a number of other bases that are on the NPL. The Army is required by CERCLA and other laws to explicitly consider reuse in cleanup and to work with local redevelopment authorities. Several annual defense authorization bills have helped accelerate the cleanup and property transfer process and provided for the establishment of a restoration advisory board at each closing facility through which local citizens and agencies can review and provide comments on cleanup activities.[77] In marked contrast to the local redevelopment authorities, which plan for reuse but are to provide little or no official guidance on cleanups, the restoration advisory boards are supposed to have a substantive role in cleanup decisions, but little or no direct or official input on reuse. For our purposes, the fact that the reuse and cleanup groups have legislatively prescribed formal roles—an institutional setting that our other two sites do not offer—suggests that we may be able to glean something useful about land use and remedy selection by looking more closely at each of these entities and at their relationships with each other.
The Fort Ord Reuse Authority (FORA), the designated local redevelopment authority, came into being in May 1994 and immediately set about developing a basewide reuse plan that Monterey County and the eight municipalities that make up its governing board could accept. The interim plan that it issued at the end of that year provides integrated plans for land use, transportation, conservation, and recreation, and a five-year capital improvement program, as well as the results of an infrastructure study. It identifies planned land uses for nearly eighty individual parcels on the base. Since issuing the 1994 plan, FORA and its consultants have been revising it, and in 1996, they completed a new plan and an accompanying environmental impact report. The plan is expected to be adopted by the FORA board in 1997.

On the cleanup side, the Fort Ord Restoration Advisory Board (RAB) was created by adding local citizen representatives to an existing technical advisory group of federal, state, and local agency personnel and has met on a regular basis since May 1994 to advise the Army about cleanup matters. The RAB has opportunities to provide input into the cleanup process in the basewide RI/FS, in individual site discussions, and in the finding of suitability to transfer or lease property. In addition, the RAB can provide input on the memorandum of approval that the Army needs to prepare for the regulatory agencies on the no-action sites and on the draft and final RI/FS for the interim action sites.

Notwithstanding the seemingly firm statutory base for the RAB and FORA, the relatively clear articulation of the responsibilities of the two groups on land use and cleanup issues belies a process of land use decision making and public involvement that has progressed in fits and starts and has been anything but straightforward. In fact, the workings of each group have, at times, been quite contentious. With respect to reuse planning, although FORA presents a relatively

unified front at present, this has not always been the case. In the initial stages of base closure, when it became apparent that local resistance to the base closure was for naught, the municipal energies that went into defending Fort Ord soon focused on carving up the sizable spoils that base closure had to offer. Among the many communities of the Monterey peninsula, there was little agreement about the future uses of the site. These differences derived in large part from the different expectations, demographics, and economic alternatives among the surrounding jurisdictions. For instance, the two communities hardest hit by the closure, Marina and Seaside, faced losing one-quarter and one-half, respectively, of their populations as a result of base closure, as well as the economic activity generated by base activities. Not surprisingly, their plans for reuse initially emphasized much more intensive postclosure development. Other jurisdictions, most notably the city of Monterey (which has a more educated and higher-income population than Seaside and Marina, as well as a more diversified economic base) and Monterey County, have generally pushed for conservation reuses and development of higher education facilities. The diverse population of Seaside (about one-half of whose population is African American, Asian, or of Hispanic origin, the highest proportion in the Monterey peninsula area) has added an additional layer of complexity to the interactions among the various jurisdictions.

Although the RAB at Fort Ord has not had such a checkered past as FORA, relations within its membership appear much more strained. This is not surprising. While FORA members are relatively united in their purpose of getting property transferred for development, the RAB membership are much less homogeneous in their interests. The RAB includes representatives of federal, state, and local agencies, conservation proponents, environmentalists concerned with quality of life issues, and environmental justice advocates. Nor has the RAB been immune from the ambitions of local politicians running for office. In addition, while some community members of the RAB have developed comfortable working relationships with the Army, other members have been adamant that the Army and regulatory agencies have shut them and other disenfranchised people out of the cleanup and reuse process.

The separation of cleanup from reuse planning has particularly irked some RAB members. It is clear from DOD guidance documents on the establishment of the advisory boards that the RAB is charged with identifying "cleanup levels that are consistent with planned land reuse," yet Army representatives at Ford Ord have also clearly stated that the actual issue of reuse is not part of the RAB's agenda.[78] From the outset, several RAB members have suggested that cleanup decisions should be made in conjunction with reuse decisions. The Army has opposed the efforts of these members to move the RAB toward more active participation on reuse matters**.**

Lessons Learned

Of our three case studies, the interplay of land use and cleanup is most formalized in the relationship between FORA and RAB, two entities with explicit responsibilities to plan for reuse and to involve the public in cleanup decisions. This formal relationship, however, belies a lack of coordination. For example, when the project coordinator of FORA appeared at an early RAB meeting and presented the 1994 interim reuse plan, it became painfully obvious that the contaminated sites in which the RAB was interested were not distinguished on the FORA reuse

planning map, a likely quirky or bureaucratic oversight but one that was illuminating, suggesting that the two groups were working towards different goals.[79] The important question is: what can we learn from the fact that FORA and RAB operated as two distinct processes—rather than as an integrated one?

At Fort Ord and other closing DOD sites on the NPL, provisions in federal statutes have led to the separation of economic reuse and public involvement in hazardous waste cleanups. To the extent that this legislation may serve as a basis for future CERCLA reform efforts directed at non-DOD sites, it is important to stress an obvious point: the formal separation of reuse from cleanup makes it difficult for either group to assess the inherent cleanup-reuse tradeoffs, such as those at Ford Ord. While Fort Ord may simply be an example of a poorly managed process, the legislative charter for each group contributes to the split along cleanup and reuse lines.

The legislative language in the Base Closure and Realignment Act has given the "reuse" public a clear charge to shape development, a coherent mission that appears much more focused than that given to the public focused on cleanup issues. At Fort Ord, the very fact that the Army must take the reuse plan into account and transfer property to FORA has tended to strengthen its relationship with FORA. The RAB, in contrast, has operated more in an advisory capacity for cleanup, and community members have little standing to ultimately influence the Army's decisions. Moreover, while FORA receives financial support from, among others, its constituent members, financial support for the RAB has not yet materialized. It currently has no funds to hire technical consultants and, to the extent that many of its members lack the technical competence to review cleanup goals and actions, its actual critical ability to comment on technical aspects of the cleanup process is limited.

The broader lesson here is that resources to support public involvement in cleanup and in reuse are far from equal, at least at Ford Ord. If institutional resources are available to support a reuse public but not a cleanup public—and arguably support for reuse advocates in the form of agency staff and resources or private development money may be much more forthcoming at many sites where reuse is seen as yielding significant economic benefits—this cripples the ability of community members to thoroughly and quickly review documents, attend meetings, and command public visibility for cleanup over a long time period, thereby exacerbating a longstanding problem of assuring public participation at NPL sites.

Finally, while FORA has become, in essence, a regional planning authority, binding—to a certain extent—the fractious demands of its members, land use conflicts have continued to emerge on a number of fronts. Why is this important for remedy selection? Much of the discussion about the role of land use in remedy selection assumes that for any given NPL site, a local community will work with EPA to determine what land uses are appropriate. Fort Ord, however, literally and figuratively touches a number of physical communities, and within each of these physical communities, of course, there are a number of competing interests. As the characterization of the cleanup problem broadens to accommodate the legitimate goals of economic reuse, the result is almost certain to be a cleanup process that is more susceptible to negotiation, rendering the remedy selection process less transparent to the general public. Any characterization of a problem carries with it implications for how a program works. The example of Fort Ord provides us with a glimpse of how difficult these future negotiations may be.

Conclusions

These three case studies provide evidence to suggest that linking cleanup to land use considerations is a policy that should be approached with some caution. We say this for several reasons. First, while development of a contaminated site need not conflict with adequate protection, the momentum for economic reuse of a site can take center stage from the remedy. At Industri-Plex, for example, even though the selection of a long-term final groundwater remedy may be years away, EPA is using Industri-Plex as an example of a national initiative that aims at establishing the beneficial reuse of Superfund sites. With an alignment of powerful forces enthusiastic to promote reuse, maintaining the primacy of the Superfund program's goals of protection of human health and the environment will require a certain vigilance.

Second, an emphasis on reuse will increase the number of "players" involved in site cleanups, such as regional and state development agencies, mass transit authorities, local municipalities, real estate interests, and others. For EPA, this creates a more complicated political matrix in which cleanup decisions are made, and one in which equal access of all parties to decision making may be difficult to ensure.

As our case studies show, the influence of land use activities and institutions on cleanup decisions is best detected not in any one step of the remedy selection process (for example, the remedial investigation or the feasibility study), but rather in the broader sweep of cleanup where EPA is confronted by pressures from municipalities, competing demands from residents, the legal maneuvers of PRPs, and the keen desire of different groups new to cleanup, such as redevelopment authorities or regional planning agencies, to impose their interests in cleanup decisions. When the primary emphasis of Superfund shifts from cleaning up contaminated media to cleaning up contaminated property—which has happened in all of our case studies—the remedial process can become more turbulent, as the statutory provisions and institutions managing NPL cleanups strain to accommodate a complex array of demands for site redevelopment and pressures to cede more control of cleanup and reuse decisions to local officials and private parties.

To the extent that responsibility for selecting and maintaining the long-term effectiveness of the remedy will become contingent on the intent and actions of a more diffuse set of institutions—local government, private property laws, current and future property owners, land recordation offices, the courts—the ultimate effectiveness of a remedy to protect human health and the environment will become increasingly difficult to assess. Whether site cleanups are focused on addressing contaminated "media" or on contaminated "property" will have enormous implications for the design and management of the Superfund remedial process. Focusing on contaminated "media" suggests that the major challenge is a purely technical one. Considering an NPL site as contaminated "property," however, raises important questions about what should be done with the site after cleanup is completed (however that is defined), what parties should benefit from cleanup, and by what means contamination left on-site at levels that preclude unrestricted uses will be managed over the long-term.

In the next chapter we look closely at the limitations of the current cleanup program in the face of institutional controls, a subject that we feel lies at the very center of linking land use to cleanups.

Chapter 4:
INSTITUTIONAL CONTROLS

Introduction

Institutional controls are not a new feature of the Superfund program; they have been used at sites on the Environmental Protection Agency's (EPA) National Priorities List (NPL) since the program's inception. At no point in the remedy selection process do land use considerations become entangled with cleanup decisions more inextricably than through institutional controls. How institutional controls are initiated, designed, implemented, monitored, and enforced, and who would be liable if they fail are questions that are at the center of any discussion about linking land use and remedy selection.

In the context of remedy selection, institutional controls are restrictions placed on land and groundwater use. While institutional controls are quite varied—ranging from warning notices to keep trespassers off sites to controls less visible to the eye, such as property restrictions recorded on a deed that specify how the land can be used—they have a common purpose: to act as a barrier, to separate the public from levels of contamination that potentially pose unacceptable health risks. Institutional controls are used at sites when it is not cost-effective or technically feasible to reduce the volume of contamination to levels that provide adequate protection for unrestricted uses.

Superfund was built on the failure of institutional controls. The inability of zoning regulations and private land use restrictions to control development at Love Canal near Niagara Falls, New York, led to the construction of a school on an abandoned industrial waste dump containing 21,000 tons of highly toxic chemical wastes and to the construction of houses adjacent to the site. By the summer of 1978, more than twenty-five years after industrial activities on the site had stopped, contamination from the site had migrated into the basements of local homes and had been carried, by a rising water table, to the surface of the school yard. The site was declared a public emergency and was soon in the spotlight of national attention. The story was unsettling for a number of reasons. Foremost were the startling images of a typical suburban community mired in toxic wastes, a new contemporary vision of hell. But as the story unfolded, it became clear that "institutional controls," as much as leaky disposal pits, were to blame for putting people at risk. The site owner, Hooker Plastics and Chemical Corporation, donated the site to the board of education in 1953. Prior to the conveyance, Hooker received assurances from the board that no construction or other groundbreaking would take place on the portions of the site where the company had dumped it wastes. The property was transferred to the school board with a deed that included a "hold harmless" clause that stated "the grantee (Board of Education) has been advised by the grantor (Hooker) the premises described above have been filled to the present grade level thereof with waste production resulting from the manufacture of chemicals."[80] This deed notice—a typical form of an institutional control—was not heeded.

Love Canal left a deep impression on the public and on Congress: It was thought that the threat to human health and property from abandoned industrial sites was both insidious and widespread and land use controls, whether administered by local governments in the form of zoning ordinances to restrict land uses or through private controls on real property, could not be relied on to protect residential neighborhoods from hazardous wastes left by past industrial practices.

The significance of Love Canal should not be consigned to the pre-CERCLA past but rather requires that we define "institutional controls" with care. EPA has variously defined institutional controls as "legal, non-engineering remedial mechanisms"[81] or "legal, non-engineering measures to prevent human exposure to contaminants at hazardous waste sites."[82] But "institutional controls," as Love Canal suggests, is a term that evades easy definition. What institutions, for example, are involved in these mechanisms? Will the controls be devised, implemented, and enforced by recognized "institutions," such as EPA, a state Superfund program, a town zoning board, or a local health department, or should we extend the definition of "institution" to encompass not only these entities but, as one commentator has put it, the "sets of ordered relationships among people which define their rights, exposure to rights of others, privileges and responsibilities."[83]

When we place institutional controls firmly in the context of property rights and local land use decision-making processes, institutional controls can be seen not simply as legal agreements but as practices that help determine which parties at Superfund sites bear unwanted costs, whose interests will prevail, and who will derive a greater share of benefits from agency cleanup decisions affecting real property. When we admit societal values, power, political leverage, and notions of rights and duties into the picture, it becomes difficult to see "controls" as anything but contested, and hence problematic. For institutional controls are not stagnant features of a remedy but are made and unmade in the course of experience by regulatory statutes, by the acuity of government oversight, by negotiations at planning board meetings, by the attitudes of bankers, developers, and others involved in real estate, by the limitations of scientific understanding of the health risks posed by toxic chemicals, by the vast and evolving corpus of real property law, by public trust in government or the lack thereof, and, in a broader sense, by the constellation of rights and responsibilities that inform a societal ethic.[84]

Despite precedents like Love Canal and anecdotal evidence of institutional control failures in more recent years,[85] it is likely that in the coming years institutional controls will be used more frequently and play a more central role in the remedy selection process. Institutional controls are appealing to many parties involved in Superfund because, in essence, they impose restrictions on the uses of contaminated sites in place of more comprehensive and costly cleanups. For example, at a site where extensive groundwater contamination has polluted private wells used for drinking water, such a remedy could de-emphasize treatment technologies and opt for controls to cap existing wells, to connect residents to an alternative water source, and to implement well-drilling bans to guard against future use of the contaminated aquifer.

For others, however, concerns about the long-term effectiveness of institutional controls, uncertainties about their enforcement, and the consequences of their failure make them altogether

more questionable. The increased demands that will be placed on institutional controls at Superfund sites present policymakers and the public with a number of unknowns and ambiguities. CERCLA, for example, provides the agency the authority to take actions "as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment"[86] and authorizes EPA to acquire and hold an interest in site property, such as an access easement,[87] but it does not contain specific provisions about the design of institutional controls. Similarly, while the National Contingency Plan (NCP) makes clear that institutional controls should not be used as a substitute for treatment and engineering controls. The NCP contains no detailed provisions that specify the legal authority for institutional controls and whether they are to be implemented by a unit of government, a potentially responsible party (PRP), or another party, such as a custodial trust.[88] Without clear statutory provisions institutional controls are often left to the end of remedy selection. As one state hazardous waste official said, "If you leave institutional controls to the last and you can't get them implemented, then you're stuck. You're at a dead end rather than the destination of the record of decision (ROD)."[89]

Other uncertainties concern the design and implementation of institutional controls. When institutional controls are used in conjunction with containment strategies, the technical adequacy of the remedy becomes dependent on a number of nontechnical factors over which the agency has little influence, such as the efficacy of local government administration, the evolving debate surrounding property rights, and the effect of liability provisions, to mention only a few. The effectiveness of containment, one could argue, is in large part a function of how well EPA can craft institutional controls to anticipate these diverse and unpredictable forces and the willingness and ability of local governments to maintain controls such as zoning restrictions, which are under their jurisdiction.

In this chapter, our discussion of institutional controls obliges us to consider how the unpredictability of local land use decision making and the complexities of real property law can potentially limit the effectiveness of institutional controls. It is this effectiveness that is *the* central question of institutional controls. This raises two fundamental questions. The first is the question of authority. Since institutional controls are rarely based on federal law, but are either legal restrictions tied to state property laws or ordinances based on the police power of local government, to what extent can a federal agency like EPA effectively promote institutional controls in a local context? The second question is tied to issues of enforcement. Once institutional controls are in place, CERCLA provides EPA with oversight but no direct mechanism to enforce the control. What kinds of institutional arrangements are needed to monitor and enforce land use restrictions? How feasible is it for local or state government to ensure the long-run legal enforcement of institutional controls that could entail considerable costs for what could be decades when many state and local governments are facing budget cuts?

To begin our discussion of these issues, we first review EPA data regarding the use of institutional controls at NPL sites, the types of institutional controls used, and which stakeholders (for example, PRPs, local governments, or state governments) are responsible for implementing them. We then describe the legal basis for institutional controls and discuss the two primary forms of institutional controls used at NPL sites: proprietary controls and local

government controls. Proprietary controls are legal devices, such as easements and restrictive covenants, that are based on state property law and are used to restrict the use of private property. Local government controls include zoning restrictions, building permits, well-drilling bans, and other restrictions that are traditionally within the police power, that is, the legislative authority, of local governments. Finally, we examine the question of how institutional controls are connected to broader land use planning practices and to the local institutions responsible for compliance and enforcement of land use regulations.

The Use of Institutional Controls at NPL Sites

Available data suggest that EPA has come to rely more heavily on institutional controls in remedy selection in recent years. In the early years of the program, EPA tended to favor remedies that sought to significantly reduce or remove site contamination. According to an EPA study, only 14% of the RODs signed in 1985 anticipated the use of institutional controls. By 1991, however, institutional controls were anticipated in 55% of the RODs signed that year.[90]

There are a range of possible institutional controls that can be used at Superfund sites, including land use restrictions (zoning, permitting, and so forth) and a range of private law devices, such as easements and restrictive covenants. A brief summary of institutional controls includes:

- **Traditional zoning restrictions** based on local legislation regulating land use activities.

- **Overlay zoning**, such as a contaminated groundwater management zone that, as the name implies, is drawn on a municipality's existing zoning map to provide protection not explicitly stated under existing zoning regulations.

- **Permit programs** administered by a local or state agency for the purpose of controlling access to contaminated groundwater. These can take the form of prohibiting new wells or specifying where new wells may be located, monitoring groundwater contamination levels, and capping existing wells. Permits could also be used to prohibit or limit soil excavation at those sites with contaminated subsoils or to protect the integrity of a cap.

- **Site acquisition** by which EPA under CERCLA Sections 104 (j) (1) and (2) acquires real property or an interest in property at a site to conduct a remedial action, an interest that permits the government to control activities on the property.

- **Easements** by which the site owner transfers limited ownership rights of the property to a recipient who "holds" the easement, enabling the holder to preclude certain uses of the property.

- **Deed restrictions** are obligations or promises agreed to by the owner and a second party that constrain the owner's use of the land.

- **Notices** and **advisories** warning the public of site contamination or the risks posed by drinking groundwater or eating fish from contaminated streams.[91]

An informal study conducted by EPA's Superfund office reviewed 1,307 RODs signed from 1980 to 1993 and found that 44% (569 sites) anticipated using institutional controls as part of the remedy.[92] Deed or land use restrictions accounted for 38% of the institutional controls planned or in use, followed by groundwater use restrictions with 23%, well installation restrictions with 16%, site access restrictions with 7%, and soil excavation restrictions with 6%.[93]

According to the study, institutional controls have been implemented at roughly one-quarter of the 569 sites. PRPs were primarily responsible for implementing institutional controls at the NPL sites surveyed. Nongovernment PRPs implemented 35% of institutional controls, followed by local and state government PRPs (14%). In addition, non-PRP stakeholders were significantly involved with the design and implementation of institutional controls. Local governments that were not PRPs implemented 13% of the institutional controls, while non-PRP state governments implemented 10%. EPA implemented 1.5% of the controls.[94]

Although these figures are the best estimates currently available to describe the prevalence of institutional controls at NPL sites and what parties are responsible for implementing them, one must take these numbers with a grain of salt and recognize their limitations. The results are from an informal study and extend only through 1993. At many sites where institutional controls are called for in the ROD, cleanups are not yet completed and institutional controls have yet to be implemented. At those sites that are construction complete and where institutional controls are in place, lack of systematic monitoring makes it difficult to assess how effective the controls have been; nor can the data help us understand the processes by which institutional controls were selected, or enable us to anticipate how institutional controls may work in the long-term.

Property Controls and Local Government Controls

The legal basis of an institutional control to proscribe certain land uses derives from two sources: the police power of the local government and the rights associated with private ownership of property inscribed in each state's property law. In remedy selection, the source of the legal authority of an institutional control will have significant and lasting implications for the roles played by federal, state, and local governments; for the duties and responsibilities ascribed to current PRPs/owners; and for the obligations of future owners of the property to control certain uses. The type of institutional control selected is likely to depend on the mix of parties involved in the site cleanup.

Local governments are delegated the authority by states to impose a wide range of land use controls, including zoning restrictions, building permits, well-drilling bans, soil excavation bans, and public advisories. These types of controls are known in Superfund discussions as

government controls, although it is more precise to call them *local* government controls since it is local governments rather than state governments that enact zoning ordinances and create local zoning agencies and planning organizations to control land uses.[95]

When local government controls such as zoning are not sufficiently precise to prohibit certain activities that could compromise the integrity of the remedy, land use restrictions are implemented through deed notices, covenants, or easements. These restrictions are called proprietary controls, and typically give the "holder" of the easement or the "promisee" of a covenant a limited interest in the site property in order to control or restrict the use of the site and to prohibit activities that could compromise the reliability of the remedy.

For example, a site owner may agree to grant EPA or a PRP an interest in the property, giving them the ability to enforce a restriction against both current and future landowners. Such a restriction could specify that a landfill cap must not be disturbed by future construction, or that certain activities (for example, soil excavation or gardening) are not permitted on the site, or that the owner is prohibited from building new structures or extending the footprint of an existing building. The restriction is intended to reduce risk not by removing the contamination completely but rather by controlling exposure to hazardous substances. In exchange for placing a limitation on the use of the land and providing EPA or the PRP with the ability to enforce the restriction, the site owner can thereby negotiate a less extensive and thus less costly cleanup.

Local government controls and proprietary controls can be used together in remedy selection, as is the case at Industri-Plex. To encourage economic development at the site, the city of Woburn has had to rezone a thirty-acre parcel on the site from industrial park to business interstate (for retail use), an example of an institutional control that is somewhat peripheral to the cleanup issues of the site but, nevertheless, central to reuse decisions. While the city of Woburn and other stakeholders discussed rezoning portions of the site to attract retail development, the site PRPs and EPA have continued to evaluate a variety of proprietary controls, such as deed restrictions, to control disturbances to contaminated soil and to limit possible changes to the existing buildings and roads on-site that serve as a protective cap. In this instance, the institutional controls will have a crucial bearing on the long-term integrity of the remedy and influence cleanup standards directly.

For both local government and proprietary controls, then, it is essential that we understand the conditions under which these agreements are binding and the circumstances under which they may be abrogated, thereby making the institutional control unenforceable.

Proprietary Controls

Proprietary controls, as we have noted, are based on the rights associated with private ownership, and more specifically, on ownership of a limited interest in property as specified in a legal instrument, such as an easement or deed restriction. The long-term effectiveness of proprietary controls, in the Superfund context, may be confounded by a number of legal factors. A detailed examination of property law is beyond the scope of this chapter,[96] but we can nonetheless point out key questions to consider when evaluating the reliability of proprietary

controls at Superfund sites. For example, although an easement or a restrictive covenant between a site owner and EPA might bind the current owner to the stipulated restrictions, to what extent will subsequent owners be bound by the agreement? Can third parties (for example, community groups or the local government) enforce a restriction at a site if the property owner fails to comply with the control and the holder of the easement (EPA, a PRP, the state government, or a local government if signatory to the agreement) fails to act promptly?

Let us look at these questions in more detail. Different types of land ownership may make it difficult to determine what party presently has sufficient interest to negotiate and to implement an institutional control in a consent decree. For example, the owner may have leased part of the site to an auto repair shop or some other commercial activity or mortgaged the property to a third party. In this situation, where the site is owned by many kinds and combinations of owners, it may be difficult to devise and implement an institutional control.

Second, easements may be terminated by a court if the holder of the easement fails to bring suit in a timely fashion against a primary owner violating the conditions of the easement. If the holder of the easement fails to act, and the easement is terminated, no third party has the legal authority to restrain the owner from taking the actions that had been proscribed in the easement.[97]

Third, restrictive covenants are extremely complicated, and, according to one commentator, "they often defeat the attempts of parties to write covenants which will be enforceable against successors."[98] For the covenant to run with the land, many states require that successive owners succeed to the entire estates, or interests in property, of the original signatories. In other words, the form of ownership between the past and present owners must be similar if the covenant is to bind successive owners.

One can anticipate problems with the long-term enforceability of institutional controls at Superfund sites in view of these legal requirements. For example, a PRP/site owner, five years after cleanup has been completed, sells the site to Company X with a covenant in the deed that requires the owner of the site to perform periodic monitoring of groundwater underlying an industrial facility, a stipulation put in the consent decree in order to ensure that the contaminated plume is not migrating toward private wells downgradient to the site. Company X then sells the site to Company Y with the restrictive covenant in place. Within a few years, Company X goes out of business. It is unclear if the burden of the covenant would bind Company Y.

Fourth, at enforcement-lead sites, where neither states nor local governments are responsible for the long-term operations and maintenance (the phase in the cleanup where institutional controls will be implemented and monitored) of the site remedy, a PRP or the federal government may hold the easement.[99] While EPA can require written assurances from the PRP in the consent decree that the PRP will maintain the institutional control as long as it is necessary, absent the involvement of local parties (and according to EPA, local governments are typically not signatories to these agreements),[100] it may prove difficult for the federal government to maintain an effective monitoring and oversight presence in the long run, unless EPA can negotiate an agreement with a municipality, specifying inspection schedules and

oversight responsibility that is more rigorous than the five-year review required under CERCLA. Without the direct and ongoing presence of a particular group to uphold the provisions of the easement, it is the workings of the property market—the use of title searches, the recording and delivery of deeds to land recording offices, the fears of liability, and the demands of insurance companies and banks—that are asked to serve as the enforcers of the easement. While one could argue that under CERCLA, banks and other lenders have required site assessments and title searches as a matter of course before they provide a loan for the purchase of commercial property, it is the rare bank manager who would be in a position to comment on the technical adequacies of a design for a foundation of a new building that encroaches on heavily contaminated soil. In other words, while CERCLA's liability provisions may create a chilling effect in the real estate market when property is bought and sold, it is unlikely that the caution of the market will extend to the careful monitoring of ongoing commercial activities. Responsibility for overseeing the restrictions would thus become more diffuse.

The use of both restrictive covenants and easements to limit public exposure to residual contamination at Superfund sites is anything but straightforward. State property laws governing their use vary; the common-law tradition of different types of ownership could limit their long-term reliability if they fail to bind third parties to the agreements worked out in the consent decree, and the question of authority—who holds an easement and on what legal basis can the government or some other entity challenge noncompliance with the easement or deed restriction—is, again, open to interpretation. These issues suggest that proprietary controls, negotiated between PRPs/site owners and government (federal, state, or local) may be insufficient by themselves to effectively ensure the long-term safety of the public from residual contamination. Their reliability hinges on how carefully they are devised, the authority and willingness of the party holding the rights to use them, and the willingness of a property owner to comply.

For each party, this latter factor, the willingness to exercise or observe the controls, will turn on whether the advantages of the proprietary controls outweigh the disadvantages. Without question, such controls can confer certain economic or social advantages to those parties accepting them; for PRPs, it may well be a cheaper remedy; for a local government PRP, it may be a means to bargain for capital improvements, assuming a second PRP with adequate financial resources can pick up the tab, as at the Abex site; for local residents, it may mean increased property tax revenues and jobs from the reuse of the property; and for EPA, it may be completion of a site cleanup after years of investigation and effort. On the other side of the ledger, possible disadvantages are obvious: PRPs and successive site owners may find that the restrictions unacceptably limit their economic opportunities on the site. Individual homeowners or PRPs may be forced to pay for hookup to alternative water sources if the remedy calls for capping wells. Similarly, a town or PRP may have to bear the costs of expanding a water distribution network or of increasing the capacity of a water treatment plant. A containment remedy could require costly operations and maintenance for decades, and EPA may have to return for additional remediation if litigation or the passage of time erodes the efficacy of the institutional control.

Local Government Controls

Compared with easements and restrictive covenants, the use of local government controls, such as zoning ordinances and permits, brings to remedy selection a new set of players, provides different levers by which competing parties can influence the decisions about the future disposition of a site and the selection of institutional controls, and requires different safeguards if public protection from residual contamination is likely to be achieved through the use of institutional controls.

As noted earlier, local government controls typically involve the local government's using its police power to place restrictions on sites or on the activities of citizens under its jurisdiction, and include water and well use advisories, building permits, zoning restrictions, and well-drilling prohibitions. Establishment of these controls may be required in consent decrees at enforcement-lead sites but is more typically done through cooperative agreements.[101] EPA can negotiate local land use restrictions with PRPs and local and state government officials in the course of the remedy, but the agency has not asserted authority under CERCLA to enforce land use controls at Superfund sites. EPA clearly has the authority to amend a remedy if its five-year review shows that institutional controls are ineffective. But, in the meantime, the crucial responsibility for ensuring the effectiveness of institutional controls is lodged primarily with local municipalities, and more specifically with the institutions in local communities that make or influence land use decisions. Interestingly, H.R. 2500 (the Oxley bill) proposed to eliminate the five-year review requirement.[102]

Local Land Use Policies and Politics

In most communities, zoning is the primary means of land use regulation, and it is the traditional concerns of zoning—separating land uses by districts, protecting the property values of single-family detached houses by specifying residential densities, regulating the size and height of building—that have shaped the ways in which most localities now administer and enforce land use controls.

The procedures by which localities implement, review, change, and enforce zoning schemes are set out in the Standard State Zoning Enabling Act. This act, prepared by the U.S. Commerce Department in the 1920s, served as a model for state legislatures seeking to grant localities the power to zone. The act was widely adopted at the time and remains in effect for all but a handful of states. The Standard Act provides the legislative branch of local government—the city council, the town selectmen, the board of supervisors, and so forth—responsibility for enacting zoning ordinances and adopting master plans. To advise it, the governing body appoints a planning commission (or in some localities, a zoning commission), which typically consists of five to nine members and is supported by technical experts (transportation engineers, architects, and so forth) and by staff from a planning department in larger jurisdictions. The commission reviews specific development projects and, more broadly, makes recommendations about changes to the locality's zoning ordinances and zoning map. They also comment on rezoning submissions tied to changes in the use of individual parcels. The recommendations of

the planning commissions are, in most cases, only advisory and are subject to the actions of the local governing body.

While the governing body and the planning commission consider and make major changes to a locality's zoning scheme, the Standard Act gives responsibility to a board of appeals or board of adjustment to grant special exceptions and variances to the zoning ordinances. The drafters of the Standard Act gave the board of appeals considerable discretion to permit a use or a building type that would otherwise not be allowed in the district (for example, a special exception) and to provide zoning relief in the form of a variance to an applicant if compliance with the standard zoning rules would lead to "unnecessary hardship."

This summary discussion of local land use administration may give the impression that local land use is an orderly activity, administered by disinterested public officials insulated from competing development interests. This would be misleading. More importantly, it would prevent us from seeing how local administrative practices to control land use can compromise the long-term effectiveness of institutional controls.

Much of the discussion about the use and reliability of institutional controls at Superfund sites is subject to two misperceptions about how land use regulation is administered at the local level. The first is that future uses can be readily anticipated through land use planning, and, second, zoning ordinances are rigid classifications that present formidable obstacles to changes in land use.

Proposals to revise Superfund call for a site to be cleaned up to reasonably anticipated land uses; yet much of what we call land use "planning" involves very little planning but rather occurs in a piecemeal fashion. The Standard Act sanctioned the creation of both zoning and planning commissions and states that zoning regulations "shall be made in accordance with a comprehensive plan,"[103] a provision that has been incorporated into the zoning legislation of many states.[104] The rationale here is that the narrower concerns of zoning—separating incompatible uses, setback requirements, and so forth—should be situated in the broader context of a community's social and economic aspirations, as embodied in its comprehensive plan. The plan is intended to serve as a guide to coordinate the development of an area.

The Standard Act, however, does not specify what a comprehensive plan should be, and, to a large extent, the term has come to mean that zoning should be reasonable, conform to commonly understood municipal land use policies, and, notwithstanding the obvious tautology, be carried out in a comprehensive fashion. In practice, this has meant that local government can pass zoning ordinances when there is no comprehensive plan to which the ordinances should refer; and in those communities that have devised a comprehensive plan, zoning ordinances need not follow the provisions of the plan. While a handful of states require local government to undertake comprehensive planning to meet state planning objectives, in most localities, a comprehensive plan is only advisory and does not carry the force of law.[105] Moreover, the plan is likely to be modified continually in the face of actual land use development.

The argument that local development must conform to a zoning map is also flawed. While comprehensive plans often mapped land use locations, zoning maps were drawn largely to depict the result of a municipality's zoning ordinance. There were, needless to say, discrepancies between the planned uses and the end results. More recently, local governments, aware of past inaccuracies in predicting the future use of private land, have moved away from mapping the location of predetermined use districts and have opted for greater discretion and flexibility about the location of land uses. Instead of rigid designations of districts, which were likely to be overturned as development pressure induced local governments to rezone land, most local governments now prefer to devise broad land use plans, that describe in words, rather than maps, the objective of local land use.

There appears, then, to be a mismatch between the characterization of "land use" in the Superfund reauthorization debate as predictable, based on social consensus, and firmly charted in a town's zoning laws, and the process of land regulation that occurs in many localities. Local land use decisions are not often the end product of the careful deliberations of planners; nor do they typically represent the vision of the local community. In many jurisdictions, the members of the planning commission may often be composed of building contractors, real estate agents, architects, and so forth—those professions mostly clearly aligned with development interests. Land use often masquerades as a neutral term, or is equated with the simple designation of land as industrial, commercial, or residential, but decisions about land use are among the most contested and controversial in any municipality. The recommendations of a planning commission and the decisions made by local councils, for example, to rezone a parcel of land in order to site a municipal facility or large retail outlet, as we have seen at Abex and Industri-Plex, may affect a neighborhood's property values, its tax base, and the amenities available to the local community.[106] By creating areas of intensive uses that may result from returning Superfund sites to new industrial or commercial uses, land use policies can create economic windfalls for some members of the community (such as PRPs, site owners, workers) that may be borne as costs by others (nearby residents) in the form of pollution left untreated, noise, and increased traffic. Because land use regulation creates winners and losers and seeks to control the use of private property in the name of the public good, few operations of local government have been more subject to public controversy and political machinations. The use of institutional controls at Superfund sites will take place in what is often an ad hoc process, which concentrates not on broad issues of development but on a parcel of land, where pressure is exerted by developers and other real estate interests to derive the highest economic value from a property, a process that is often irresistible to local government.

The second misperception about land use is closely related to the problem of predicting future uses. Here we are concerned with the likelihood that a zoning restriction—for example, limiting the use of the land—will continue to remain in force once a specific use at a site has been established. The reliability of institutional controls is assumed to follow from the consistent application of zoning ordinances, and yet in no area of American law are there such frequent requests for amendments to the law (rezoning requests) or minor revisions to the law under the guise of an administrative action (variance, special exemptions, and so forth).

Much of the unpredictability of local land use regulation and, by extension, the problem of ensuring that institutional controls remain robust can be traced to the origins of zoning. The Standard Act, which still governs most zoning in the United States, was based on New York City's 1916 Zoning Code. To determine initial zoning boundaries, city officials in New York surveyed existing uses in a district and based their designation on the most prevalent use within the area. In a city as densely populated and built up as New York City, where development patterns tended to be focused on the block level, zoning was seen as a tool to reinforce existing land uses, by specifying lot size and building requirements, not as a means to anticipate future uses. For the framers of the Standard Act, the urban landscape to be regulated was for all intents and purposes a static one. Zoning districts would remain relatively unchanged; fine adjustments to the ordinances could be made through the judicious granting of variances, single-parcel rezoning or "spot" zoning, or special exemptions. There was little need, it was assumed, to determine standards that could be used by zoning officials to approve or reject applications for changing the designation of a zoning district. As a result, the Standard Act provides no administrative means to amend a zoning ordinance. In most states, this means that an individual who wishes to petition for a change in the use of his or her property cannot simply make an application to a planning commission and then wait until the staff has evaluated the proposal against relevant standards or criteria. There are typically no provisions in most zoning schemes for staff to make such a decision. An application to rezone a property is essentially a request to amend the zoning ordinance, to change the law, requiring a legislative act that only the governing body of the locality has the authority to execute.

Rezoning

The attempt to rezone a property sets off a rather cumbersome and lengthy review process, involving public notice, planning commission hearings, staff reports, governing body hearings, public comment periods, and finally government action. It is an onerous process in large part because the framers of the Standard Act anticipated that requests for rezoning would be extremely rare and, as such, were to be evaluated by the same process by which the original zoning ordinance was adopted.

In our day, however, the most common land use action taken by local government is to rezone land. Often the action is taken in response to a request of a property owner wishing to "upzone" his or her property to a more intensive, and hence more profitable, use. For example, an owner or developer may wish to construct multifamily housing rather than single-family units or to develop the property commercially, even though the property is zoned for residential use. A local government, similarly, might attempt to upzone city-owned property to increase its tax base or to attract industry by creating special zoning districts, such as enterprise zones or industrial estates, and in circumstances when a new road or extension of a subway system makes the prior designation of the area inappropriate for the clamor of new commercial uses likely to result.

This anomaly in most states' zoning schemes—to change land use local government must change the law—may have considerable repercussions for the long-run reliability of institutional controls at Superfund sites. While some states, notably California, Florida, and Oregon, stipulate

that local rezoning decisions must be made in the context of the community's comprehensive plan, for the most part, the only legal constraint on a local government's decision to rezone a property is procedural. Before a rezoning decision is made, local government must issue public notice that a rezoning request has been received, mandate review of the application by a planning commission, and provide public hearings. Yet, absent specific standards by which rezoning applications are granted or denied, local governments have considerable discretion to amend the zoning ordinances and to change land use, a situation that has been described as "unpredictable and unfair"[107] and characterized as case-by-case bargaining that tends to favor the stronger interests in a community.[108] At Woburn, for example, where the Industri-Plex site is located, the city updates its zoning ordinance every five years, but according to a former elected official, the zoning changes are not made in a systematic fashion but depend on "what's hot." When a local government is a PRP at a Superfund site, as at Abex, the local government's largely unfettered authority to rezone land can lead to outcomes that can be seen as arbitrary and unfair, a situation that we examined in detail in the preceding chapter.

Variances

Rezoning decisions are only one operation of local government that can lead to inconsistency and unpredictability in local land use regulation. The robustness of institutional controls at Superfund sites can be further compromised by a second popular tool used by municipalities to grant landowners relief from zoning ordinances: the variance. While rezoning, as we have noted, changes the zoning law of a community, variances involve a departure from the provisions of the zoning ordinance and are typically decided by a zoning board of appeals.

The Standard Act provides the board of appeals power "to authorize upon appeal in specific cases such variance from the terms of the ordinance as will not be contrary to the public interest, where, owing to special conditions, a literal enforcement of the provisions of the ordinance will result in unnecessary hardship, and so that the spirit of the ordinance shall be observed and substantial justice done."[109]

For the framers of the Standard Act, the granting of variances was intended to be exceptional, yet applications by landowners for variances and decisions to grant them are now extremely common in local land use. Variances can take two forms. An area variance will relax the requirements of a zoning ordinance in matters involving some aspect of lot regulation, such as setback requirements, lot width, and so forth. Use variances, which are likely to be more important to our concerns, will allow changes in the use of a site, such as multifamily housing in a single-family area, or permit commercial activities in a site zoned for industrial use. Use variances are prohibited in certain states, but in many states they may be granted on the grounds of unnecessary hardship. In principle, unnecessary hardship should refer to hardship inherent in the physical characteristics of the land. For example, the owner of an narrow L-shaped lot may find it impossible to comply with the side-yard setback requirements, based on rectangular lots, of the zoning ordinance. Yet, evidence suggests that variances are often granted by zoning boards of appeals on the basis of personal circumstance and the financial hardship the applicant would face if the property were used only for a purpose allowed in the given zone. The board of appeals in Woburn cannot grant zoning variances but is known to liberally grant hardship

variances. According to the former mayor, these variances are granted on the basis of a vague definition of hardship. In effect, these variances may well be tantamount to spot zoning, which is itself contrary to the law.

As one author has put it, "Various studies have convincingly shown that boards of adjustment (or appeal) commonly operate according to their own sense of what is right, with little regard to the law, or even their local planning department."[110] In one study, the board of appeals in Lexington, Kentucky, granted 76 of 102 applications for variances, although 75 of these had been recommended for denial by the planning department.[111] Similarly, in Alameda, California, the board of appeals granted 208 variances that had been reviewed and rejected by the planning department. Other studies have shown approval ratings of between 63% and 85%, a rate that bears out the old adage that zoning boards of appeal have "never met a variance they didn't like."[112] In most states, variances are considered by scores of local zoning boards of appeals, each of which may have a different set of standards to guide its deliberations for considering a request for a variance, a situation ripe for judicial attack.

The Courts

The lack of consistent standards to decide rezoning applications or requests for variances has given the courts a significant role in local land use regulation. Local land use decisions can quickly become extremely litigious: a property owner, for example, aggrieved by the rejection of his or her rezoning application may challenge the propriety of the governing body's action; the government, for its part, may sue the owner to comply with regulations; a neighborhood organization may sue the government to force it to enforce restrictions against the owner; a third party, such as an environmental group or a housing organization, may attempt to sue the neighborhood organization as furthering exclusionary activities. In the face of this litigation, the courts are often seen as the planning commission of last resort.

Although the courts try not to make substantive zoning decisions, judicial attacks on local land use regulations are well documented in case law and in the planning literature and constitute yet another source of uncertainty to the effective working of institutional controls at Superfund sites. In view of the wide variation in the decisions of state and appellate courts concerning the limits of police power to regulate land use and the need for constitutional protection for the individual, it is easy to envisage the possibility that an owner of a site that is encumbered with a use restriction may challenge and successfully invalidate an institutional control, such as a zoning restriction, on the grounds that the restriction will cause a severe burden and, as such, constitutes a taking of private property by the government.

Clearly, in its deliberations the court will consider the extent of the loss, the owner's property interests, the public benefit of the restriction, and the intent of the government action, but as there is no judicial consensus on when a land use control amounts to a taking, institutional controls may be vulnerable in the long-term to shifting legal interpretations about what is a constitutional regulation and what action is an unconstitutional taking.

Enforcement

The contested and ad hoc nature of much of local land use regulation, and the court's power to invalidate local land use controls, could compromise the effectiveness of institutional controls at Superfund sites. Yet, the most profound limitation to the reliability of institutional controls may well be the long-run capacity of local government to monitor and enforce institutional controls, a factor that one experienced state hazardous waste official has called "the weakest link in the chain."[113]

Many of the institutional controls that have been implemented at Superfund sites and those that are likely to be used more frequently in the future address a range of problems that fall outside the purview of the more traditional systems of zoning enforcement. For example, institutional controls at NPL sites may involve:

- Detailed site inspection and site management to guard against trespassers' breaching a cap or undertaking activities in fenced-off areas where residual contamination is high.

- Inspection of private wells to curtail the use of contaminated water by homeowners unwilling to comply with government bans, or the provision of information to warn local residents about health risks arising from exposure to residual contamination from the site.

- Regular site reviews to ensure that activities prohibited on a site—soil excavation, groundwater use and so forth—are not taking place.

- Monitoring to prevent an owner of a site from knowingly or even unwittingly extending the footprint of a warehouse or a factory into an area that contains residual contamination.

- Efforts to ensure that the site is not developed to include new types of activities—picnic grounds, caretaker flats, ponds, and recreational areas—that were not anticipated in the development of the institutional control in the remedy.

Increasingly, the monitoring and enforcement of institutional controls at Superfund sites will come to resemble the system of site plan reviews and inspections that many municipalities have developed to help them tailor zoning ordinances to specific sites and projects. Unlike the regularized control of zoning regulations through building permits, the sort of land use controls imposed on a Superfund site may well be unique to the site and thus harder to monitor and enforce on a routine basis. In the words of one enforcement official, site review is "a planner's paradise but an enforcement nightmare."[114]

More broadly, the enforcement problems with institutional controls fall into three categories. First, it is often unclear in the course of a site cleanup what entity should be responsible for monitoring and enforcing institutional controls. Because institutional controls are often given only the vaguest mention in the ROD, the questions of what type of monitoring and

enforcement activities should occur (reporting, interview, site visits), the frequency and duration of monitoring, and who is responsible for upholding the institutional control (PRP, state government, local government) are often not addressed until the final stage of the remedy. It may be difficult to get recalcitrant PRPs or site owners who are not PRPs to accept the institutional control to which much of the technical remedy may be tied. Typically, no party will commit to implementing an institutional control until after a consent decree or cooperative agreement has been signed. Furthermore, often the institutional control is devised without reference to specific criteria by which it should be evaluated, or procedures to coordinate the activities of various parties who are likely to be responsible for the effectiveness of the institutional control, a situation that is most evident at the Industri-Plex site, which we discussed in the preceding chapter.

When local land use restrictions are part of the remedy, it is likely that the state and EPA could not enforce land use ordinance violations against recalcitrant responsible parties if the local municipality did not act. Yet, institutional controls are often devised without a clear sense of a locality's zoning ordinances or the capacity of local government to effectively uphold the control. At Industri-Plex, for example, although the city of Woburn is kept abreast of developments, the working group on institutional controls does not include a representative of the local government. The city, for its part, has stated in the past that it is relying on EPA and the state Department of Environmental Protection, the "best people" to develop institutional controls.[115] Often missing is a careful assessment of how political attitudes toward the site may change. A control that safeguards the public health today might be seen as restricting development opportunities in the future, with obvious implications for the eagerness with which local municipalities will enforce the control.

A second category of enforcement problems is that in which many local governments lack the formal mechanisms whereby the conditions imposed on a site—zoning restrictions, easements, restrictive covenants, use restrictions—can become part of the records of local government or be readily available to the site inspector or other enforcement personnel in the course of their duties. In certain jurisdictions, land use records are computerized and part of a relational database that links information about land use from a variety of sources, such as health departments, land registries, public works departments, and zoning enforcement. In many other municipalities, however, land use records are available, not in electronic form, but in old ledgers, and they may be incomplete.[116] Effective record keeping and systematic review of the institutional controls imposed on a site require a level of administration that is not necessarily a standard feature in local government.[117]

Third, the long-run effectiveness of institutional controls must be based on regular monitoring and prompt enforcement, yet according to recent surveys of state and local administrators, budget cuts are eroding the capacity of local government to put inspectors in the field and to coordinate data exchange among building, engineering, and public works departments. Two recent surveys examining the use of insitutional controls at the municipal and state levels highlight this point.[118] The preliminary results of a survey of members of the International City/Council Management Association (ICMA) suggest that fewer than 10% of the local government respondents have experience implementing and enforcing institutional controls

at former hazardous waste sites and that only half of the local governments surveyed believed they had adequate resources to enforce institutional controls at sites cleaned up to a "future use risk-based level". Moreover, those respondents claiming to have sufficient resources to enforce institutional controls expected the state to enforce environmental controls while local governments would enforce non-environmental land use controls.[119] A survey of state hazardous waste officials conducted by the Association of State & Territorial Solid Waste Management Officials (ASTSWMO) reveals that the "lack of funding and lack of authority along with unclear jurisdictional issues" are the main obstacles to the effective implementation of institutional controls.[120]

At the Industri-Plex site, for example, monitoring and enforcing institutional controls by local government may run up against budgetary shortfalls. Tax limit legislation, according to the former mayor of the city, will almost certainly constrain the city from effectively policing the institutional controls that will be put in place at Industri-Plex. With staffing levels dropping and workloads intensifying, the assiduousness by which local governments track and report institutional controls is likely to decline, and as older, more expensive employees are bought out and replaced (if at all) with younger less expensive staff, the institutional memory of a regulatory agency—that informal sense developed over time about where problems are or are likely to develop—will be attenuated.

Conclusions

Institutional controls are not technical appendages of a remedy but mechanisms that rely on complex social and legal processes, such as local zoning, the enforcement regimes of local, municipal, or county governments, and the interpretation of private property laws. These processes, of course, are not static but evolve to address emerging concerns in ways that we cannot fully anticipate.

The effectiveness of institutional controls, as we have seen, can be constrained by a number of factors:

- Local governments, rather than EPA, have the authority to impose government controls at NPL sites, yet local governments may have little incentive to restrict land use or face political pressure to allow unrestricted use.

- The efficacy of institutional controls is assumed to follow from the consistent application of zoning ordinances. Frequent requests for amendments to the law (rezoning) or minor revisions to the law under the guise of an administrative action (variances and special exemptions) continually threaten to undermine this consistency.

- To be effective, private property–based restrictions must bind both current and successive users of the site to the restrictions specified in the deed or in a covenant. The question of

authority—who holds an easement and on what legal basis the government or some other entity can challenge noncompliance with the easement or deed restriction—is again open to interpretation.

- The long-term efficacy of institutional controls must be based on regular monitoring, PRP or site owner compliance, and prompt enforcement; yet funding for environmental monitoring and enforcement at the local level has been reduced, and noncompliance with property-based restrictions can be difficult to detect.

The greater reliance on institutional controls should be seen not merely as a more cost-effective "mechanism" to prevent public exposure to residual contamination but as a challenge to the prevailing assignment of rights and duties under Superfund law.

To the extent that CERCLA enjoins EPA to select remedies that rely on treatment and permanent solutions, it has protected the interests of those parties potentially affected by site contamination and assigned duties to PRPs and others who are held liable for site contamination (for example, banks, insurance companies). With containment strategies and the use of institutional controls becoming more prevalent components of site cleanups the capacity of individuals who are potentially affected by site contamination to call on the federal government to protect their interests may be diminished. In this new legal and political situation, the full measure of cleanup costs will no longer be borne by PRPs but rather will be allocated in part to the local community.

With deep funding cuts for environmental enforcement activities at both the federal and state levels, there is a strong possibility that noncompliance with institutional controls will go unnoticed. Institutional controls "work" only if they are complied with. While this is true of *any* site remedy, institutional controls require monitoring and enforcement over long time periods and are thus more problematic. If we define a right to exist only when there is a system to protect the holder of the right from the action or claims of another, to what extent should we see the increased use of institutional controls as a process that reduces the rights of nearby residents or workers on remediated sites while privileging those of past polluters?

Chapter 5:

FINDINGS AND RECOMMENDATIONS

Linking land use and remedy selection in the Superfund program is in many ways a simple, appealing, and rational concept, with something in it for everyone. Land use-based remedies hold the promise of reducing the cost of cleanups, helping local governments redevelop sites that have sat idle because of the slow pace and high cost of Superfund cleanups, encouraging more public deliberation in cleanup and reuse decisions, and building more support for an environmental program that has for years been a target of criticism. Thus, for many in the Superfund policy community, linking land use to remedy selection would add a reasonable pragmatism to a program widely viewed as inefficient.

Although Congress is even now debating changes to Superfund to link land use to remedy selection, the fact is land use-based cleanups are already a feature of the Superfund program. The Environmental Protection Agency's (EPA) land use directive anticipates many of the changes mentioned in recent bills to amend remedy selection, and at National Priorities List (NPL) sites, remedial project managers have increasingly used non-residential scenarios when selecting site remedies. In Administrator Browner's most recent Superfund testimony, she states "EPA has improved its cleanup decisions by consistently using reasonable assumptions about current and future land use. Currently, about 60% of EPA's records of decision (ROD) include a land use other than residential land use."[121] Thus, one can argue that the proverbial train has already left the station, making it more urgent that the implementation issues raised in this report be addressed, and addressed soon.

Basing cleanups on expected land use is a strategy that, in essence, makes trade-offs between costs and long-term reliability, and brings to the remedy selection process a more diverse set of interests and institutions. While this may well be the right policy course, to be successful it needs to take into account: the likely changes that will result in how the benefits and costs (in both the short and long-term) of cleanup are distributed; the implications for public involvement strategies; and the legal, administrative, and social factors that make the use of institutional controls as a mechanism to protect public health vulnerable.

Our research suggests that linking land use to remedy selection presents EPA with two major challenges: first, how to involve the public more effectively in cleanup and reuse decisions; and, second, how to ensure the effectiveness of institutional controls when the legal authority for such controls stem from the police powers of local governments and the private property laws of each state.

We set forth our findings and recommendations below.

Findings

1. Agreement about the future use of a site may not lead to agreement about the appropriate remedy—or cleanup standards—for that site.

The debate about land use often involves discussion about different categories of land use—such as residential, commercial, or industrial. Categorizing the type of land use at a site provides a shorthand that enables EPA to anticipate who may be exposed to site contaminants and by what pathways that exposure may occur. There can, however, be considerable variation in routes of exposures within any of the major land use classifications (residential, industrial, commercial) depending on the types of *activities* that could occur at a site. In other words, the relation between land use and exposure is often not known and may vary widely.

At Abex, for example, all parties agreed that certain residential areas at the site were going to remain residential and should be cleaned up to allow residential use. The sticking point was the characterization of exposure, not of land use. The residents feared that their gardening activities and home construction work would expose them to contaminated soil on-site, a view that EPA upheld. Thus, a seemingly technical concern (the likely pathways of exposure) became a controversial matter for the community, one that led to disagreement regarding the appropriate remedy.

2. It is often not possible to determine the "anticipated future use" of a site, and, in fact, the remedy selection process can lead to unanticipated land uses at Superfund sites.

Underlying many of the Superfund reauthorization proposals for remedy selection is the notion that, for each site, EPA will base cleanup on the "reasonably anticipated future land use," and that the remedy selected will permit that use.[122] For example, S. 8 (the Smith-Chafee bill introduced in the 105th Congress) includes language that ties cleanups more tightly to the actual or planned land use at a site, that is, to the use that has "a substantial probability of occurring."[123] To identify the likely future use of a site, the bill would require EPA to consider the current use, the use that is authorized by zoning or formally adopted land use decisions, the development patterns in the area and population projections, and the views of a community response organization (if any).[124]

Our case studies and our review of land use planning practices suggest that the language of S. 8 may be too narrow to account for possible or potential uses of NPL sites. At nearly 80% of sites on the NPL, there are adjacent residential areas.[125] Predicting the "future land use" of these sites could be difficult. Local land use designations are often made as part of a politicized process involving a range of stakeholders with competing legal and economic interests. Zoning decisions face continual pressure from rezoning proposals and administrative decisions to grant variances. Rezoning is a legislative decision, but as we have seen in our case studies, local

legislators may be willing to change the law and rezone properties quite expeditiously. In addition, although courts have traditionally deferred to the zoning decisions of local legislative bodies, judicial attacks on local land use regulations are not uncommon.

Second, the anticipated use of a site often evolves in tandem with the site remedy. As we have seen, changes in the use of a site can result from decisions made in the remedy selection process. The provisions of S. 8 assume that land use decisions are made independently of the remedy selection process and that the ultimate disposition of the site is unaffected by the deliberations that take place among potentially responsible parties (PRP), EPA, site owners, and other stakeholders. The point is this: though many assume the use of a site follows from the level of cleanup achieved, a remedy may ultimately be determined by the possibilities of redevelopment that evolve during the cleanup process.

3. Institutional controls are: (a) often critical to ensuring long-term protection; (b) often neglected and left to the end of the remedy selection process; and (c) subject to legal, administrative, and social pressures that may limit their effectiveness.

Institutional controls in the Superfund context are, fundamentally, mechanisms to ensure protection where contamination has been left on-site at levels that preclude unrestricted use. At many sites, they are a necessary component to the success of the remedy. At sites where the technical elements of a remedy are fully implemented, the remedy is not protective unless the institutional controls—in whatever form—are in place, function as anticipated, and are enforced.

While the need for institutional controls is recognized early in the cleanup process, often they are not drafted with any specificity until after a ROD has been issued. Institutional controls are more typically developed during the negotiations between EPA and PRPs that lead to a settlement agreement and are set down in a consent decree, a legally binding document signed at the latter stage of the remedial process. Developing institutional controls as part of the consent decree means that often the general public has little opportunity to get involved, since the negotiations leading up to the agreement are private.

The development of institutional controls at the Industri-Plex site illuminates many of these issues. Property use restrictions at Industri-Plex have been discussed for more than a decade. The need for institutional controls was first mentioned in the 1986 ROD and appeared subsequently in the consent decree and remedial action plan. Now, eleven years after the ROD, and with most of the technical elements of the remedy implemented, the institutional controls have still not been fully developed, much less implemented.

The effort to develop institutional controls at Industri-Plex has proved difficult. In addition to the sheer complexity of the site, the difficulty of developing the controls derives in large part from the two disparate functions given them. First, they are needed to prevent exposure and maintain the viability of the remedy. Second, the institutional controls are purposefully being designed in such a way as to allow property owners the flexibility to alter or expand their operations, even if this involves disturbing the remedy, a somewhat unusual form of institutional

controls. The tension between these two goals is problematic, and becomes even more so when one takes into account that these controls will need to be in force for decades. During that time, institutional controls will need to be largely self-administering and self-enforcing, with regulators acting directly only if the self-enforced system fails.

Given this mix of incentives and the lack of precedent in developing institutional controls in such a complex situation, the cleanup at Industri-Plex should be viewed as an important experiment. It remains to be seen, however, how successful this experiment will be in managing risks at the site while promoting development. Two points are clear: the design of institutional controls has made only halting progress over the last ten years; and their development has taken a separate path from the nearly completed structural components of the site cleanup. This calls into question whether risks at the site are being managed in the most efficient and integrated fashion.

In summary, it appears that EPA does not adequately delineate institutional controls early in the process. In addition, the agency often fails to specify the legal authority for implementing the institutional controls, the funding mechanisms to monitor them, or what organization will enforce them until very late in the cleanup process.

4. Linking cleanup decisions to land use considerations places an even heavier responsibility on EPA to effectively involve the public in the remedy selection process.

Few operations of local government have been more subject to public controversy and political machinations than land use. Land use decisions and land use controls at Superfund sites may become controversial for reasons that have little to do with cleanup. Returning Superfund sites to industrial or commercial uses can create economic windfalls for some members of the community (such as PRPs, site owners, and workers) that may be borne by others (such as nearby residents or neighboring towns) in the form of contamination left on-site, noise, and increased traffic. One of the most difficult challenges will be to assure sustained public involvement in reuse and cleanup decisions over what can literally be decades.

A long history of criticism exists regarding EPA's efforts to involve the public effectively in the remedy selection process.[126] Many external critics have noted that the public involvement requirements that are set forth in agency regulations do not provide adequate opportunity for meaningful public involvement. In fact, the need for a stronger mandate for public involvement in CERCLA is one of the few changes on which all parties appear to agree. This is evidenced by the new public involvement titles that have appeared in all four of the major Superfund reauthorization bills introduced in Congress over the past few years: H.R. 3800, H.R. 2500, S. 1285 and, most recently, S. 8.

Critics of current public involvement efforts in Superfund have called for a number of changes to the public involvement process. These include: the development of community working groups, easier access to technical assistance grants (TAG), increased TAG funding, and more aggressive community outreach to encourage earlier, better informed, and sustained

participation.[127] The agency, to its credit, has responded to a number of these criticisms and has drafted initiatives to promote increased public involvement, especially by members of the communities that have traditionally been underrepresented. Unfortunately, it is too soon to assess how effective these measures have been.

The experience in our three case studies, taken in the context of other evaluations of public involvement at NPL sites, suggests that there is still a need to greatly improve public involvement efforts at Superfund sites. This has proved to be a daunting task at many Superfund sites, and is likely to be even more difficult when reuse considerations at a site enlarge the scope of legitimate public interest—and the likely beneficiaries of the reuse options come to influence and perhaps dominate public discussions about cleanup and reuse.

Where economic reuse becomes a central theme at a Superfund site, and the impacts of cleanup and reuse extend to other communities, the need for more aggressive public involvement becomes even more pronounced. Increasing the focus on economic development at NPL sites, especially at large and valuable properties such as Industri-Plex and Ford Ord, enlarges the spatial and political impacts of site decisions. Unlike cleanup, the economic and social impacts of reuse can readily extend beyond the site boundaries to a much larger region. Such impacts are not limited by hydrology, erosion, air deposition, or other physical properties but can, instead, be readily diffused throughout the region and appear in such forms as taxes, congestion, economic competition, highway construction, shrinking open space, and the demand for water.

At such sites, EPA is likely to find itself beset by a number of problems concerning public involvement, the most basic being how to identify the affected "public," a problem that occurs at many Superfund sites. At Fort Ord, for example, it is unclear how representative the remediation advisory board (RAB) is of the diverse communities that surround the base, or how the Army should take into consideration the RAB's divided opinion. Clearly, the forms of public representation and how a regulatory agency should respond to diverse public interests become more perplexing when the traditional concerns of Superfund—the protection of human health and the environment—become increasingly complicated by the added dimension of reuse.

Even at sites where reuse and economic development is not a central concern, relying more fully on institutional controls to achieve protection means it is even more critical for EPA to involve the public early on—and throughout—the cleanup process. This effort will require a thorough rethinking of the current public participation process, since public involvement at NPL sites is constrained by certain structural features. First, the public may lack the technical wherewithal to forcefully argue about a site's risk characterization or the cleanup alternatives proposed in a ROD. Second, since at enforcement-lead sites (which are the majority of NPL sites) PRPs conduct the remedial investigation and feasibility study, they are in a much stronger position than local residents to influence the cleanup process. While PRPs and the regulatory agencies have the institutional capacity to engage in cleanup discussions for years (this is, after all, their full-time job), much of the public does not.

At Abex and Industri-Plex, for example, the local community has had very little involvement in the development of institutional controls, which were devised in negotiations that

led to the consent decree rather than in the more public forum that precedes the ROD. The discussion of institutional controls was generally closed to the local communities at these two sites—the public can be asked to attend only if the negotiating parties agree. It is unlikely in the thirty-day comment period afforded them that the public will be able to effectively evaluate many of the assumptions in the agreements about the viability of institutional controls. At Abex, the community's mistrust of the amended remedy and the motives of the PRPs and EPA in devising institutional controls arose in part from the community's exclusion from the process.

Recommendations

The major findings of our report suggest two different categories of recommendations. The first category pertains to the regulatory underpinnings of the Superfund program—the requirements of the remedy selection process as articulated in CERCLA and the National Contingency Plan (NCP). Many of the findings suggest the need for revisions to CERCLA and the NCP to clarify the role of land use in the remedy selection process, integrate the development and enforcement of institutional controls into the cleanup process, and, finally, invigorate the agency's public outreach and involvement program. We focus here on specific recommendations for changes to the NCP, although arguably these same changes could be made to CERCLA as well.

Our recommendations focus on the NCP for three reasons. First, it could well be years before Congress successfully reauthorizes Superfund. Because of the fact that land use-based remedies are being selected now, we believe it is important that the regulations for the program, the NCP, catch up with the reality of the program as it is currently being implemented. Second, the NCP is *the* regulatory blueprint for the program. As such, it is the major source of information on the workings of the remedy selection process, and the first document that any stakeholder would consult to learn about the program's requirements. Currently, much of the policy regarding land use-based remedies is spelled out in EPA's 1995 land use directive.[128] This is not sufficient, as the directive is purely advisory to EPA staff, is less readily accessible to outside parties, and does not have the force of law. As such, it is not binding on EPA.

The use of institutional controls—no matter what their flaws—is here to stay in the Superfund program. Indeed, EPA has been selecting containment remedies at a large number of NPL sites since the program began in 1980, and the reasons for doing so— limitations of remedial technologies, the large extent of contamination at some sites, and the policy choice in the 1980s to limit off-site treatment of hazardous substances—are still factors that inform cleanup decisions, and are legitimate ones. Given these circumstances, it is critical that the remedy selection process be structured in such a way as to make the choices about alternative remedies more transparent, to better anticipate at what points and under what circumstances institutional controls may fail, and to provide opportunities for those in the local community who are most likely to be affected by the failure of institutional controls to participate more fully in cleanup decisions.

The second category of recommendations is, of necessity, much more general because it stems from a more complex set of issues—federalism, property rights, and the evolving institutions and culture of local land use regulation. These issues become part of Superfund cleanups when land use considerations, notably institutional controls, become more central to site remedies. The concerns raised in this report suggest that as institutional controls become more central to cleanup, EPA will have less direct authority to ensure protective remedies over the long-term. This is because the long-term regulatory presence at NPL sites will be turned over to state and local governments, as they will likely have the responsibility for enforcing institutional controls. The second set of recommendations addresses the need to develop institutional capacity to assure long-term effectiveness of institutional controls and to maintain a much needed regulatory presence at those Superfund sites where residual contamination presents risks to human health.

1. **EPA should revise the National Contingency Plan to address the role of land use in remedy selection, including incorporating the development of institutional controls into the formal remedy selection process.**

Even absent a major reauthorization to Superfund, EPA can—and should—clarify the role of land use in the selection of site remedies. With the use of institutional controls and land use–based remedies becoming more common, it is critical that the NCP identify specific actions that the agency must take when linking land use and remedy selection. These include: (a) discussing future use possibilities with local officials and the public; (b) specifying the type and legal basis of institutional controls in the ROD; (c) identifying what entity will have the responsibility for enforcing the institutional controls; and (d) identifying the type of process required if the site owner desires a change in the selected land use and/or institutional controls.

The reason for incorporating these requirements in the NCP is twofold. First, putting these requirements in the NCP will increase the transparency of the Superfund remedy selection process. As noted earlier, incorporating land use in remedy selection involves some cost-risk trade-offs, and these should be explicit. It also is critical that the same level of attention be paid to the long-term reliability of institutional controls as is paid to the selection of the technical aspects of a remedy itself—because these two components are inextricably linked. Thus, as part of the remedy selection process, EPA should identify the legal basis for institutional controls as well as the mechanisms for enforcing them. The second reason it is important to incorporate these changes into the NCP is to ensure that a full public record is available regarding institutional controls, as well as meaningful opportunity for public comment. As noted earlier, the details of institutional controls are often developed in consent decrees, where the public's right to participate is, in most cases, curtailed. The selection of institutional controls should be part of the formal remedy selection process and, therefore, subject to the same notice and comment and administrative record requirements as is required for the other elements of the remedy selection process.

2. In consultation with state and local governments, EPA should develop a strategy (ultimately codified in the NCP) for ensuring effective long-term regulatory oversight of Superfund sites where contamination remains at levels that present a risk to public health even after the remedy is "complete."

Over the past ten to fifteen years, most of the attention of EPA and its external critics has been focused on the remedy selection provisions of the Superfund program. Much less attention has been paid to assuring that, once implemented, remedies will remain protective over the long-term. This focus made sense in the early years of the program. Now, however, cleanups have been completed at one-third of NPL sites, and at two-thirds of NPL sites final cleanup plans have been approved.[129] Hundreds of sites on the NPL are categorized as "construction complete" and are not expected to be deleted from the NPL because they will require long-term operations and maintenance activities to ensure protection of public health and the environment. In other words, it will not be possible to "walk away" from many sites on the NPL. Two key issues need to be addressed: (a) what organization should be responsible for monitoring, evaluating, and enforcing institutional controls? (b) who will pay for the staff to conduct these activities?

Although it is unclear what institution, or institutions, will bear these long-term responsibilities and how they will be financed, several alternative arrangements that might increase the effectiveness of institutional controls should be evaluated. One alternative would be to create a new office within EPA (or a new agency) whose sole responsibility would be long-term oversight of contaminated sites. More creatively, EPA or PRPs could establish local trusts to monitor the effectiveness of institutional controls at Superfund sites. These trusts could be financed by PRPs at enforcement-lead sites to monitor compliance with the terms of consent decrees and RODs.[130] Another approach would be to provide for a federal hazardous substance easement (as was done in H.R. 2500), modeled after conservation-related easements in federal statutes, such as the Land and Water Conservation Fund Act of 1965[131] or the National Soil Conservation Program.[132] Still another mechanism would be to require permits to serve as an institutional control for a site in place of less reliable property law restrictions and local zoning controls.[133] In addition, CERCLA could require EPA to review land use controls at NPL sites every three years (or some relatively short period) and stipulate damages against landowners who violate property use restrictions specified in consent decrees or in RODs.

In summary, many alternatives should be considered and evaluated—the critical step is for EPA to take on the challenge of solving the problem of ensuring protection after the technical elements of the remedy are implemented. This will require researching and evaluating a range of options and then putting in place those that seem most promising.

* * * * *

Throughout this report, we have raised a number of concerns about the notion of integrating future land use more fully into the remedy selection process. Our recommendations are intended to address some of these concerns. Some readers will, of course, differ with our findings and recommendations. It is worth pointing out, however, the common thread that runs

throughout our conclusions—the need for a more transparent and deliberative remedy selection process. Opting for land use–based remedies without anticipating the complications that may follow could lead to another Superfund backlash, where this year's push for land use–based remedies becomes next year's push for permanent cleanups. The Superfund program has already been buffeted about many times during its first seventeen years. What Superfund needs now is a program that will stay the course.

# # #

ENDNOTES

[1] Pub. L. No. 96-510, 94 Stat. 2767 (1980) (codified as amended at 42 U.S.C. §§ 9601-9675 (1988 & Supp. IV 1992)).

[2] CERCLA 121.

[3] Data based on EPA's "*Superfund Pipeline Analysis*" as of January 31, 1997, provided by EPA staff. Some number of these sites may be delisted at a later date, but this information is not available.

[4] Frank Popper, *The Politics of Land-Use Reform,* (Madison: University of Wisconsin Press, 1981), p. 8.

[5] George Wyeth, "Land Use and Cleanups: Beyond the Rhetoric," *Environmental Law Reporter, News & Analysis 26 (1996): 10358.*

[6] National Commission on Superfund, *Final Consensus Report of the National Commission on Superfund,* (Washington, D.C.: The Keystone Center and the Environmental Law Center of Vermont Law School, 1994).

[7] U.S. Environmental Protection Agency, *Land Use in the CERCLA Remedy Selection Process,* OSWER Directive No. 9355.7-04 (Washington, D.C., 1995). It should be noted that this directive is purely advisory and does not have the force of law.

[8] Pub. L. No. 99-499, 100 Stat. 1613-1781 (codified as amended at 42 U.S.C. §§ 9601-9675 (1988 & Supp. III 1991)).

[9] CERCLA 121 (b) (1).

[10] Section 121 of CERCLA requires EPA to review other federal and state environmental laws to determine the "applicable or relevant and appropriate requirements" that could be used to set cleanup standards at Superfund sites.

[11] Milton Russell, "Contamination or Risk: Cost Implications of Alternative Superfund Configurations" (paper presented at the American Economics Association meeting, Washington, D.C., January 7, 1995), p. 2.

[12] Clean Sites, *A Remedy for Superfund: Designing a Better Way of Cleaning Up America* (Alexandria, Va.: Clean Sites, 1994); Clean Sites, *Improving Remedy Selection: An Explicit and Interactive Process for the Superfund Program* (Alexandria, Va.: Clean Sites, 1990).

[13] Mary R. English and others, *Stakeholder Involvement: Open Process for Reaching Decisions About the Future Uses of Contaminated Sites,* Final Report (Knoxville: University of Tennessee, Waste Management Research and Education Institute, 1993); U.S. General Accounting Office, *Nuclear Cleanup: Completion of Standards and Effectiveness of Land Use Planning are Uncertain,* Report to the Chairman, Committee on Government Affairs, U.S. Senate, U.S. GAO/RCED-94-144 (Washington, D.C., August 1994).

[14] Fred Hansen, Testimony before the House Subcommittee on Transportation and Hazardous Materials of the Committee on Energy and Commerce, 103rd Cong., 2nd Sess., 3 February 1994, p. 261.

[15] Jerry Taylor, Testimony before the House Subcommittee on Water Resources and Environment of the Committee on Transportation and Infrastructure, 104th Cong., 1st Sess., 22 June 1995, p. 789.

[16] Remarks of Richard Cavagnero, Acting Chief, Waste Management Branch, EPA Region 1, quoted in T. Tondro, "Reclaiming Brownfields to Save Greenfields: Shifting the Environmental Risks of Acquiring and Reusing Contaminated Land," *Connecticut Law Review* 27 (1995): 813.

[17] Probst and others, *Footing the Bill for Superfund Cleanups: Who Pays and How?*, (Washington, D.C.: The Brookings Institution and Resources for the Future, 1995), p. 35.

[18] Ibid, p. 38.

[19] 62 *Federal Register* 15573, April 1, 1997.

[20] The enabling legislation for Superfund consists of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA).

[21] The cleanup provisions of CERCLA (1980) were amended by SARA in 1986.

[22] CERCLA 121(b)(1).

[23] CERCLA 121(b)(1).

[24] CERCLA 121(b)(1)(G).

[25] U.S. General Accounting Office, *Superfund: Operations and Maintenance Activities Will Require Billion of Dollars*, Report to Ranking Minority Member, Committee on Commerce, House of Representatives, GAO/RCED-95-259 (Washington, D.C., 1995) p. 5.

[26] CERCLA 121(b)(2)(A)(i) and (ii).

[27] U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, OSWER Directive 9355.3-01 (Washington, D.C., 1988) pp. 2-9.

[28] Ferris, L. and D. Rees, "CERCLA Remedy Selection: Abandoning the Quick Fix Mentality," *Ecology Law Quarterly* 21 (1994): 785-851.

[29] Lawrence J. Dyckman, Statement before the House Subcommittee on Water Resources and Environment, Committee on Transportation and Infrastructure, *Superfund: EPA's Use of Risk Assessments in Cleanup Decisions*, 104th Cong., 1st Sess., 22 June 1995, p. 7.

[30] Ibid., p. 7.

[31] Curtis Travis, Testimony before the Senate Subcommittee on Superfund, Waste Control and Risk Assessment, 104th Cong., 1st Sess., 5 April 1995; Russell, "Contamination or Risk."

[32] 40 C.F.R. § 300.430(a)(1)(i).

[33] 40 C.F.R. § 300.430(a)(1)(iii)(A).

[34] 40 C.F.R. § 300.430(a)(1)(iii)(B).

[35] 40 C.F.R. § 300.430(a)(1)(iii)(C).

[36] 40 C.F.R. § 300.430(a)(1)(iii)(D).

[37] J. S. Hirschhorn, "Definition and Analysis of Stubborn Superfund Problems," in *Working Papers on Superfund Reform* (Alexandria, Va.: Clean Sites, 1992), p. 73.

[38] Quoted in *Working Papers on Superfund Reform*, Appendix B, p. 7.

[39] U.S. Environmental Protection Agency, *The Facts Speak for Themselves: A Fundamentally Different Superfund Program* (Washington, D.C., 1996), p. 1.

[40] For clarity of discussion, throughout the chapter we refer to EPA as the lead agency, although the state can be designated the lead agency on a site-by-site basis.

[41] U.S. Environmental Protection Agency, *The Remedial Investigation, Site Characterization and Treatability Studies*, OSWER Directive No. 9355.3-01FS2 (Washington, D.C., 1989), p. 2.

[42] National Oil and Hazardous Substances Pollution Contingency Plan, 55 *Federal Register* 8710 (Preamble discussion).

[43] Ibid.

[44] Transcript of statement of Carol M. Browner, Administrator, U.S. Environmental Protection Agency, before the Subcommittee on Water Resources and Environment of the House Committee on Transportation and Infrastructure, 105 Cong., 1 Sess., March 12, 1997, p. 3.

[45] U.S. Environmental Protection Agency, *Land Use in the CERCLA Remedy Selection Process*, p. 5. Of course, at a site where the future use is likely to be contested, discussions with the site owner, the municipality, and the neighbors abutting the property may lead to more than one reasonably anticipated future use of the site; the land use document does not provide guidance to help site managers address this problem apart from involving the public early in the remedy selection process.

[46] U.S. Environmental Protection Agency, *Land Use in the CERCLA Remedy Selection Process.*

[47] U.S. Environmental Protection Agency, *Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors,"* OSWER Directive 9285.6-03 (Washington, D.C., 1995), p. 15.

[48] See K. Walker and others, "Confronting Superfund Mythology," in *Analyzing Superfund*, ed. R.L. Revesz and R.B. Stewart (Washington, D.C.: Resources for the Future, 1995), p. 40. Occupational scenarios accounted for roughly one-third of the maximum risks at sixty-three NPL sites reporting soil risks. The authors claim, "Restricting the use of residential development as the default land use in favor of more "realistic" and perhaps more lenient land use assumptions involving industrial use of the site may not always lead to less cleanup."

[49] U.S. Environmental Protection Agency, *Risk Assessment Guidance for Superfund: Volume I. Human Health Evaluation Manual (Part A),* Interim Final Report, EPA/540/1-89/002 (Washington, D.C.: U.S. EPA Office of Emergency and Remedial Response, 1989) [hereinafter called *RAGS*], p. 1-1.

[50] U.S. Environmental Protection Agency, *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*, OSWER Directive 9355.0-30 (Washington, D.C., 1991).

[51] Ibid.

[52] Ibid.

[53] *RAGS,* p. 8-2.

[54] *RAGS,* pp. 8-11 to 8-15.

[55] U.S. Environmental Protection Agency, *Role of Baseline Risk Assessment.*

[56] *RAGS,* p. 8-25.

[57] Institutional controls, in theory, can help EPA manage risks by preventing an individual's exposure to contaminants. These controls include deed restrictions, deed notices, permits for well drilling, and so forth, and are evaluated later in the remedial process.

[58] U.S. Environmental Protection Agency, *Human Health Evaluation Manual: Part B. "Development of Risk-Based Preliminary Remediation Goals,"* OSWER Directive 9285.7-01B (Washington, D.C., 1991), p. 1.

[59] For carcinogens, risk-based PRGs are set initially at the concentration that will limit an exposed individual's incremental lifetime risk of cancer to one in one million, the risk level specified by the NCP as the point of departure for determining remediation goals. For noncarcinogens, this concentration level is set at a hazard index of one.

[60] C.F.R. §300.430(e)(9)(iii). The two threshold criteria for remedy selection are overall protection of human health and the environment and compliance with ARARs.

[61] Under CERCLA 121(f)(1)(G), the lead agency will seek the support agency's comments on the proposed plan prior to it being made available to the public.

[62] C.F.R. §300.430(f)(3)(i)(C). The comment period can be extended beyond thirty days.

[63] C.F.R. §300.430(f)(3)(i).

[64] U.S. Environmental Protection Agency, *Interim Guidance on Superfund Selection of Remedy,* OSWER 9355.0-19 (Washington, D.C., 1986).

[65] Ibid.

[66] C.F.R. §300.435(c)(2).

[67] For remedies seeking to restore contaminated groundwater and surface water the operations and maintenance clock starts ten years after the remedy is fully implemented.

[68] U.S. General Accounting Office, "EPA's Community Relations Effort Could be More Effective," Report to Congressional Requesters, U.S. GAO/RCED-94-156 (Washington, D.C., April 1994).

[69] It is worth noting that all the major Superfund reauthorization bills (H.R. 3800, S. 1285, H.R. 2500, and now S. 8) have new public involvement titles that address these issues.

[70] We completed our work on the case studies in August of 1996. Thus, it is possible—and in fact likely—that there have been new developments regarding the sites that are not reflected in our descriptions here.

[71] See series of well-known U. S. Supreme Court cases (*Dolan v City of Tigard, Nollan v California Coastal Commission, Lucas v South Carolina*) over the last ten years.

[72] Copies of the discussion papers (Abex, #97-26; Industri-Plex, #97-27; and Fort Ord, #97-28) can be found on our web site (http://www.rff.org.) or ordered from RFF publications (202-328-5025).

[73] Levels in excess of 500 mg/kg in residential areas are considered a risk to human health. For areas zoned commercial/industrial, EPA considers soil concentrations of more than 1,000 mg/kg unsafe.

[74] Based on the findings of the draft RI/FS report, EPA ordered the Abex Corporation to perform a second removal action in March of 1992. The EPA order required Abex to excavate and remove additional contaminated surface soil in the Washington Parh Housing Project and the Effingham playground.

[75] U.S. Environmental Protection Agency, *EPA Superfund Record of Decision Amendment,* EPA/AMD/R03-94/190 (Washington, D.C, 1994).

[76] Administrative record #AB500493 [on file with Robert Hersh, Resources for the Future].

[77]CERCLA 120(h); and Defense Authorization Amendments & Base Closure and Realignment Act of 1988 (p. 2.100-526); and Defense Base Closure and Realignment Act of 1990 (P.L. 101-510, title xxix, part A).

[78] Transcript of RAB meeting, February 1994, pp. 41–43 [on file with Robert Hersh, Resources for the Future].

[79] Transcript of RAB meeting, January 26, 1995, p. 13 [on file with Robert Hersh, Resources for the Future].

[80] Quoted in Charles Bennett, *Risks in the Environment: How to Assess Them* (Burlock, Ontario: Burlock Publications, 1996), p. 4.

[81] Thomas Davis, *Ensuring the Security of Waste on Site: The Problem of Institutional Controls*, Draft Report for U.S. EPA (Washington, D.C., 1994), p. 6.

[82] Sobotka & Company, Inc., *Implementation of Institutional Controls at Superfund Sites, Final Draft*, prepared for Office of Policy Analysis, U.S. EPA (Washington, D.C., 1989), p. i.

[83] A. A. Schmid, "Analytical Institutional Economics," *American Journal of Agriculture Economics* 54 (1972): 892.

[84] For an extended discussion of a land use ethic, see T. Beatley, *Ethical Land Use: Principles of Policy and Planning* (Baltimore, Md.: Johns Hopkins Press, 1994); and R. Platt, *Land Use and Society: Geography, Law, and Public Policy* (Washington, D.C.: Island Press, 1996).

[85] According to a recent Environmental Law Institute report, although Oregon has some of the most comprehensive planning requirements in the country, requiring municipal planning boards to submit local land use plans to the state, state officials in Oregon found that a housing development had been built on top of a closed landfill. Private wells in the subdivision were found to be contaminated. The state previously had notified the locality that development of the site was forbidden. See *Institutional Controls in Use* (Washington, D.C.: Environmental Law Institute, 1995).

[86] 42 U.S.C. 9604(a)(1), 9606(a).

[87] 42 U.S.C. 9604(j)(1).

[88] 40 C.F.R. §300.430(a)(1)(iii)(d).

[89] Claudia Kerbawy, telephone interview with Robert Hersh, November, 1995. Chief of 307, Environmental Response Division, Michigan Department of Environmental Quality, Lansing, Michigan.

[90] T. Davis, *The Problem of Institutional Controls*, p. 14.

[91] Ibid., p. 14.

[92] Ibid., p. 13.

[93] Ibid., p. 14. The study, "Strategic Issues Analysis Project," based its findings on information from the ROD Information Directory database (the RID database) and a survey of remedial project managers.

[94] Ibid., p. 16. In addition, the study found that other federal agencies implemented 1% of institutional controls at the sites surveyed, followed by a "combination of implementers" (5.5%) and "undetermined implementers" (21%).

[95] Land use laws vary from state to state, but in all states local governments derive their land use powers from state enabling legislation.

[96] For a more extensive discussion of private property law restrictions and how courts treat proprietary controls, see D. Coursen, "Institutional Controls at Superfund Sites," *Environmental Law Review* 23 (1993): 10279; L. D. Thanheiser, "The Allure of a Lure: Proposed Federal Land Use Restriction Easements in Remediation of Contaminated Property," *Boston College Environmental Affairs Law Review* 24 (2) (1997): 271–345; G. Wyeth, "Land Use and Cleanups"; J. Pendergrass, "Use of Institutional Controls as Part of a Superfund Remedy: Lessons from Other Programs," *Environmental Law Review* 26 (1996): 10109; J. Green, *Enforcement of Institutional Controls at Closing Military Bases: Preliminary Evaluation and Recommendations*, Draft, (Washington, D.C., 1996); K. J. Ayers, "The Potential for Future Use Analysis in Superfund Remediation," *Emory Law Journal* 44 (1995): 1503.

[97] J. Pendergrass, *Institutional Controls in Use* (Washington, D.C.: ELI, 1995), p. 6.

[98] N. Robinson, *Environmental Regulation of Real Property,* pp. 6-16.

[99] K. J. Ayers, "Future Use Analysis in Superfund Remediation."

[100] U.S. Environmental Protection Agency, Office of General Counsel, "Use of Institutional Controls at Superfund Sites," Memorandum from David F. Coursen to Howard F. Corcoran (Washington, D.C., 1992).

[101] Ibid., p. 3.

[102] H.R. 2500, 104th Cong., 1st Sess.

[103] R. Platt, *Land Use and Society,* p. 234.

[104] E. D. Kelly, "Zoning," in *The Practice of Local Government Planning*, 2nd ed., ed. F. S. So and J. Getzels (Washington, D.C.: ICMA Training Institute, 1988).

[105] D. J. McCarthy, Jr., *Local Government Law* (St. Paul, Minn.: West Publishing Co., 1990).

[106] J. Dubin, "From Junkyards to Gentrification: Explicating a Right to Protective Zoning in Low-Income Communities of Color," *Minnesota Law Review* 77, no. 4 (1993): 739; F. Popper, *Politics of Land-Use Reform*.

[107] E. D. Kelly, "Zoning," p. 258.

[108] T. Lowi, *The End of Liberalism: Ideology, Policy, and the Crisis of Public Authority* (New York: Norton, 1969).

[109] R. Bernhardt, *Real Property*, 3rd ed. (St. Paul, Minn.: West Publishing Co., 1993), p. 429.

[110] B. Collingsworth, *The Political Culture of Planning* (New York: Routledge, 1993), p. 47.

[111] Ibid.

[112] Ibid.

[113] Claudia Kerbawy, telephone interview with Robert Hersh, November, 1995.

[114] E. D. Kelly, *Enforcing Land Use Controls,* Planning Advisory Service, Report Number 409 (Chicago: American Planning Association, 1988), p. 4.

[115] Interview with Woburn local government officials, September, 1995.

[116] Bob Harding, telephone interview with Robert Hersh, November, 1995. General Services Administration (GSA) staffer, on temporary assignment to EPA Superfund office.

[117] For an extensive discussion on this point, see E. D. Kelly, *Enforcing Land Use Controls.*

[118] Association of State and Territorial Solid Waste Management Officials (ASTSWMO), *Survey of States on Institutional Controls at Federal Facilities* (Washington, D.C.: November 1996); and International City/ Council Management Association (ICMA), *ICMA Draft Preliminary Summary of Findings of Institutional Controls Study* (Washington, D.C.: November 1996).

[119] ICMA, *ICMA Draft Preliminary Summary of Findings of Institutional Controls Study.* p.1-2.

[120] Association of State and Territorial Solid Waste Management Officials (ASTSWMO), *Survey of States on Institutional Controls at Federal Facilities,* p. 1.

[121] Carol M. Browner, Administrator, U.S. Environmental Protection Agency, Testimony before the House Subcommittee on Water Resources and Environment of the Committee on Transportation and Infrastructure, 105th Cong., 1st Sess., 12 March 1997, p. 3.

[122] Section 102, H.R. 2500, 104th Cong., 2nd Sess. (1996); Section 402, S. 1285, 104th Cong., 2nd Sess. (1996).

[123] Section 401, S.8, 105th Cong. 1st Sess. (1997)

[124] Ibid.

[125] U.S. Environmental Protection Agency, *Superfund Administrative Reform Fact* Sheet (Washington, D.C. May 25, 1995).

[126] U.S. General Accounting Office, *Superfund: EPA's Community Relations Efforts Could Be More Effective*, GAO/RCED-94-156 (Washington, D.C., 1994); Clean Sites, *Remedy for Superfund*.

[127] National Commission on Superfund, *Final Consensus Report of the National Commission on Superfund*.

[128] U.S. Environmental Protection Agency, *Land Use in the CERCLA Remedy Selection Process.*

[129] U.S. Environmental Protection Agency, *Superfund Facts: The Program at Work*, (Washington, D.C., May 7, 1997). p.1.

[130] There are numerous examples of this in the field of conservation. Land trusts are formed to conserve open space and maintain the rural character of landscapes. Typically the trust is given a partial interest in the property to enforce the restrictions of a conservation easement.

[131] 16 U.S.C. §§ 460 1-4 to 460 1-11 (1988).

[132] 16 U.S.C. § 590a (1988).

[133] For a more extensive discussion of permitting at NPL sites, see G. Wyeth, "Land Use and Cleanups."

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