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CLEANING UP SUPERFUND:
THE CASE FOR STATE ENVIRONMENTAL LEADERSHIP

by
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EXECUTIVE SUMMARY

The nation has a number of programs dealing with the cleanup of contaminated waste sites. Among the more important are the federal Superfund,[1] Resource Conservation and Recovery Act (RCRA) corrective action, underground storage tank, and various state superfund-type programs.

The Superfund program has been, by far, the most visible of the nation's site remediation programs. It has been highly controversial almost from its inception in 1980, with most comments on Superfund being quite negative. Only about 250 of 1,300 sites have been cleaned up in the past 15 years, and a large fraction of expenditures has been used for legal proceedings. Congressional hearings are now underway with the goal of amending and reauthorizing the statute this year.

Unlike most federal environmental programs, an alternative approach to Superfund is already in place and appears to be doing a much better job; this approach involves the 40-plus state superfund-type programs. Briefly, many of the state programs are cleaning up sites at a fraction of the time and cost of the federal Superfund.

For example, the states are spending about $700 million annually working on about 11,000 sites, while the EPA spends approximately $1 billion annually dealing with about 1,000 sites.

In this paper, both the federal Superfund program as well as key state activities are briefly reviewed. Then, key how-to steps are provided with the goal of turning much of Superfund over to willing and able states. Specific recommendations are proposed for state certification, funding provisions, EPA's continued role, and modification of the Superfund statute.

[1] A capital "S" in Superfund will refer to the federal program, while the term superfund or superfund-type will mean state cleanup programs.

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I. THE FEDERAL SUPERFUND PROGRAM

A. What is Superfund?

The Comprehensive Environmental Response, Compensation and Liability Act, referred to as "CERCLA" or "Superfund," was enacted in 1980 in response to the Love Canal and other highly visible hazardous waste site problems. In 1986, CERCLA was extensively revised via the Superfund Amendments and Reauthorization Act (SARA).

The term Superfund derives from a $15-billion trust fund established to pay for cleanup and enforcement activities at waste sites by the Environmental Protection Agency (EPA). The fund is financed primarily by a tax on crude oil and certain commercially used chemicals.

Annual expenditures for the Superfund program include actual cleanup work by EPA and potentially responsible parties (PRPs), as well as large non-cleanup spending. This latter amount is primarily for so-called "transaction" costs, mainly various legal activities. A recent estimate places overall Superfund annual spending at approximately $4 billion, with cleanup and non-cleanup costs approximately equal.[2]

Using the enforcement provisions of Superfund, EPA endeavors to compel PRPs to clean up waste sites for which they are held liable. Cleanup activities can be either "removal" or "remedial" actions. The entire Superfund process is regulated by the National Oil and Hazardous Substances Contingency Plan (NCP). Key elements of Superfund are outlined below.

B. How Does a Site Become a Superfund Site?

EPA learns of releases (emissions, leaks, etc.) that may warrant Superfund response through both formal and informal channels. CERCLA notification requirements mandate that any person who knows of a hazardous substance release notify the federal government. EPA typically receives several thousand notifications per year regarding hazardous waste sites. A preliminary assessment (PA) and site inspection (SI) process is then used to whittle down such notifications to potentially serious sites.

EPA next uses a mathematical model, called the Hazardous Ranking System (HRS), to score the serious sites. The HRS considers such factors as waste characteristics, pathways for exposure, and likelihood of release to both public health and ecological receptors. Sites which score above 28.5 are eligible to become National Priority List (NPL) or "Superfund" sites. There are currently about 1,300 sites on the NPL. (See Figure 1 for approximate site distribution.)[3]

C. How Is Liability Determined?

Entities which generate, transport, or dispose of hazardous substances may be potentially responsible parties. PRPs are financially responsible for the costs of studying and cleaning up a site, as well as EPA's related administrative

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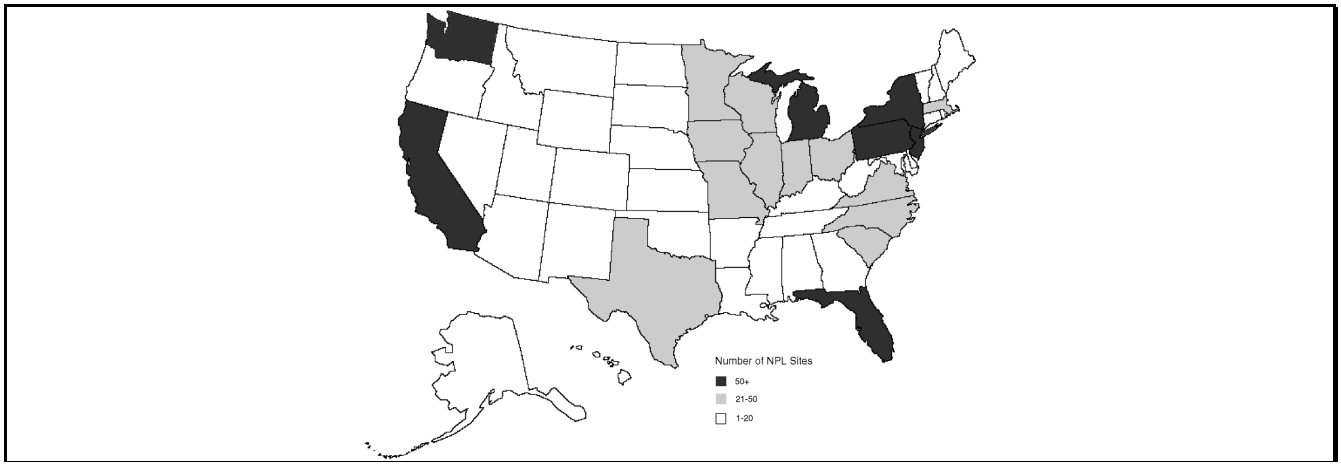
[2] Review of the National Strategies, Inc. Report: *The Costs of Superfund: A Financial Analysis*, Barents Group LLC, KPMG Peat Marwick LLP, June 13, 1995.

[3] Superfund Progress—Aficionado's Version, United States Environmental Protection Agency, Office of Solid Waste and Emergency Response, Superfund Program, August 1992.

and enforcement costs. They are liable for disposal that took place even before the law was passed, and that may have been lawful at the time.

A PRP's liability is not limited to its "fair share" of costs based on its wastes, but each PRP may be held liable for the entire cost of cleanup under the joint and several liability concept. Therefore, in order to negotiate with the government to perform the response activities, PRPs often organize and allocate the cleanup costs among themselves.



D. How Can Site Responses Occur?

Every Superfund site is unique, and cleanups must be tailored to the specific characteristics and requirements of each site, including the specific contaminants and the potential exposure situation at the site. EPA or PRPs can respond to hazardous substance releases in two ways as defined by CERCLA:

1. Removal Actions

Removal Actions are short-term actions which stabilize or clean up a hazardous site that poses a threat to human health or the environment. Typical removal actions include removing tanks or drums of hazardous substances from the surface, excavating contaminated soil, installing security measures at a site, or providing a temporary alternate source of drinking water to local residents.

2. Remedial Actions

Remedial actions are the study, design, and construction of longer-term and usually more expensive actions aimed at permanent remedies. EPA can take remedial actions only at sites on the NPL. Typical remedial actions include removing buried drums from a site, constructing wells to pump and treat ground water, incinerating wastes, or applying bioremediation techniques or other innovative technologies to contaminated soil.

E. How Are Site Remedies Selected?

For sites requiring remedial action, the EPA or PRP must conduct a remedial investigation and feasibility study (RI/FS). The remedial investigation defines the site characteristics, and the feasibility study analyzes options for remediating the site. Nine criteria[4] are used to test the cleanup options in order to select a site remedy.

[4] The Superfund Program: Ten Years of Progress, United States Environmental Protection Agency, Solid Waste and Emergency Response, June 1991.

The first two criteria are called "threshold criteria" because they are the minimum requirements that each alternative must meet to be eligible for selection as a remedy:

Œ Overall protection of human health and the environment. Will the remedy protect human health and the environment? How are risks eliminated or controlled by the remedy?

Compliance with applicable or relevant and appropriate requirements (ARARs). Does the remedy meet all such requirements of federal and state environmental laws and regulations? The term "applicable" refers, in this case, to the legally applicable federal or state requirements which deal with the circumstances at a contaminated site. More complicated are the "relevant and appropriate" requirements which address situations sufficiently similar to a Superfund site that in the judgement of regulators they should be applied at the site.

Criteria 3 through 7 are known as the "primary balancing criteria" and are used to identify major trade-offs among the alternatives:

Ž Long-term effectiveness and permanence. Does the remedy protect human health and the environment over time?

Reduction of toxicity, mobility or volume. How well do treatment technologies perform in reducing the threats at a site?

Short-term effectiveness. How well are the community and cleanup workers protected during the remedial action?

‘ Implementability. What is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution?

’ Cost. How much will the remedy cost, including estimated capital (e.g., supplies and equipment, and contractor costs) and operation and maintenance costs?

The final two criteria, which are determined after the proposed remedial action plan is generated, are called "modifying criteria" because new information or comments from the state or the community may modify the preferred alternative or lead to another response action being considered. Then the alternatives are compared against each other to identify the most effective remedy:

“ State acceptance. Does the state concur with, oppose, or have no comment on the preferred alternative?

” Community acceptance. Does the affected community concur with, oppose, or have no comment on the preferred alternative?

II. SUPERFUND'S MAJOR PROBLEMS

There are, of course, various positives and negatives associated with the federal Superfund program. Brief descriptions of these positives and negatives are provided below.

A. What Is Working?

Some activities which seem to be achieving beneficial results at reasonable costs include the following:

- The Superfund program maintains a fairly comprehensive list of sites potentially requiring remedial action. In recent years, this list has contained about 30,000 sites.

- The Superfund emergency removal program has been a success. Operating with about 5 percent of EPA's total Superfund budget, the removal program has dealt with over 2,000 obvious problems with a minimum of wasted motion and funding.

- The underground storage tank (UST) leak detection and cleanup program has worked reasonably well. The key cleanup decisions for USTs are made at the local level with nonprescriptive, common-sense decisions as to "how clean is clean." The UST program consists of elements from Superfund and the Resource Conservation and Recovery Act.

B. What Is Not Working?

- The major negatives are the excessive time and cost related to federal Superfund remedial studies and actions. The overall program has emphasized process over cost-effective cleanup activities, with the result that the average site cleanup costs approximately $25 to $30 million.[5] This can be compared with the original Superfund estimate in 1980 that $1.6 billion would be sufficient to remediate about 400 sites, or about $4 million per site.

- As a result of the long time frame from site discovery to final cleanup (about 10–15 years), Superfund sites are often kept in "limbo" for a decade or so. Even non-Superfund, or "brownfields," sites are sometimes severely impacted because of the fear that they may someday become Superfund sites.

- Confidence in federal remedy selection has generally been lacking.

- The perception of "unfairness" continues to haunt the federal Superfund program. Criticisms are aimed at such concepts as retroactive and joint and several liability, as well as enforcement against contributors of very small amounts of waste.

- The notoriety of many federal Superfund sites has attracted numerous toxic tort-type lawsuits.

[5] Extrapolated from Total Costs of Cleanup of Non-Federal Superfund Sites, Congressional Budget Office, January 1994.

III. STATE SITE REMEDIATION PROGRAMS

We live in a much different world than that of 1980 when Love Canal and other "horror stories" were front page news. There was very little federal or state experience with such sites in those days.

In addition to the extensive technical and other knowledge gained in the past 15 years, the most striking change is that over 40 states now have their own waste site cleanup programs. A July 1994 study by the Association of State and Territorial Solid Waste Management Officials for the EPA found that some 11,000 sites are active in some phase of their state's remedial process.[6] In addition to superfund-type cleanups, state programs also deal with cradle-to-grave management of hazardous wastes, leaking underground storage tanks, and other related waste programs.

These state programs are by no means identical to each other, or to the federal Superfund program. However, they are very active and have produced substantial results. Recognizing that there are terminology problems, the following important comparisons were made in the July 1994 report:

- 5,892 sites had completed removal actions—3,527 state/territory and 2,365 federal.
- 2,844 sites had remedial construction completions—2,689 state/territory and 155 federal.
- 20,134 sites were still in the remedial process—11,000 state/territory and 9,134 federal—from a completed preliminary assessment through a remedial action.

Most importantly, many states have shown that they can remediate sites in much less time and at lower cost than the federal program. In Minnesota, for example, cleanups routinely take two to three years and cost less than $5 million. New York, California, and Wisconsin have all remediated more than 200 sites—each comparable to the entire federal total of sites completed.

It is very difficult to make an explicit overall comparison of relative costs of federal versus state site costs. However, one can obtain a rough approximation by noting that EPA spends about $1 billion annually working on about 1,000 sites. In contrast, the states are spending about $700 million annually working on approximately 11,000 sites.[7]

The primary reason for the states' strong advantage is that hazardous waste sites are local problems. Unlike air pollution or surface water contamination, which may affect entire regions of the country, waste sites usually impact only the immediate environments of the contaminated site. The states are much closer to these site problems, the people involved, the local environment and economy, and land use issues.

Given these advantages, the states have also been more innovative than the EPA whose responsibility has been to operate a consistent *national* program. Some examples of state innovations are included below.

A. Minnesota Landfill Program

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[6] A Report on State/Territory Non-NPL Hazardous Waste Site Cleanup Efforts for the Period 1980-1992, Association of State and Territorial Solid Waste Management Officials/United States Environmental Protection Agency, Office of Solid Waste and Emergency Response, July 1994.

[7] "An Analysis of State Supported Superfund Programs, 50-State Study 1993 Update," United States Environmental Protection Agency, Office of Solid Waste and Emergency Response, December 1993.

The State of Minnesota found that municipal landfills which contained hazardous wastes were a particularly troublesome problem. Under superfund-type laws, most of the action was legal in nature as hundreds of potentially responsible parties, including small municipalities, began to sue, or be sued, over who should clean up what.

To solve this problem, the state created the Minnesota Landfill Cleanup program. Under this program, the state will take over the long-term care and future remediation of 106 closed municipal waste landfills that were permitted by the Minnesota Pollution Control Agency.

B. New Jersey Safe Harbor Program

Under a recent amendment to the Spill Compensation and Control Act, local or county governments are not subject to liability for a cleanup when taking title to properties. This amendment provides a safe harbor from liability for local or county government entities that acquire properties via condemnation, foreclosure, or other similar means.[8]

Other changes are being sought to further promote partnerships with local and county government entities, private parties, and the state to achieve reuse of industrial sites.

C. California Voluntary Cleanup Program

The California EPA's Department of Toxic Substances Control (DTSC) has introduced a streamlined program to get contaminated properties back to productive use. Corporations, real estate developers, and local and state agencies entering into Voluntary Cleanup Program agreements will be able to restore properties quickly and efficiently, rather than having their projects compete for DTSC's limited resources with other low-priority hazardous waste sites.

Prior to initiation of the Voluntary Cleanup Program, project proponents had few options for DTSC involvement in cleaning up low-risk sites. If a site presented a grave threat to public health or the environment, then it was listed on the state superfund list and the parties responsible conducted the cleanup under an enforcement order, or DTSC used state funds to do so. Because of staff resource limitations, DTSC was unable to provide oversight at sites which posed lesser risk or had lower priority.

The Voluntary Cleanup Program allows motivated parties who are able to fund the cleanup—and DTSC's oversight—to move ahead at their own speed to investigate and remediate low-priority sites. DTSC has found that working cooperatively with willing and able project proponents is an efficient and cost-effective approach to site investigation and cleanup.

IV. TURNING SUPERFUND OVER TO THE STATES

There are, of course, a number of key issues in how superfund-type activities can become, increasingly, a state activity. These include funding, legal and enforcement authorities, site cleanup criteria, the role of potentially responsible parties, and, undoubtedly, other matters.

It is very important to understand that state superfund-type programs are large and well established. To illustrate, the Appendix includes a summary table containing the following information as of the end of 1993: the number of state sites identified as needing action, state cleanup fund balances, and staffing. Given the active and generally effective state programs, it is recommended that willing and able states be given Superfund authority. A June 1995 survey of the Environmental Council of the States (ECOS) showed strong state support for this approach. Asked, "Do you favor a Superfund program that can be delegated to the states?," all 31 respondents said yes.[9]

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[8] Broader application of the "safe harbor" program, to include banks or other agents which acquire a site, may be in order to avoid encouraging excessive public-sector ownership.

[9] ECOS newsletter, August 1995.

An opportunity exists in the current Superfund reauthorization process in Congress to amend the law to deal with such key matters as the following.

A. State Certification

The new law should state that a governor may request that his or her state wishes to operate Superfund within its boundaries. In so doing, the governor would certify that the state has the necessary statutory and regulatory authority to:

- Fund its cleanup activities, including necessary state staffing.
- Provide sufficient enforcement authority to deal with those who caused the site contamination, including compelling site remediation.
- Provide for the necessary criteria to specify levels of cleanup for waste sites.
- Allow meaningful community involvement in the site investigation and remedy selection processes.

As part of the state certification, the governor would provide a short narrative as to why the state program is considered effective and give such basic information as the number of sites in the state program, the current cleanup time frames, and approximate cleanup costs per site.

The EPA would not approve or disapprove a state request, but simply facilitate the movement of the program to the state if the governor's certification contains the above elements. The state and EPA would need to work out a procedure for EPA and/or the state to complete any EPA-led work in progress in that state.

To illustrate the maturity and sophistication of many existing state cleanup programs, summaries of six such programs are provided in the Appendix. The programs outlined are those of California, Minnesota, New Jersey, New York, Ohio, and Texas. Emphasis in these write-ups is on state funding/staffing, cleanup criteria, public participation, and enforcement tools.

These state summaries illustrate the variety of approaches the states are using. These different approaches provide an ongoing laboratory of ideas. It would be a serious mistake for EPA, or the Congress, to micromanage the states and thus inhibit their ability to innovate and to tailor their programs to local conditions. The national consistency route has been tried, and found sadly lacking due to its inevitable focus on process, not results.

Finally, while many in Congress and elsewhere have problems with such legal concepts as retroactive and joint and several liability, it would also be a mistake to attempt federal preemption of these or other enforcement tools at the state level. Such preemption would likely result in many states refusing to accept the Superfund program, and could inhibit state innovations in enforcement.

The bottom line is that many states have learned what is required to achieve timely, cost-efficient site cleanups in their states, and they should be largely left alone to pursue what works best for them.

B. Funding Provisions

The most contentious issue in turnover of Superfund to willing and able states would almost certainly be the share of Superfund trust fund monies which the states should receive to assist with program implementation.

In thinking about how to allocate trust fund monies to certified states, the following key issues should be considered: 1) the concept should not be overly complex and, thus, take years to implement; 2) it should not leave de facto control with the EPA; 3) the approach should provide an incentive for the states to want to take the program; and 4) the concept should not encourage inefficiencies in the states (e.g., by providing "too much" money).

The following specific recommendations are offered on this subject:

- The current Superfund taxing authorities should probably be retained for the next few years until the new, largely state-run activities can be put in place.

- The amount of the trust fund allocated annually to certified states should be "by state" and not "by site." The states can set their own priorities within the amount of funds received.
- Some form of block grant-type approach should probably be adopted. This could be based on a straightforward proposition such as population (a rough indicator of industrial activity) or, perhaps, a percentage of the states' own waste site cleanup funding.

V. EPA'S RESIDUAL SUPERFUND ROLE

As more and more states voluntarily take over Superfund activities in their states, several issues should be recognized:

Œ All states will not want, or be able, to operate Superfund in their state. Most sites are in the dozen or so larger, industrial states and smaller states may not want to administer such a program for a handful of waste sites.

Several hundred sites are already well along in the federal process and, in some cases, the state and EPA may agree that it is more efficient for EPA to complete these sites. In general, it is wise to encourage as rapid a turnover as possible for the states willing and able to run their own program.

Ž The EPA's emergency removal program has worked well and this program should probably be continued in some fashion.

Thus, EPA's role should shrink rapidly over the next several years, but EPA would continue to manage cleanups where states do not want the program, finish projects in the federal pipeline, provide an emergency removal program, and continue certain research and technical development activities.

In order to improve the residual EPA program, as well as to provide a better model for state activities, the Superfund statute should also be amended in the following additional ways:

- Remove the preference for treatment in remedy selection. The objective should be *safe and protective* remedies with the use of treatment, or other methods. The current preference for treatment simply adds one additional, time-consuming hoop to jump through.

- Remove the ARAR provision from the statute. The development of "legally applicable and relevant and appropriate" standards has not worked well and has simply raised an additional burden for the states and EPA to deal with. (An option would be to leave in the "legally applicable" part, but if a statute or regulation is legally applicable that may not need to be restated.)

- Change the requirement for "permanent" remedies to "safe" ones.

- Explicitly state that expected land use should be a major consideration in remedy selection.

VI. FEDERAL FACILITIES

It is recommended that the states which have authority for private sites also be given regulatory responsibility for federal (e.g., DOE, DoD, etc.) facility remedial actions. The major advantages to this approach are:

- Consistency with private cleanups.

- Provision of state authority over what are essentially local environmental programs.

However, there are some proposed changes in the Superfund statute which would greatly assist in remediating federal facilities under the "new Superfund." These include:

- Designation of the federal agency as the primary day-to-day manager for both removal and remedial actions at their sites. The present committee (EPA, state, federal agency) approach has not worked well, with the result that federal cleanups are also taking far too long and costing too much. The federal agency should, of course, be bound by applicable laws and regulations, but should be allowed to reassert control over their sites and move cleanups much more rapidly. It should be "OK to clean up."

- Adoption of the other modifications mentioned earlier, including removal of preference for treatment and ARARs, replacement of "permanent" with "safe," and explicit consideration of land use as a factor.

VII. CONCLUSIONS

State programs working to remediate local hazardous waste sites have proven to be highly effective in terms of both dollars and time expended. These results are attributable to the local nature of hazardous waste sites and the ability of state-level organizations to bring fresh, innovative, and flexible approaches to bear on finding effective solutions to problems at these sites.

Adoption of the principles described in this paper need not require numerous, complex amendments to the present Superfund statute. That would simply reopen interminable discussions on such issues as joint and several liability, retroactive liability, and remedy selection. Rather, the amended Superfund statute should make it attractive for most states to operate their own cleanup programs under their own laws and regulations. With states as the major players in a new Superfund, much of the expense and complexity associated with the old Superfund could be avoided.

APPENDIX

A. State Cleanup Programs

In Table 1, a listing is provided of state superfund-type programs. Included in the table are the number of NPL sites in the state, the number of state sites needing attention, the balance in state cleanup funds, and staffing levels—all at the end of 1993.

In order to illustrate the variety and sophistication of state superfund-type programs, brief summaries are also provided of six well-developed state programs. These programs were selected to illustrate the variety of approaches which the larger, industrial states are taking to deal with such issues as funding, cleanup criteria, public participation, and enforcement. Most of the information contained in these summaries was derived from the EPA's December, 1993 report titled "An Analysis of State Superfund Programs, 50 State Study, 1993 Update." Their inclusion is not intended to imply a specific endorsement of these programs.

Table 1: State Superfund-Type Programs

EPA Region	State	NPL Sites	State Sites Needing Attention	State Fund Balance ($Millions)	State Staffing Levels
1	Connecticut	15	579	21.8	51
	Maine	10	160	5.7	29
	Massachusetts	30	5,867	23.6	260
	New Hampshire	17	250	3.0	8
	Rhode Island	12	60	2.0	34
	Vermont	9	1,291	1.5	21
2	New Jersey	109	12,894	161.5	668
	New York	85	680	905.4	343
	Puerto Rico	10	0	4.2	8
3	Delaware	19	89	4.0	32
	District of Columbia	0	0	0.0	1
	Maryland	12	343	14.0	34
	Pennsylvania	100	50	60.5	145
	Virginia	25	310	0.3	25
	W. Virginia	6	0	2.2	13
4	Alabama	14	125	0.4	23
	Florida	58	725	8.4	62
	Georgia	13	0	8.3	10
	Kentucky	20	500	5.0	23
	Mississippi	4	200	2.7	16
	N. Carolina	23	655	3.8	29
	S. Carolina	24	200	16.9	29
	Tennessee	15	157	6.2	51
5	Illinois	32	147	6.1	94
	Indiana	37	82	14.9	28
	Michigan	82	9,785	18.2	388
	Minnesota	43	184	5.3	114
	Ohio	36	771	34.7	115
	Wisconsin	40	565	24.0	100
6	Arkansas	10	101	6.2	2
	Louisiana	12	184	3.1	44
	New Mexico	12	220	0.1	32
	Oklahoma	11	0	0.3	11
	Texas	30	83	30.4	103
7	Iowa	24	200	1.0	10
	Kansas	15	200	1.9	18
	Missouri	23	163	5.8	40
	Nebraska	10	120	0.0	11
8	Colorado	19	0	13.2	32
	Montana	8	265	3.0	28
	N. Dakota	3	0	0.1	6
	S. Dakota	4	218	1.7	5
	Utah	13	31	0.4	33
	Wyoming	3	0	0.0	5
9	Arizona	11	65	3.7	29
	California	102	350	26.9	265
	Hawaii	3	0	0.2	15
	Nevada	1	145	6.0	26
10	Alaska	7	1,051	0.0	37
	Idaho	10	50	3.1	21
	Oregon	12	102	5.5	99
	Washington	52	628	46.3	114
	TOTALS	1,295	40,845	1,523.5	3,740

Source: Excerpted from “An Analysis of State Superfund Programs, 50-State Study 1993 Update,”United States Environmental Protection Agency, Office of Solid Waste and Emergency Response, December 1993.

B. California

Statutory authority for California's superfund-type program comes from the Hazardous Substance Account Act. This act, which includes the Hazardous Substance Cleanup Bond Act of 1984 and the Hazardous Substance Cleanup Financing Authority Act, establishes the site-mitigation program and provides for a cleanup fund.

The Site Mitigation Program, located within the Department of Toxic Substances Control (DTSC), is **staffed** with approximately 290 people. DTSC's Office of Legal Counsel and Criminal Investigation provides 10 attorneys, augmented by five to ten attorneys from the Attorney General's office. In addition, DTSC works closely with the California Water Resources Quality Control Board and the Regional Water Quality Control Boards. Site Mitigation Program funding is provided through the Hazardous Waste Control Account, federal grants, hazardous waste disposal fees, cost recovery, reimbursements, and activity fees. The annual program budget is approximately $60 million.

California **cleanup criteria** include acceptable risks, future land use, and the National Contingency Plan's (NCP) nine remedy-selection criteria. The state sets cancer risk levels at 10^{-4} to 10^{-6}, with 10^{-6} as a point of departure. Proposed remedies must be based on the effect of contamination on beneficial uses of resources, the effect of alternative remedial action measures on groundwater, site-specific characteristics, and cost effectiveness. The state has set maximum contaminant levels (MCLs) for water contaminants and air toxics. Cleanup levels are also guided by risk standard assessment, background levels, and EPA guidelines.

DTSC is required to hold at least one **public** meeting before approving a remedial action plan and must consider related public comments. Parties affected by a removal or remedial action are eligible to participate in DTSC's decisionmaking process. A schedule of site activities must be prepared and made available to the public.

California's **enforcement** tools include strict and proportional liability standards and treble punitive damages. Civil and administrative penalties up to $25,000 per day for order or agreement violation may be charged to a responsible party (RP). Criminal penalties up to $25,000 per day and/or up to one year in prison may be levied. Cooperating RPs may sue non-cooperating RPs for three times their share of cleanup costs. Any award is split equally between cooperating RPs and DTSC.

C. Minnesota

The Minnesota Environmental Response and Liability Act (MERLA) provides statutory authority for the State Fund. MERLA also provides for strict, joint and several liability, injunctive relief, civil penalties, cost recovery, and citizen suits.

The Minnesota Pollution Control Agency (MPCA) Ground Water and Solid Waste Division manages the state's superfund-type program with three sections and about 110 **staff** members. The Attorney General's office provides full-time attorneys to support MPCA's activities. The state's cleanup fund provides 90 percent of required administrative and cleanup funds with the remaining 10 percent coming from federal grants. The total annual program budget is approximately $30 million.

Cleanup decisions are based on criteria similar to the NCP. The most restrictive criteria are applicable at each site. MPCA uses ARARs and seeks a permanent cleanup. A 10^{-5} cancer risk factor, or Hazardous Quotient <0.2 for individual non-carcinogen contaminants or <1.0 for multiple contaminants, is applied.[10] Other criteria include health risk limits (HRLs) for drinking water contaminants, state groundwater cleanup levels, water quality criteria, MCLs, maximum contaminant level goals (MCLGs), and EPA guidelines.

[10] The Hazardous Quotient is the ratio of the exposure dose to the reference or "safe" dose of a chemical.

The entire cleanup process is **public**, including notification of RPs and approval of state actions at a public meeting of the Pollution Control Agency Board. A public relations officer is assigned to each site. MPCA holds public meetings after completion of the remedial investigation/feasibility study (RI/FS) to explain the proposed plan. Minnesota's **enforcement** program has strict, joint and several liability. Penalties up to $20,000 a day apply if a responsible party fails to take sufficient response action in accordance with MPCA requests. There is no provision for punitive damages.

In addition to the above "enforcement-based" program, Minnesota has developed two additional site remediation tools. The first is the Minnesota Voluntary Investigation and Cleanup (VIC) program. Under a 1988 law, any person may propose an investigation or cleanup of a piece of property that they own or intend to purchase or develop, regardless of whether it is a priority site under the state cleanup program. The MPCA will provide technical review and approval of these proposals on a first come-first serve basis. The cost of the services must be paid by the requesting parties.

The second is the Minnesota Landfill Cleanup program. Under this program, the state will take over the long-term care and future remediation of 106 closed municipal waste landfills that were permitted by the MPCA.

D. New Jersey

The New Jersey superfund-type program has as its statutory authority the Spill Compensation and Control Act as well as other hazardous discharge laws. The Act established a fund for cleanups and provided authority for emergency response, removals, remedial actions, enforcement, cost recovery, victim compensation, and damages. In addition, New Jersey's Industrial Site Recovery Act requires transferors of industrial facilities to clean up contamination.

New Jersey's Site Remediation Program is a part of the Department of Environmental Protection and oversees cleanups of contaminated sites in the state. It has a **staff** of over 600 persons. In addition, the Attorney General's Office provides some 25-30 attorneys for legal support of the remediation program. Funding for the program comes from the Spill Compensation Fund, reimbursements from potentially responsible parties, federal grants, and the state's bond fund. Annual expenditures are over $100 million.

The state's **criteria** for site **cleanups** include water quality criteria, MCLs and MCLGs from the federal Safe Drinking Water Act, background levels, risk assessments, EPA guidelines, and New Jersey's soil cleanup criteria (SCC) guidelines. For soil cleanups, the state may use the SCC or case-specific levels derived from risk assessments using EPA methodology. A cancer risk level of 10^{-6} is used. If SCC are determined to be below background levels, then the cleanup level is background.

The state has rules which provide for **public** participation. A Site Remediation Program Advisory Group is used to assist in program refinements and improvement. The Advisory Group includes industry, banking, realtors, consultants, environmentalists, and other stakeholders.

Enforcement against potentially responsible parties is through strict, joint and several liability. Civil penalties are authorized up to $50,000 per day per violation. Treble damages may be assessed through cost recovery actions.

E. New York

New York's superfund-type program derives its statutory authority from the Abandoned Sites Act of 1979, the State Superfund Act (1982), and the Environmental Quality Bond Act (EQBA) of 1986. The first Act mandates a statewide site inventory, provides order and cleanup authority, and authorizes provision of water supplies. The Superfund Act established the Hazardous Waste Remedial Fund which funds site cleanup and the state's match for the federal Superfund program. The EQBA authorized issuance of $1.2 billion in bonds to deal with inactive hazardous waste sites.

New York's program is administered by the Department of Environmental Conservation (DEC) with over 300 **staff** in two divisions. In addition, about 10 attorneys from the Attorney General's office and 80 Department of Health

staffers support the program's activities. The state cleanup fund finances about 92 percent of staff and administration costs, with seven percent of the remainder funded by federal grants, and one percent funded by the state general fund. Total annual expenditures are approximately $130 million.
Cleanup criteria used in New York's program include water quality criteria, MCLs, MCLGs, background levels, risk standard assessment, and EPA guidelines. If a site cannot be cleaned up to predisposal condition, DEC specifies generic soil cleanup objectives which are intended to eliminate all significant threats. A cancer risk level of 10^{-6} is used.

The statutes effective in New York require the DEC to develop a citizen participation program which includes a site-specific **citizen participation** plan, establishment of a local document repository, and creation of a public contact list. This program begins operation at the start of remedial investigation and continues through all stages of the remediation process. Descriptions of proposed actions/documents are mailed to citizens on the list, comments are solicited, and public meetings are held before actions or decisions can be finalized.

New York's **enforcement** authority includes orders for information and site access, subpoena authority, administrative order authority, consent order, and injunctive action authority. Strict, joint and several liability applies to responsible parties. Civil penalties of $25,000 per violation and $25,000 per day for continuing violations apply. Criminal penalties of $25,000 per day and/or one year imprisonment may apply as well. Both civil and criminal penalties double for a second violation.

F. Ohio

Statutory authority for Ohio's superfund-type program is derived from the Solid and Hazardous Waste Disposal Law. This Law contains provisions for two cleanup funds, the Hazardous Waste Cleanup Fund and the Hazardous Waste Facility Management Fund. In addition, it contains enforcement authorities and citizen suit provisions.

The cleanup program is managed by the Division of Emergency and Remedial Response in the Ohio Environmental Protection Agency (OEPA) with a **staff** of approximately 210 employees. In addition, three attorneys are available to the program through the Attorney General's Office. Funding is provided from state cleanup funds, federal grants, and solid waste disposal fees. The program's annual budget is about $18 million.

As **cleanup criteria**, Ohio uses MCLs wherever appropriate. If not applicable, the state uses risk assessments, water quality criteria, background, and EPA guidelines. Cumulative carcinogenic risk must be reduced to 10^{-4} to 10^{-6}, with 10^{-6} as the point of departure. Ohio's program conducts ecological risk assessments and bases cleanup criteria on the best available treatment technology. The state's "how clean is clean" policy calls for cleanup to risk-based levels or background.

In the area of **public participation**, general rules in the Ohio Administrative Code apply. The policy is to be consistent with the NCP in requiring a public comment period, responsiveness summary, public meetings, and establishment of an information reporting system.

Governing statutes do not address liability standards although OEPA has advocated strict, joint and several liability. **Enforcement** tools available include judicial search warrants for site access, administrative orders, injunctive actions, civil penalties, cost recovery, liens, criminal penalties in limited circumstances, and citizen suits. No punitive damages are available, but civil penalties up to $10,000 per day may apply.

G. Texas

Statutory authority for Texas' superfund-type program is derived from a number of sources. The Hazardous Substances Spill Prevention and Control Act established the Spill Response Fund. The Solid Waste Disposal Act established the Hazardous Waste Disposal Fee Fund, a priority list, and a treble damages provision. The Texas Water Code and Texas Administrative Code provide authority for voluntary cleanups. The Texas Health and Safety Code defines public participation requirements.

The program is managed by the Texas Natural Resource Conservation Commission's (TNRCC) Pollution Cleanup Division with a **staff** of over 100 employees. The TNRCC Legal Services Division provides an attorney to support the program's activities. Funding is from combined state and federal monies, with a total annual budget of about $40 million.

TNRCC has published, under Risk Reduction Standard 2, preliminary remediation goals for over 150 chemical constituents which serve as starting points to determine **cleanup levels**. Values are determined for each chemical by setting cumulative risk for ingestion, inhalation of volatiles, and inhalation of particulates at 10^{-6}. Soil values to protect groundwater are set at 100 times groundwater cleanup levels. Risk Reduction Standard 3 cleanup levels for air, surface and groundwater, and soil are determined through a site-specific process, use 10^{-6} as a goal, and require concentration to be consistent with risk between 10^{-4} and 10^{-6}. The state may also apply water quality criteria, MCLs, background levels, and EPA guidelines.

Texas Health and Safety Code requires **public** notice and comment on both site listing and remedy selection. As required by community interest, TNRCC meets informally with parties affected by cleanup activities.

Enforcement authority available to the state includes comprehensive order and injunctive authority, civil penalties of up to $25,000 per day, cost recovery, liens, de minimis settlement, mixed funding, and treble damages. The state applies strict, joint, and several proportional liability standards. Proportional liability is applied when the preponderance of evidence allows divisibility of liability.

ABOUT THE AUTHOR

Dr. J. Winston Porter is president of the Waste Policy Center (WPC) in Leesburg, Virginia. The WPC is a private research organization which deals with environmental management and policy issues. Dr. Porter is a frequent communicator on environmental issues, including recent op-ed pieces in the *New York Times* and the *Wall Street Journal*.

From 1985 to 1989, Dr. Porter was the Assistant Administrator for Solid Waste and Emergency Response at the Environmental Protection Agency (EPA). In this position, he was the national program manager for the Superfund and the RCRA (Resource Conservation and Recovery Act) programs. During his tenure, Dr. Porter testified at over 50 Congressional hearings, and was interviewed by many of the national TV news programs as well as major newspapers and news magazines.

Earlier, he was with the Bechtel engineering and construction organization, where he managed the environmental department, and later directed the master plan of the $20 billion Jubail Industrial City in Saudi Arabia.

Dr. Porter received his B.S. in chemical engineering from the University of Texas at Austin and his Ph.D. in the same field from the University of California at Berkeley.