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BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

Cleaning Up Hazardous Wastes: An Overview Of Superfund Reauthorization Issues

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COMPTROLLER GENERAL OF THE UNITED STATES

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To the President of the Senate and the
Speaker of the House of Representatives

The taxing authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (commonly known as Superfund) will expire at the end of fiscal year 1985. This report represents the culmination of our work to date on Superfund issues; as such, it discusses the status of the program and issues involved in the act's reauthorization, including

--the extent of the hazardous waste cleanup problem,

--cost estimates associated with cleaning up hazardous waste sites,

--accomplishments of the current cleanup process,

--options for addressing the "how clean is clean" issue, and

--the number of sites included under federal cleanup responsibilities.

Copies of this report are being sent to appropriate House and Senate Committees; the Administrator, Environmental Protection Agency; and other interested parties.

Charles A. Bowsher

Comptroller General
of the United States

Contents

EXECUTIVE SUMMARY

Toxic chemicals at thousands of hazardous waste sites across the country continue to seep into the nation's groundwater, contaminate the land, and poison the air. The 1980 Superfund Act sought to control this threat by providing a $1.6 billion cleanup fund accumulated largely from taxes on petroleum and certain chemicals. The taxing authority for this program expires in September 1985; this provides the Congress with the opportunity to assess the program's status and direction.

This report discusses major issues facing the Congress in deliberating reauthorization of the Superfund program. In analyzing these issues, GAO drew upon information developed in a series of 23 GAO reports on hazardous waste. Specifically, GAO presents information on

--the extent of the problem,

--cost estimates for cleaning up sites,

--accomplishments of the current cleanup process,

--options for addressing the "how clean is clean" issue, and

--the number of sites included under federal cleanup responsibilities.

BACKGROUND

The Superfund program represents a departure from most other environmental laws. Laws such as the Clean Water and Clean Air Acts give the Environmental Protection Agency (EPA) responsibility for setting national standards and ensuring compliance. States

themselves or reimburse the government for cleaning up the sites. Although EPA has responded to short-term emergency situations at non-priority sites, it considers cleanups at such sites to be primarily a state or local responsibility. (See pp. 45 to 57.)

RESULTS IN BRIEF

Although uncontrolled hazardous waste sites pose a substantial danger to human health and the environment, the scope of the hazardous waste problem, the degree of health risks involved, and the cost of correcting these problems are unknown. As of December 31, 1984, EPA had identified 19,368 hazardous waste sites, of which 538 have been designated as priority sites. Of these, 194 have no cleanup action currently underway or in the planning stage.

Under Superfund EPA has no mandate to set nationwide cleanup standards or oversee state-conducted cleanups. The absence of standards complicates an already lengthy, complex process for cleaning up hazardous waste sites. During Superfund's reauthorization, federal and state roles and responsibilities may need to be reassessed.

PRINCIPAL FINDINGS

Extent of the Problem

EPA and the states have given site discovery relatively little emphasis. Although EPA estimates that its inventory of potential sites may grow to 25,000, it acknowledges that a systematic discovery effort and a change in program emphasis toward cleaning up sites that received less emphasis earlier in the program, such as mining-related sites, could dramatically increase the program's size to over 378,000 additional sites.

The precise nature of the health risks posed by hazardous waste sites is also unknown. The Department of Health and Human Services has completed few Superfund-mandated health studies on the relationship between toxic substances and illness. (See pp. 5 to 16.)

Using alternative assumptions based on historical data and other available information, GAO projects that Superfund costs for priority sites in 1983 dollars could range from $6.3 billion to $39.1 billion and that these cleanups could take until fiscal year 2017. Also, the Department of Defense estimates that cleanup of its sites could cost an additional $10 billion. Since Superfund by law cannot be used to clean up federal facilities, Defense's costs must be funded through its budget. (See pp. 13 and 17 to 26.)

Status of Cleanup Process

The long-term cleanup process involves a series of activities such as performing technical studies and designing and implementing cleanup projects. EPA considers 10 sites to have received final cleanup action, and expects to take long-term cleanup actions at about 10 percent of the 19,368 known sites. (See pp. 27 to 36.)

"How Clean Is Clean?"

Neither the Superfund Act nor EPA regulations define hazardous waste site cleanup standards. Available solutions range from no action, to temporary containment of wastes, to total elimination. The option selected depends on the cost-effectiveness of the solution in relation to funds available for other site cleanup actions.

In the absence of specific hazardous waste standards, EPA considers applying other environmental laws in determining the extent of site cleanups. These other laws, however, do not address all of the substances and conditions found at sites. Part of the difficulty in setting standards is that little information is available on the risks posed by chemicals at these sites. (See pp. 37 to 44.)

Federal Limitations

Except for emergency actions, EPA limits its cleanup efforts to priority hazardous waste sites. Although EPA has not taken an active role at non-priority sites, some state governments have programs to clean up these sites. State resources, authorities, and capabilities, however, vary. This variance, coupled with the absence of cleanup standards, may result in the public's not

dangers of hazardous wastes. (See pp. 45 to 55.)

MATTERS FOR CONSIDERATION BY THE CONGRESS

During reauthorization deliberations several alternatives, including the following, are available for structuring the act:

(1) Make no change in the basic structure of the act. Superfund would continue to provide for cleanup at only the nation's worst hazardous waste sites on a priority basis, as resources will allow. EPA would not have responsibility for setting national standards or delegating cleanup functions to the states.

(2) Change the structure of Superfund more along the lines of previous environmental legislation, emphasizing permanent, long-term remedies and giving EPA responsibility for setting national standards for all hazardous waste sites. States could be delegated some or all cleanup functions, with EPA retaining oversight responsibility.

The information GAO has developed suggests that the Congress should consider the merits of changing the act's structure. The absence of national cleanup standards complicates an already lengthy, complex process for cleaning up hazardous waste sites. The lack of precise data on the health and environmental effects of hazardous waste sites makes standard setting difficult. Nevertheless, if we are to provide consistent site cleanup on a national basis, it is important that, where feasible, reasonably uniform criteria be established to govern both federal and state cleanup decisions.

GAO has made specific recommendations on the Superfund program in other reports. Those recommendations that are still open are discussed in this report.

AGENCY COMMENTS

In general, EPA agreed that the facts presented in this report were accurate and that the alternatives presented for congressional consideration were appropriate. EPA also provided detailed comments on specific sections of the report. These comments have been incorporated into the report where appropriate. (See ch. IV.)

ILLUSTRATIONS AND TABLES

ABBREVIATIONS

EPA	Environmental Protection Agency
ERRIS	Emergency Remedial Response Information System
GAO	General Accounting Office
NCP	National Contingency Plan
NPL	National Priorities List
OTA	Office of Technology Assessment

CHAPTER 1

INTRODUCTION

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, commonly known as "Superfund," was enacted on December 11, 1980, to provide for cleanup of the nation's uncontrolled hazardous waste sites. The act provides for a $1.6 billion fund for cleaning up these sites, to be accumulated over a 5-year period from taxes on petroleum and certain chemicals and from federal appropriations. The act's taxing authority will expire at the end of fiscal year 1985. Producing reauthorizing legislation that will deal effectively with the nation's hazardous waste problem is an important challenge facing the 99th Congress. This report represents the culmination of our work over the past several years on Superfund issues; as such, it is intended to provide a discussion of key issues involved in the act's reauthorization.

In addition to this introductory chapter, the report is divided into 5 additional chapters, each of which is structured around a distinct issue. The introductory chapter provides a general overview of the Superfund program. Appendixes I and II provide detailed background data on the Environmental Protection Agency's (EPA's) Superfund activities and our past Superfund reports, including all open recommendations.

EPA's implementing policies and procedures are contained in the National Contingency Plan (NCP). This plan, first published in 1968 under the Federal Water Pollution Control Act, initially outlined procedures for oil-spill cleanups. In 1982 EPA revised the plan to delineate (1) federal and state response authorities for abandoned or uncontrolled hazardous waste sites and (2) methods and criteria for when and to what extent a removal or remedial response should be undertaken.

The plan limits long-term permanent cleanup actions to sites included on the National Priorities List (NPL). This list designates the nation's worst known sites contaminated with hazardous substances. Priority list sites are determined by a national ranking system, and each state is allowed to designate a state priority site regardless of its national ranking. As of December 1984, the priority list included 538 final and 248 proposed sites.

Superfund provides for two types of responses to hazardous substance releases or threatened releases: removal and remedial. Removal actions are short-term responses to address immediate and significant dangers at any hazardous waste site but are not necessarily final solutions; remedial actions are final but not necessarily prompt measures taken to provide a permanent remedy. The following chart summarizes EPA's cleanup process.

THE STEPS IN CLEANING UP AN UNCONTROLLED HAZARDOUS SITE

After someone alerts EPA about an uncontrolled hazardous site, what happens? Here are the highlights from initial telephone call to cleanup.

1.Identification and Preliminary Assessment

A citizen may report half-buried barrels in the neighborhood. A facility manager may send EPA a formal notice. Once EPA learns of a possible hazardous site, all available background information from U.S. Geological Survey maps and EPA, State, and local files is collected. EPA tries to determine the size of the site, the identity of the parties most likely to have disposed of wastes there, the types and quantities of wastes most likely to have been disposed of there, local hydrological and meteorological conditions, and the impact of these wastes on the environment. If it looks as though the site may be a hazard, a site inspection is conducted.

2.Site Inspection

Inspectors on the site collect sufficient information to rank the hazard of the site. They look for 55-gallon drums, dead or discolored vegetation, and other evidence of hazardous waste. Samples of the soil or nearby water may be taken. Inspectors determine the ways hazardous materials could be contaminating the nearby environment, for example by runoff into nearby streams. They check whether children have access to the site and might play there.

3.Ranking Sites for the National Priorities List

Sites are ranked based on the type, quantities, and toxicity of wastes; the number of people potentially exposed; the likely pathways for exposure; the importance and vulnerability of the underlying aquifers; and other factors. The sites with the highest hazard ratings are put on EPA's National Priorities List (NPL).

4.Remedial Investigation

The next step for sites placed on the NPL is a carefully designed field study or remedial investigation. Based on extensive sampling and laboratory analyses, this investigation provides more precise data on the types and quantities of wastes at the site, on the soil type and water drainage patterns, and on the resulting environmental or health threats.

5.Feasibility Study and Cleanup

Cleanup actions must be tailored to each individual site. As part of the feasibility study, EPA identifies alternative cleanup approaches and determines their relative effectiveness and cost.

Longer-term remedial actions are reserved only for sites on EPA's National Priorities List. Remedial actions may include taking the wastes to another site; "capping" the original site with waterproof clay; installing drains, liners, or grout "curtains" to prevent ground-water contamination; providing alternate sources of water; or temporarily or permanently relocating residents.

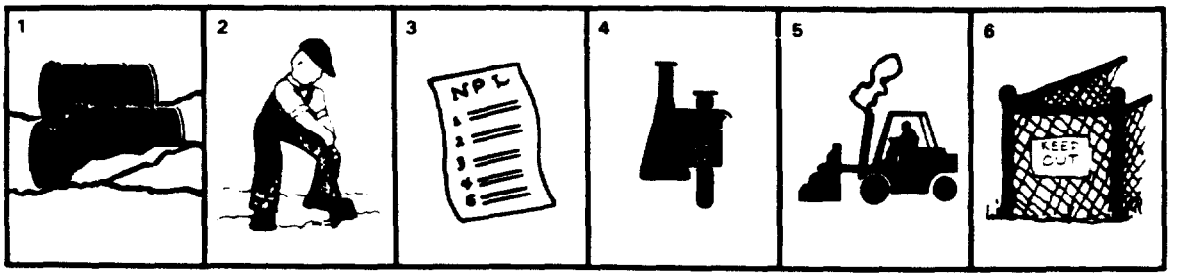
6.Post-Cleanup Responsibilities

After cleanup, the State is responsible for managing the site to prevent future health hazards or environmental damage.

Removal Actions

EPA may also initiate a short-term removal action at any time that a site is found to present an imminent hazard because of the potential for fire or explosions or contamination of a drinking water supply, for example. Removal actions range from installing security fencing to digging up and removing wastes for safe disposal. Such action may be taken at any site, not just those on the NPL.

Steps in Cleaning Up A Superfund Site



Source: EPA

The act also provides that the parties responsible for the hazardous conditions at the sites should either perform cleanups themselves or reimburse the government for cleaning up the sites.[1] Superfund does not, however, provide or require standards for determining the degree of site cleanup to be attained before cleanup actions are considered to be complete.

Cleanup actions at sites can range from waste destruction or offsite disposal, to containment of wastes onsite, to a combination of these approaches.

This report examines the extent of the hazardous waste cleanup problem, the potential costs of cleaning up hazardous waste sites, EPA's cleanup process, the "how clean is clean" issue, and the number of sites included under federal cleanup responsibilities. Additional perspectives on these issues can be found in reports by EPA, the Office of Technology Assessment (OTA), and the Congressional Budget Office.

EPA's report, dated December 1984, was done in response to section 301(a)(1) of the Superfund Act, which required the President to submit a comprehensive report to the Congress on EPA's experience with implementing Superfund. Sections 301(a)(1)(A) through (I) require that the report address at least nine separate issues, including the effectiveness of the Superfund program, income into and expenditures from the fund, the extent of the hazardous substance release problem, alternative tax schedules for financing the program, and the economic impacts of the current tax on the nation's balance of trade.

OTA's study, dated March 1985, is entitled Superfund Strategy. The principal goals of OTA's study were to provide: (1) an understanding of future Superfund needs and how permanent cleanups can be accomplished in a cost-effective manner for diverse types of sites, (2) a description of the interactions among the components of the complex Superfund system, and (3) an analysis of the consequences of pursuing different strategies for implementing the program.

The forthcoming Congressional Budget Office study is scheduled for publication in the spring of 1985. The objective of this study is to (1) examine the current status of hazardous waste generation, management, and costs, (2) evaluate recent changes to federal law regulating hazardous wastes, and (3) analyze additional options for improving federal regulation and financing the program that are now under congressional review.

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[1]To the extent that responsible parties cannot be identified or are not able to pay, Superfund will finance these cleanups

OBJECTIVES, SCOPE, AND METHODOLOGY

The objective of this report is to provide the Congress and others with information that we believe will be useful in deliberations on Superfund's reauthorization. We discuss five major issues that the Congress may consider in reauthorizing Superfund. They are: (1) the extent of the hazardous waste cleanup problem, (2) cost estimates associated with cleaning up hazardous waste sites, (3) progress of and proposed changes to EPA's Superfund cleanup program, (4) options for addressing the "how clean is clean" issue, and (5) the number of sites included under federal cleanup responsibilities. Except for the information on Superfund program costs, this information was developed primarily through a series of 23 individual GAO reports that address Superfund and Superfund-related issues.

To evaluate EPA's December 1984 estimate of potential cleanup costs, we focused on key cost factors such as the number of NPL sites, the costs to clean up sites, and the extent of responsible party cleanups. To determine what effect uncertainties about the values of key cost factors might have on Superfund program costs, we analyzed alternative assumptions using EPA's Superfund cost model. We tested this model and verified the computed program cost estimates contained in EPA's study and used in our evaluation. The basis for analyzing alternative assumptions was historical information and EPA analyses that were available during EPA's study. More detailed information on these alternative assumptions is provided in the text.

We also analyzed several EPA documents including: its Superfund section 301 study, background documents used in preparing the section 301 study, its studies on remedial technology and cleanup costs, and various policy documents. In addition, we performed literature searches and incorporated other Superfund-related studies in our report.

We have combined the messages of our individual reports with additional analyses and interviews with headquarters Superfund program officials. We believe this approach has provided a broad understanding of the overall program and should be helpful to the Congress as it considers legislation reauthorizing the Superfund program.

The specific objectives, scope, and methodology for the individual reports are contained in those respective reports. The matters presented in this report were discussed with EPA headquarters Superfund program officials, and their views are incorporated where appropriate.

Our work was conducted from November 1984 through March 1985, and was performed in accordance with generally accepted government auditing standards.

CHAPTER 2

THE EXTENT OF THE HAZARDOUS WASTE PROBLEM IS UNKNOWN

At thousands of hazardous waste sites across the country, toxic chemicals are seeping into the nation's groundwater, contaminating the land, and poisoning the air. Concern over uncontrolled hazardous waste sites culminated in the enactment of the Superfund Act to provide for identification, emergency response, and long-term cleanup at the worst sites.[1] While EPA and the states have identified thousands of potential hazardous waste sites, the full size and extent of the hazardous waste site problem in the United States is not fully known. In addition, few federal studies on the health risks posed by these sites have been completed. Without knowing the number of hazardous waste sites in this country or the extent of the health risks associated with them, the Congress, EPA, and the public cannot be sure that human health and the environment are being adequately protected. The information is also essential for making accurate cost estimates for the Superfund program.

HAZARDOUS WASTE SITES POSE A DANGER TO HUMAN HEALTH AND THE ENVIRONMENT

The magnitude of the environmental threat posed by abandoned or uncontrolled hazardous waste sites was not fully recognized until the 1970's. Some of these sites, such as Love Canal, New York, appeared to slumber quietly under homes and schools; even the oddly colored lagoons and rusting steel drums at more visible sites were not viewed as sufficiently threatening to call for major federal legislation. However, through experiences such as Love Canal, the dangers posed by these sites became more widely recognized. The potential health hazards are many and varied; some are acute, such as headaches and nausea, while others, such as cancer and birth defects, become apparent only over a long period of time. Environmental effects may also become apparent only over a long period and may involve loss of vegetation, destruction of animal habitat, and eventual destruction of species in a given geographic area.

According to EPA's December 1984 section 301 study, priority hazardous waste sites requiring long-term cleanup action are typically characterized by three factors: substances present at the site are inherently hazardous to health; routes of exposure to the substances exist through groundwater, surface water, or air; and people and environments are present that can receive exposure to the hazardous substances. (The illustration on the following page depicts routes of exposure from contaminants.)

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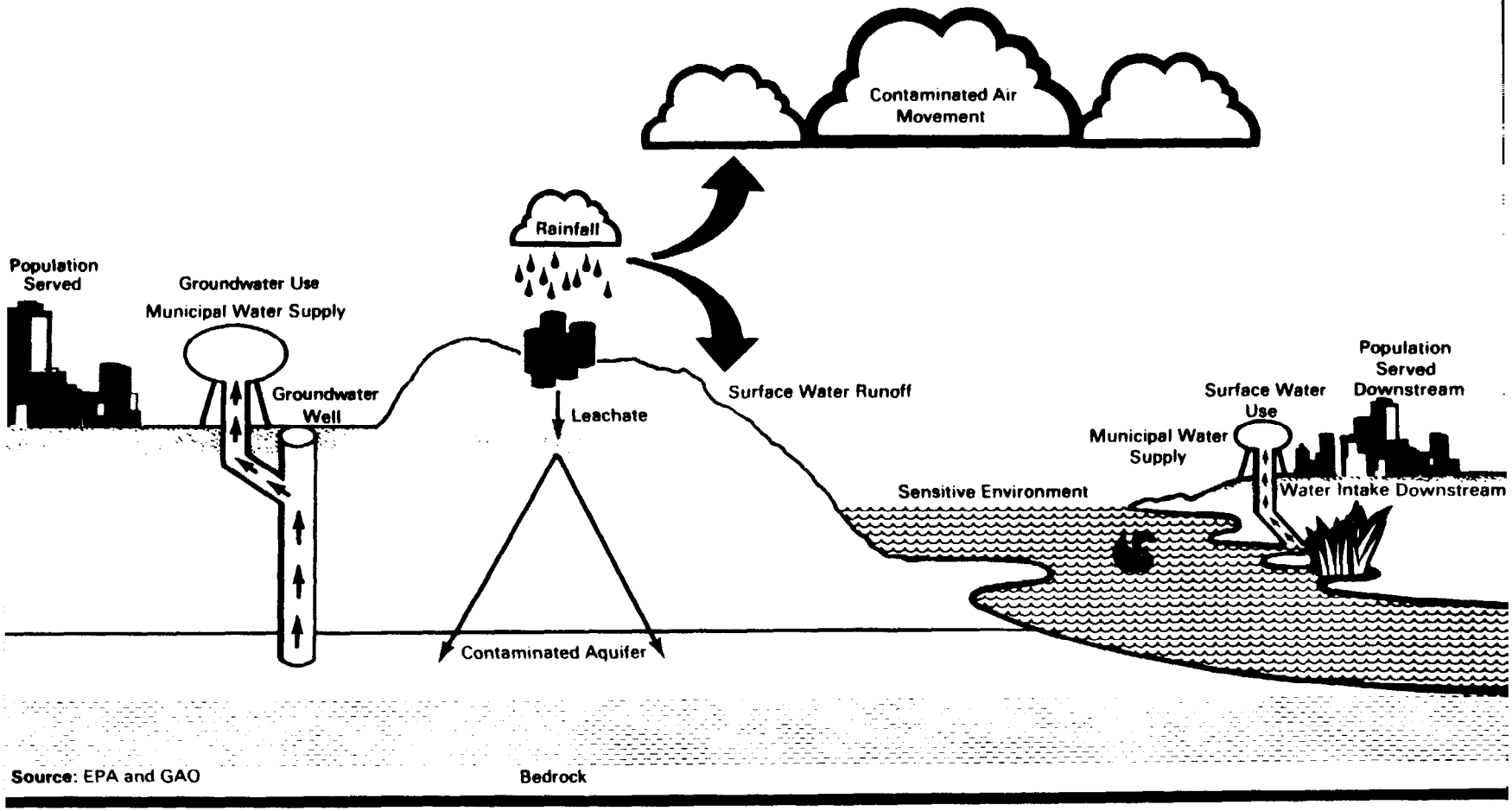
[1]The worst sites are placed on the NPL for long-term cleanup.

Groundwater, Surface Water, and Air Contamination Process



Source: EPA and GAO

The 25 substances most frequently found at these hazardous waste sites have widely differing toxicities. However, nearly half are known or suspected carcinogens, seven are teratogens (causing birth abnormalities), and seven will ignite at room temperatures. In addition, many sites contain a number of hazardous substances that may work synergistically to cause or enhance a variety of toxic effects.

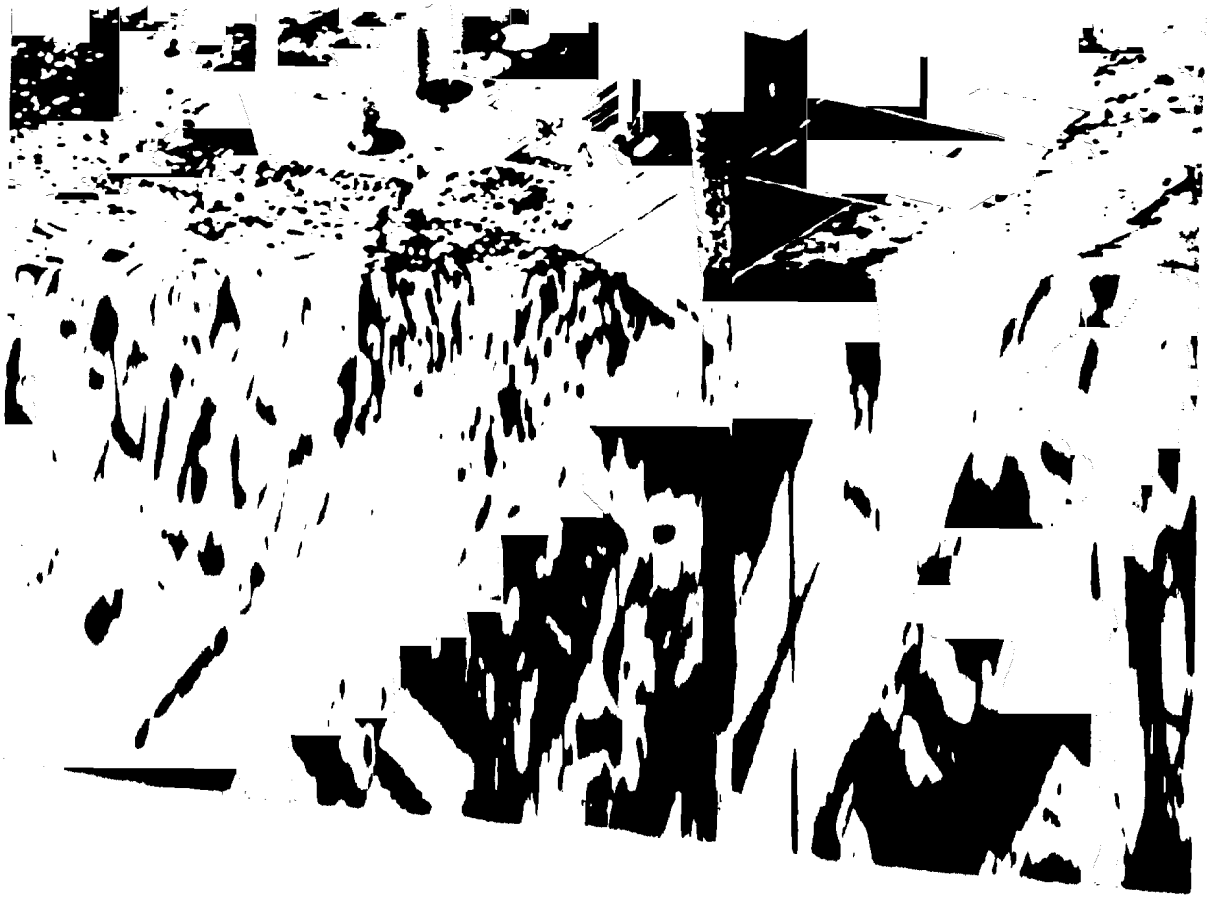
The financial impact of both health and environmental damage caused by these sites can be devastating, including serious economic loss, high health-care costs, compensation to effected individuals, and property loss. The indirect costs of human suffering and the long-term loss of valuable natural resources are incalculable. The following examples illustrate some of the problems resulting from abandoned or uncontrolled hazardous waste sites:

--In 1972 unsafe levels of the toxic chemical hexachlorobenzene were discovered in a routine sample of beef from a cattle ranch in Louisiana. Further investigation revealed that about 30,000 head of cattle within a 100-square-mile area also had unsafe levels of this chemical in their tissues. Apparently, the hexachlorobenzene had been disposed of at a nearby industrial dump and was being spread throughout the local areas by air currents. Local residents also showed unusually high levels of the chemical in their blood.

--In 1978 a fire broke out at a disposal site in Chester, Pennsylvania, where several thousand deteriorating drums of toxic chemicals were being stored. Forty-five firemen had to be treated for health effects and injuries, mostly because of direct contact with toxic fumes and chemicals. The site continues to pose a threat of fire, explosion, and toxic fumes to local residents.

--In Hardeman County, Tennessee, pesticide residues began to leak from deteriorating drums at an industrial waste disposal site and contaminate groundwater in the local area with a variety of toxic chemicals. Forty families that drank contaminated well water experienced a variety of health effects, including liver and urinary tract problems, nausea, dizziness, and rashes. The effected families have filed a $2.5 billion suit against the pesticide manufacturers.

These are only a few examples of the dangers posed by abandoned and uncontrolled hazardous waste sites; the full extent of the damage caused by these sites is unknown. The photographs on the following page illustrate two common types of hazardous waste sites.



FEDERAL AND STATE EFFORTS TO DETERMINE THE EXTENT OF HAZARDOUS WASTE PROBLEMS ARE INCOMPLETE

Although the dangers posed by hazardous waste sites are widely known, the extent of the problem is not. EPA has given a relatively low priority to its own site discovery efforts on state, local, and private lands, as well as to directing similar state efforts. In addition, the efforts of EPA and other federal agencies to identify hazardous waste sites on federal lands are incomplete. Our March 1985 report entitled EPA's Inventory of Potential Hazardous Waste Sites Is Incomplete, (GAO/RCED-85-75) stated that while EPA has information identifying 19,368 locations where hazardous waste sites are suspected, EPA estimates that as many as 5,632 more traditional sites may exist nation-wide and that a systematic discovery effort and a change in program emphasis could increase the size of the program to over 378,000 additional sites. Without identifying these sites, the Congress, EPA, and the public cannot be sure that human health and the environment are being adequately protected. The information is also essential for making accurate cost estimates for the Superfund program.

EPA and state site discovery efforts have been limited

EPA and the states have given site discovery relatively

Enforcement, (2) 2,300 sites where owners or operators of active hazardous waste treatment, storage, or disposal facilities notified EPA of their intent to continue to handle hazardous waste, but then failed to apply for a final EPA permit, and (3) 4,000 sites where owners or operators of inactive hazardous waste sites or transporters that had delivered waste to these sites notified EPA as required by section 103(c) of the Superfund Act. EPA estimates that the ERRIS list may grow to as many as 25,000 abandoned or uncontrolled hazardous waste sites within the next several years.

Although the 25,000-site figure is EPA's highest official projection in its section 301 study, the agency acknowledges that with a targeted, systematic discovery and investigation effort and a change in program emphasis toward cleaning up sites that received less emphasis earlier in the program, the number of sites on its inventory could increase dramatically beyond this estimate. For example, EPA reported that there are many currently operating facilities that have the potential for being placed on EPA's inventory. EPA stated that potential sites such as municipal and industrial landfills require intensive record searches to identify their location, the type of materials they received, and their ownership. In its section 301 study, EPA identified the following major categories where new site discoveries are possible and estimated the number of sites of potential concern within each category:

Potential Sources of Additional Sites

Category	Number of sites of potential concern
Currently operating hazardous waste treatment, storage, and disposal facilities	605
Municipal landfills	34,000 - 52,000
Industrial landfills	75,000
Mining waste sites	9,770 - 63,770

In addition to the above major categories for which EPA states that reasonable estimates of possible sites could be developed, EPA has identified a number of categories where other additions to the total number of sites could be generated by policy changes or changes of program emphasis. Those additional categories include (1) contamination from underground storage tanks containing petroleum products, (2) sites contaminated by agricultural uses of pesticides, (3) radioactive waste sites, (4) non-workplace asbestos sites, (5) single-party sites such as wood preservative contamination in log homes, (6) contamination of rivers and harbors, and (7) contamination from naturally occurring hazardous substances.

EPA concluded in its section 301 study that until systematic identification and investigation of these different types of problems are undertaken, estimating the total number of sites that could become potential hazardous waste sites is impossible.

Efforts to identify federal hazardous waste sites are incomplete

How well are federal agencies addressing potential problems related to their past hazardous waste activities? Are the agencies setting a good example for the rest of the nation? We do not know the answers to these questions because EPA's ERRIS inventory does not include all civilian and military federal sites or lands with potential hazardous waste contamination problems.

Site identification for civilian agencies has been inaccurate and incomplete

As of February 1984, the ERRIS inventory included 103 sites coded as belonging to civilian federal agencies. In our September 1984 report entitled Status of Civilian Federal Agencies' Efforts to Address Hazardous Waste Problems on Their Lands (GAO/RCED-84-188), we stated that at least 340 federal civilian locations were potential hazardous waste sites. We also reported that the ERRIS information on the status of actions taken at sites was not always accurate or complete because either (1) the EPA regional offices had no knowledge of the actions taken at federal agency locations or (2) the EPA regional offices assigned different priorities to updating information in the system and were selective in the types of data updated. As a result, in many instances the system understated the level of actions performed.

EPA's Assistant Administrator for External Affairs recognized that EPA had placed a low priority on federal agencies and their Superfund activities. As a result, in July 1984 EPA began discussions with federal agencies about a new

federal agencies on developing site identification and documentation programs and has as one objective the definition of actions that must be taken to assess and clean up, where necessary, all federal hazardous waste sites. As of March 1, 1985, discussions with the federal agencies were completed and the strategy was being revised at EPA before being sent to the Office of Management and Budget for review and approval.

In commenting on EPA's strategy, agency officials told us that it provided the proper focus for dealing with the hazardous waste issues they faced. Questions still unanswered relate to the manner in which it will be implemented, including resources, direction, and training.

Department of Defense's site identification efforts are incomplete

In 1975 the Department of Defense initiated the Installation Restoration Program to accomplish several objectives, including identification and cleanup of hazardous waste disposal sites. The program has four phases: Phase I is the installation assessment or records search to identify bases with potential old closed hazardous waste sites, Phase II is for confirming that contaminants are affecting the environment, Phase III is used for developing or advancing the technology needed to solve some of the site problems, and Phase IV is the operations or corrective action effort.

The Department of Defense has identified 473 bases that will require Phase I studies to identify inactive hazardous waste disposal sites. As of September 30, 1984, the status of the program by phase for those bases requiring work was as follows:

Status of the Installation Restoration Program

	Required	Completed	In process	To be done
Phase I	473	356	58	59
Phase II	204	51	123	30
Phases III/IV[a]	72	0	38	34

[a]Some of the Phase II studies still in process at the bases have already identified sites that will need cleanup (Phase IV) efforts. Thus, a base could be listed in both Phase II and Phase IV categories. Data provided by Defense does not make a distinction between those bases that have only reached Phase III versus those which are in Phase IV.

Because Superfund by law cannot be used to clean up sites at federal facilities, these costs must be funded though the agencies' budgets. In testimony on February 27, 1985, before the Subcommittee on Military Construction, House Committee on Appropriations, the Director of Environmental Policy, Department of Defense, estimated that spending on the program could range from $5 billion to $10 billion. Thus far, 117 of the 473 bases included in the program have not completed Phase I studies and about a quarter of the scheduled Phase II studies have been completed.

EPA plans more focused site discovery efforts

Although EPA has accorded site discovery a relatively low priority, the agency has plans to improve its efforts in this area. In this regard, EPA is currently developing methods to systematically evaluate various industries to determine categories of waste generators that are more likely to involve hazardous release problems that require Superfund action. For example, EPA is proposing a pilot program to identify coal gasification sites. Such sites are usually located at old abandoned urban power plants, and EPA believes they may contain coal tar residues. EPA believes that many of these and other similar sites can only be identified through facility-by-facility searches and sampling.

Efforts such as this could help provide a more complete and accurate inventory of hazardous waste sites. However, additional efforts will be needed if the full extent of the hazardous waste problem is to be determined. EPA has acknowledged that until systematic identification and investigation of the different types of sites is undertaken, it is impossible to estimate the total number of sites that could become potential Superfund problems. Without this information, people living near undiscovered sites may remain uninformed about the potential dangers associated with such sites. The information is also essential for making accurate cost estimates for the Superfund program.

FEDERAL EFFORTS TO IDENTIFY HEALTH RISKS HAVE BEEN LIMITED

One of the most important steps in evaluating the extent of the hazardous waste site problem is determining the effect these sites have on human health. Although it is apparent that hazardous waste sites can endanger human health, there are medical and scientific uncertainties concerning the relationship between exposure to toxic substances and adverse health effects. Establishing links between exposure to toxic chemicals and specific adverse health consequences involves rapidly changing technical and medical issues on which little scientific data have been developed. To help resolve this issue, Superfund directed the Department of Health and Human Services to carry

out various health-related activities such as performing studies on the relationship between toxic substances and illness and developing national registries of persons exposed to toxic substances and having serious diseases and illnesses. The department has made limited progress in carrying out these responsibilities.

Progress on Superfund health studies has been slow

Under Superfund the Department of Health and Human Services was required to conduct health studies, laboratory projects, and chemical testing to determine relationships between exposure to toxic substances and illness. In our September 1984 report entitled HHS' Implementation of Superfund Health Related Responsibilities (GAO/HRD-84-62), we found that except for one health study at Love Canal begun before the Superfund Act was passed, no health studies or laboratory projects had been completed as of March 31, 1984. This was still true as of December 31, 1984. By this date eight health studies and six laboratory projects were underway, however, and six other health studies were in the planning stage. By September 30, 1983, the department had planned to complete testing of about 70 chemicals or chemical classes. As of December 31, 1984, 24 chemicals or chemical classes had been identified for testing, 14 tests involving 9 of these chemicals had been started, and an additional 3 tests involving 2 chemicals had been completed.

Superfund also required the Department of Health and Human Services to establish and maintain a national registry of persons exposed to toxic substances and a national registry of serious diseases and illnesses--persons having adverse health effects that might be associated with environmental conditions. In November 1983 the department developed guidelines for collecting data for the registries. In May 1984 it adopted criteria to set priorities for establishing registries at hazardous waste sites. According to the department, a central listing of exposed persons has been established at one hazardous waste site, but no registries are planned until long-term funding and administrative issues are resolved. The department has decided that if long-term funding becomes available, it will establish exposure registries at a limited number of those hazardous waste sites where there is a strong indication of substantial human exposure and a sound scientific basis for investigating the possible correlation between exposure and health effects among persons living near the sites. In addition, the department is planning--if long-term funding becomes available--to establish registries to persons having serious diseases and illnesses that might be associated with environmental conditions.

Why limited progress has been made in implementing Superfund activities

The Department of Health and Human Services has made less progress in implementing its Superfund program than originally planned or possible because of funding delays and budget reductions recommended by EPA, staffing limitations within the department, and unclear congressional expectations concerning the development of the national registries. Through the end of fiscal year 1983, the Congress appropriated $17 million to EPA for the Department of Health and Human Services' Superfund activities, including the above studies and registries. However, because EPA did not begin transferring funds to the department until 5 months after fiscal year 1982 began (which was the second fiscal year of the program) and because the department did not allocate sufficient staff to undertake all planned activities, only $5.1 million had been spent through fiscal year 1983. By the end of fiscal year 1984, the department had obligated a total of about $20.1 million for Superfund activities.

The Department of Health and Human Services' efforts to develop registries of persons exposed to toxic wastes were hampered by the fact that the Superfund act does not specify the types of information or sites to be included in national registries or define the term "exposed persons." The specific interpretation of this provision directly affects the implementation of the law and related costs. Department officials stated that they are reluctant to initiate Superfund registries on a broader scale because (1) undertaking any type of registry is costly and (2) they have been offered no assurances of receiving the long-term funding (for at least 20 years) necessary to maintain the Superfund registries.

Our report on the department's implementation of its Superfund health-related responsibilities concluded that the Congress may wish to (1) consider the department's progress concerning these responsibilities, (2) determine whether changes are needed and how these activities are funded and staffed, and (3) determine whether legislative expectations should be clarified.

CONCLUSIONS

The dangers posed by abandoned or uncontrolled hazardous waste sites are widely recognized, but the full extent of the problem is unknown. EPA's ERRIS inventory of hazardous waste sites is incomplete, in large part, because the agency has given a relatively low priority to site discovery. Although EPA has plans to improve its site identification efforts, it currently has no specific program to identify additional hazardous waste sites and add other known categories of sites to the ERRIS inventory. Unless a comprehensive inventory is developed, it will be impossible to estimate the total number of potential

hazardous waste sites. Without this information, people living near undiscovered sites may remain uninformed about the potential dangers associated with such sites. The information is also essential for making accurate cost estimates for the Superfund program.

Federal efforts to identify and evaluate the health risks of hazardous waste sites have also been limited. While it is apparent that hazardous waste sites can endanger human health, medical and scientific uncertainties remain concerning the relationship between exposure to toxic substances and adverse health effects. Although the Department of Health and Human Services was directed under Superfund to carry out various health-related activities--some of which were designed to help resolve these uncertainties--the department has made limited progress in carrying out this responsibility. As a result, the scientific data base on hazardous waste problems is incomplete.

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The following chapters discuss additional Superfund issues that should be considered in evaluating how best to achieve Superfund's goal of cleaning up the nation's hazardous waste sites.

CHAPTER 3

ESTIMATES OF FUTURE COSTS TO CONTROL HAZARDOUS WASTES ARE LARGE BUT UNCERTAIN

Although it is certain that the cost of cleaning up the nation's uncontrolled hazardous waste sites will be high, the extent of this cost is unknown. The amount of funding the Congress will need to authorize depends on the number of sites needing cleanup, the average federal cost for cleaning them up, and the extent to which EPA can conserve the fund through obtaining cleanups and cost recoveries from responsible parties.[1] EPA recently provided the Congress with a legislatively mandated study that models various key assumptions to project Superfund costs. We analyzed EPA's modeling procedures and found that they overstate EPA's cost estimates. In addition, we found that EPA's assumptions concerning cost recoveries, responsible party cleanups, and the number of sites that may need cleanup were based on policy decisions and program goals. As an alternative, we have provided cost estimates that are based on historical data and other information available at the time of EPA's study. However, we have no basis to judge whether actual program experience will be sustained or EPA's program goals will be achieved.

On the basis of these assumptions, EPA projects that future federal funding needs will be $11.7 billion (in fiscal year 1983 dollars). However, EPA recognizes uncertainties involving their assumptions and, as a result, estimates that this cost could range from $7.6 billion to $22.7 billion. On the basis of our alternative assumptions, we projected that costs could range from $6.3 billion to $39.1 billion. Although EPA's study does not report state and responsible party costs, using EPA's model we found that these costs could add $8.5 billion to $33.7 billion.

The following sections discuss the key assumptions and what we consider to be sources of uncertainty about these assumptions. We also discuss other issues affecting funding considerations, such as the potential costs for states and responsible parties, the effect of discounting future costs, the effect of claims for natural resource damages, and the relevancy of comparing the health and environmental risks of alternative cleanup levels.

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[1]Superfund provided that the parties responsible for the hazardous conditions should either perform cleanups themselves or reimburse the fund (under the cost recovery provision) for cleanups performed by the government. The parties responsible for site cleanup under Superfund include individuals, corporations, or other entities that are (1) past or present owners or operators of sites and/or (2) generators or transporters that contributed hazardous substances to sites.

ASSUMPTIONS USED IN EPA'S COST ESTIMATES

As required by section 301(a)(1)(C) of the Superfund Act, EPA submitted a report to the Congress in December 1984 projecting the size and focus of the Superfund program and future funding needs.[2] According to this study, the current inventory of sites and anticipated additions could produce an NPL of 1,500 to 2,500 sites over the next several years. EPA's central estimate assumes that the NPL will increase to some 1,800 sites. To clean up an NPL of 1,800 sites, the study projects that future funding requirements would total $11.7 billion (in fiscal year 1983 dollars). This estimate also assumes an average remedial cost of $8.1 million, a responsible party cleanup rate of 50 percent, and a cost recovery rate of 47 percent for removal actions and 30 percent for remedial actions. EPA also reports that depending on assumptions about the size of the NPL, the average cost of a remedial action and the level of responsible party contributions to cleanup actions, future funding needs could range from $7.6 billion to $22.7 billion (in fiscal year 1983 dollars). The assumptions on which this range is based are shown below.[3]

Assumptions Used by EPA to Develop Its Cost Range

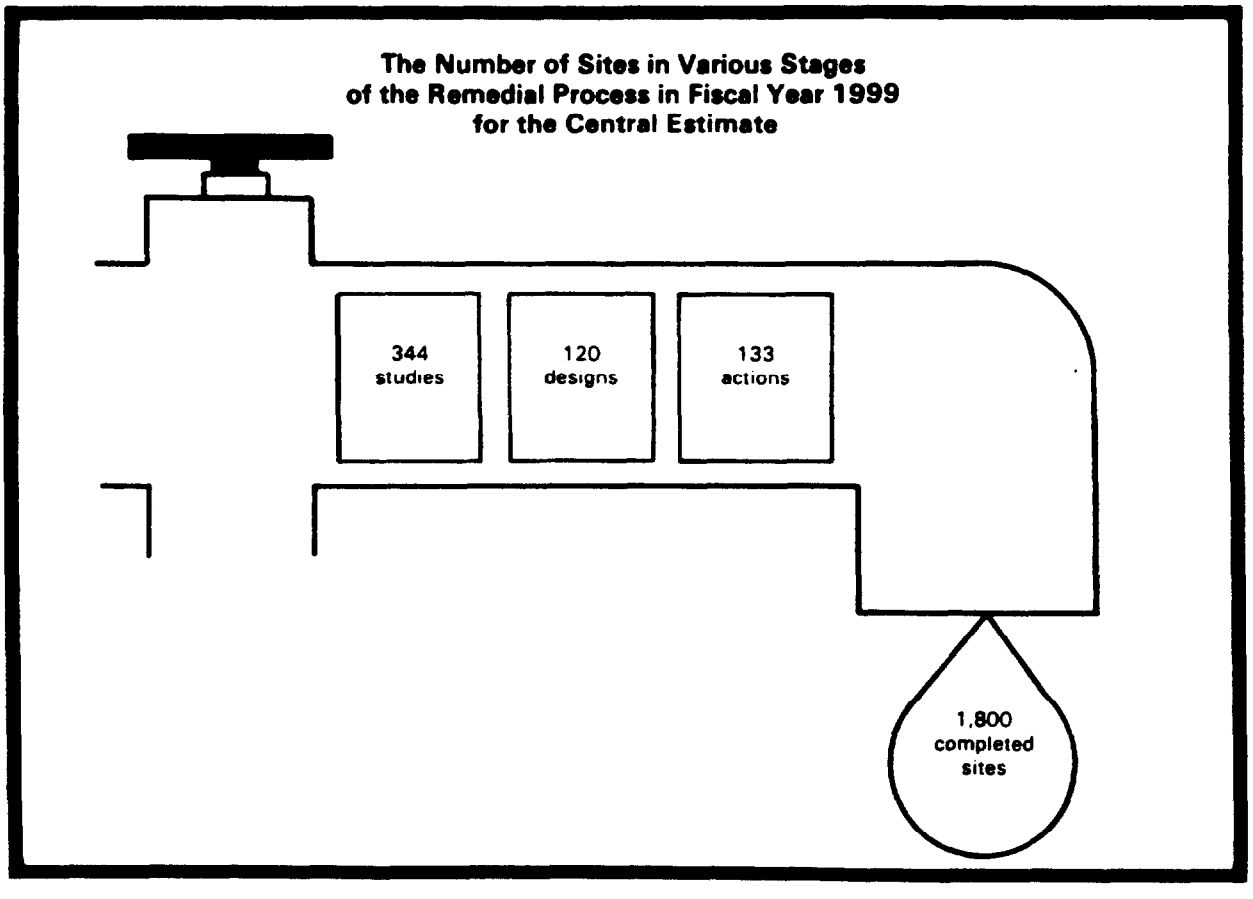
	Low estimate of $7.6 billion	High estimate of $22.7 billion
Number of sites needing cleanup	1,500	2,500
Average federal cleanup cost	$6 million	$12 million
Responsible party cleanup rate	60 percent	40 percent
Cost recovery rates:		
Removal actions	47 percent	47 percent
Remedial actions	30 percent	30 percent

[2]Under section 301(a)(1)(G) EPA provided the Congress an analysis of five alternative taxing systems to finance future Superfund costs.

[3]These assumptions cannot be multiplied together to derive total costs. Total costs also include non-site-specific costs for activities such as administration and removal actions.

PROGRAMMING PROCEDURES OVERSTATE EPA'S COST ESTIMATES

EPA's central estimate and cost ranges are overstated because of certain programming procedures. As a result of these procedures, EPA's central estimate of $11.7 billion to clean up 1,800 NPL sites could be overstated by about $1.7 billion. First, EPA's model included new sites entering the remedial process up to fiscal year 1999, when the 1,800 sites are completed. This pipeline approach assumes that by the year 1999, approximately 2,397 sites will have entered the process but only 1,800 sites will be completed. The following diagram shows the number of sites in the remedial process in fiscal year 1999 for the central estimate.



We determined that these additional 597 sites account for about $1.5 billion of EPA's central estimate of $11.7 billion (in fiscal year 1983 dollars). In addition, EPA's model excluded cost recoveries from responsible parties that will occur after remedial actions are completed in fiscal year 1999. EPA assumed a 3-year lag between the time funds are obligated and the time costs are recovered. Under this assumption, cost recoveries that would occur for the 3 years following fiscal year 1999 amount to about $200 million for the 1,800-site estimate. These modeling procedures also affect EPA's range of cost estimates. Its low estimate of $7.6 billion could be reduced by about $1.3 billion, and its high estimate of $22.7 billion could be reduced by about $2.3 billion.

EPA managers responsible for developing the model stated that they were aware that it included these additional sites and excluded some cost recoveries, but they had not measured the resulting impact. The analysis presented on the following pages corrects these modeling procedures by (1) excluding the residual number of sites in other stages of the process and (2) including the impact of future cost recoveries.

ANALYSIS OF ALTERNATIVE ASSUMPTIONS

We found that EPA's assumptions concerning cost recoveries, responsible party cleanups, and the number of sites that may need cleanup were based on policy decisions and program goals. As an alternative, we have provided cost estimates that are based on historical data and other information available at the time of EPA's study.

Analysis of alternative cost recovery and responsible party cleanup assumptions

EPA has assumed that (1) federal costs will be recovered at a rate of 47 percent for removals and 30 percent for remedial actions and (2) 50 percent of the cleanups will be financed by private responsible parties. These assumptions are based on what EPA hopes to accomplish rather than actual experience.

Actual cost recovery experience on removal actions has only amounted to a 21-percent rate. In addition, EPA has virtually no experience on remedial cost recoveries. Historical data on cleanups performed by responsible parties indicate that total dollar settlements for remedial actions at NPL sites reached $255 million through the end of fiscal year 1984. This compares with $343 million in fund-financed remedial obligations for NPL sites through fiscal year 1984. Historical data, therefore, indicate that cleanups by responsible parties may have accounted for as much as 43 percent of the cleanup costs to date.

By applying (1) the 21-percent cost recovery rate for both removal and remedial actions (for lack of better data) in place

of EPA's 47-percent removal and 30-percent remedial assumptions, and (2) the estimate of 43 percent for responsible party cleanups, future funding needs would be $1.8 billion higher than EPA's central estimate in fiscal year 1983 dollars.

Analysis of alternative assumptions concerning the number of sites needing cleanup

Although the EPA study provided a central estimate of 1,800 sites, it recognized that the range could be from 1,500 to 2,500. The study provided cost estimates for cleaning up this range of sites but did not provide cost estimates for two additional site estimates contained in the study. EPA's high estimates of sites needing cleanup ranged from 3,670 to 4,170. EPA arrived at these site estimates by halving its current ratio of ERRIS sites to NPL sites and applying the result to estimates of 22,000 and 25,000 potential ERRIS sites.

The following table shows the effect on funding needs of using these higher EPA site estimates. These estimates retain all other EPA central estimate assumptions:

Funding Needs for 3,670 and 4,170 Sites

Number of sites	Estimated completion date	Future funding (billions of 1983 dollars)
3,670	2013	$ 22.6
4,170	2017	$ 25.7

Impact of alternative assumptions

If all of these alternative assumptions--21 percent cost recovery on removal and remedial actions, 43 percent responsible party cleanup, and 4,170 priority sites--are combined with EPA's high per site cleanup estimate of $12 million into a worst case scenario, it results in a high estimate of $39.1 billion. The low estimate of $6.3 billion is based on EPA's optimistic assumptions--47 percent cost recovery on removal actions, 30 percent cost recovery on remedial actions, a 60-percent responsible party cleanup rate, 1,500 priority sites cleaned up, and federal cleanup costs of $6 million per site. It should be noted that these estimates correct the modeling overstatements previously discussed.

OTHER ISSUES AFFECTING FUNDING CONSIDERATIONS

In addition to the assumptions discussed above, other issues can affect funding considerations. This section describes the (1) financial resource requirements on states and responsible parties, (2) potential impact of discounting future costs, (3) natural resource loss claims, (4) levels of cleanup, and (5) other considerations.

State and responsible party costs

EPA's study focused on federal Superfund program costs but did not provide estimates of related state and responsible party costs. These costs include

--the states' share of (1) cleanup costs and (2) the first year of expenses to operate and maintain remedial controls (currently, states pay for 10 percent of these costs at most sites cleaned up with Superfund dollars, while the federal government pays 90 percent of these costs),

--long-term operation and maintenance costs to ensure continued control of waste problems at NPL sites (currently, states and responsible parties pay these costs),

--state and local government expenses for administration and enforcement, and

--cleanup and operation and maintenance costs incurred by responsible parties.

These costs could add billions of dollars to the projected total cleanup cost. For example, using EPA's cost model, we found that states and responsible parties could spend $40.8 billion ($7.6 billion for the states and $33.2 billion for responsible parties including cleanups and costs recoveries) in fiscal year 1983 dollars for cleanup and operation and maintenance expenses for the 4,170 sites.

Discounting future costs and costs recovered

Costs incurred and costs recovered in the future should be discounted by an appropriate rate of interest. Discounting determines the amount of money that if invested today at a selected interest rate, would be sufficient to meet expected future funding needs. In this way, the priority of the program can be evaluated by direct comparison of its discounted costs with other current budgetary expenditures. EPA's study did not discount future funding needs.

The following table shows real, inflated, and discounted values for the various scenarios discussed in previous sections.[4]

Federal, State, and Responsible Party Costs

Fiscal year 1983 dollars	Federal	State	Responsible party
	(billions)		
EPA's adjusted central estimate (1,800 sites)[a]	$ 10.0	$ 2.5	$ 11.2
High scenario (4,170 sites)	39.1	7.6	33.2
Low scenario (1,500 sites)	6.3	1.5	8.6
Inflated dollars			
EPA's adjusted central estimate	13.7	3.8	17.0
High scenario	77.4	16.2	67.1
Low scenario	8.5	2.2	12.0
Discounted at 13.5 percent			
EPA's adjusted central estimate	5.7	1.1	5.9
High scenario	12.3	1.9	9.6
Low scenario	4.1	.7	4.3
Discounted at 11.25 percent			
EPA's adjusted central estimate	6.5	1.3	6.8
High scenario	15.2	2.5	12.3
Low scenario	4.5	.8	5.2
Discounted at 5 percent			
EPA's adjusted central estimate	9.7	2.2	10.9
High scenario	33.0	6.1	27.3
Low scenario	6.5	1.4	7.7

[a]EPA's central estimate has been adjusted to correct the modeling procedures previously discussed in this chapter.

[4]See app. III for a discussion of the inflation and discount rates applied in this chapter.

Natural resource damages claims

Under Superfund federal and state trustees of natural resources (e.g., land, fish, wildlife, air, water, groundwater, and drinking water supplies) may submit claims against Superfund for reimbursement for injury to or destruction or loss of natural resources caused by releases of hazardous substances. However, no calculations of natural resource damage assessments and restoration costs are included in EPA's estimates of future funding needs. The value of these claims is difficult to project, in part, because resource losses may be mitigated during EPA's site cleanup process.

According to EPA, no future expenditure estimate is made for natural resource damage assessments and restoration because this cost element has been insignificant. EPA's fiscal year 1984 budget contained $989,700 for natural resource claims, most of which has not been spent and will be carried forward to fiscal year 1985. No funds for natural resource damage claims have been approved for the fiscal year 1985 budget.

However, natural resource damage claims could be significant (i.e., up to the maximum statutory limit of 15 percent of the fund). In our September 1984 report entitled Natural Resource Damage Claims and Assessment Regulations Under Superfund (GAO/RCED-84-196), we reported that 4 states had submitted 57 claims to EPA to recover $2.7 billion from the fund for natural resource damages. EPA informed the states that these claims were not valid because the states had not met two statutory prerequisites that EPA had determined the Superfund Act required. Ultimate resolutions of this issue will be dependent on the issuance of EPA regulations and/or court decisions.

Comparing the health and environmental risks of alternative cleanup levels is relevant

If EPA were able to estimate the reduction in health and environmental risks that could be expected from alternative levels of cleanup, the agency would be better able to estimate how much it costs to reduce health and environmental risks by varying amounts.

This information could be useful in comparing the costs of alternative levels of cleanup and deciding which to select. For example, suppose substantial health and environmental risks remain as a result of choosing a less stringent level of cleanup. One cost of choosing this cleanup level rather than a more stringent level is the added health and environmental risk. By comparison, choosing a more stringent level of cleanup will mean higher cleanup expenditures. In short, selecting the appropriate level of cleanup at a site involves considering cleanup costs and health and environmental risks; the goal is to minimize both. However, all of the information needed to reach

informed judgments on how to achieve this goal is not available. This subject is addressed in greater detail in chapter 4.

Other considerations

In addition to the issues discussed in the preceding sections, many other factors can affect the cost of Superfund. Several of these factors are discussed in the remaining chapters of this report. These factors include the following:

--The effectiveness of the current federal cleanup policies.

--The extent to which a site should be cleaned up. (Currently, the extent of cleanup is determined on a case-by-case basis, balancing cleanup costs against the degree of cleanup obtained.)

--The appropriate role for the federal government in the cleanup of non-NPL sites.

We could not factor these considerations into our analysis because there is no clear indication at this time what effect these factors have on total cleanup costs. For example, the effect that setting explicit standards may have on cleanup costs depends on uncertainties such as

--whether explicit cleanup standards would mean more or less stringent controls than is currently the case,

--whether explicit standards would facilitate cleaning up more sites in less time, and

--whether explicit standards would eliminate certain steps in the process of determining the best approach to cleaning up a site, thereby reducing costs.

Without these data, it is difficult to determine the cost and the advisability of setting explicit Superfund cleanup standards.

CONCLUSIONS

The cost of cleaning up the nation's uncontrolled hazardous waste sites will be significant. The amount of funding the Congress will need to authorize will be affected by several factors. EPA has recently provided the Congress with a legislatively mandated study estimating the cost of Superfund. This study models various key assumptions to arrive at its estimates. As an alternative, we have provided cost estimates that are based on historical data and other information available at the time of EPA's study. However, we have no basis to judge whether actual program experience will be sustained or whether EPA's program goals will be achieved.

Using alternative assumptions based on data available at the time EPA completed its study, we projected that Superfund program cost estimates could amount to $39.1 billion, as opposed to EPA's high estimate of $22.7 billion (in fiscal year 1983 dollars).

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In addition to the uncertainties involved in EPA's study, many unresolved issues surrounding Superfund can affect future funding considerations. Three of these issues--the effectiveness of EPA's cleanup program, the "how clean-is-clean" issue, and the federal role at non-NPL sites--are discussed in the following chapters.

CHAPTER 4

EPA'S SUPERFUND PROGRAM:

PROGRESS AND PROPOSED CHANGES

EPA's Superfund cleanup program has experienced difficulties during its first 4 years. The remedial program has completely cleaned up few sites; most of the program's activities have focused on preliminary steps such as inspecting sites, performing studies, and designing cleanup actions. In addition, most of the remedial actions now underway will result in only partial or temporary solutions. Although EPA has taken many removal actions, the degree of cleanup provided has varied widely, with non-NPL sites generally receiving more thorough cleanup than NPL sites. As a result, EPA has had to take repeated removal actions at many NPL sites. EPA has recognized shortcomings in its current cleanup process and proposed changes to clarify and streamline the Superfund program. While EPA's proposed changes are a step in the right direction, it is too early to determine how successful these changes will be. This chapter discusses the progress of and proposed changes to EPA's cleanup program.

EPA'S SUPERFUND PROGRAM STRUCTURE

The Superfund Act defines two types of responses to hazardous releases or threatened releases: removal actions and remedial actions. Removal actions entail the cleanup or removal of hazardous substances when a release or threatened release occurs, in order to prevent, minimize, or mitigate damage to the public health, welfare, or the environment. Remedial actions are those long-term cleanup actions leading to a permanent remedy instead of or in addition to removal actions. Remedial actions are designed to prevent or minimize the release of hazardous substances so that they do not migrate to endanger present or future public health, welfare, or the environment. While EPA takes removal actions at both NPL and non-NPL sites, it limits its remedial actions to NPL sites. Using the authority granted by the Superfund Act, EPA chose to provide three types of Superfund cleanup actions:

--Immediate removals--to respond promptly to immediate and significant threats, but not necessarily to provide final solutions. Generally, these actions are limited to those that can be completed within 6 months and cost no more than $1 million. Examples include averting fires or explosions, installing fences or other barriers to limit access, or moving hazardous substances off-site.

--Planned removals--to provide planned responses to imminent and substantial dangers when time permits. The 6-month or $1 million general limitation also applies, and states are required to contribute 10 percent of the removal costs. Both immediate and planned removal actions can be undertaken anywhere that a hazardous waste threat exists.

--Remedial actions--to achieve permanent, cost-effective cleanup of hazardous waste sites. These actions usually require extensive studies along with state funding commitments before a remedy can be determined. Remedial alternatives can range from no action, to containment of wastes on-site, to a mixture of cleanup and containment, to total site cleanup.

EPA has in effect also created a fourth cleanup action--although not officially defined as such--by allowing initial remedial measures. These are actions that are taken before a permanent remedy has been selected, so as to limit exposure or threat of exposure to a significant health or environmental hazard. The criteria used in determining the appropriateness of initial remedial measures are those used for planned removal actions, but without the general 6-month and $1 million dollar limitations. Appendix I discusses the cleanup process in more detail.

PROGRESS OF EPA'S CLEANUP ACTIVITIES

During the first 4 years of the Superfund program, EPA has focused its cleanup efforts on NPL sites. However, few sites have been completely cleaned up, and most of the remedial actions now underway will result in only partial or temporary solutions. Although EPA has taken many removal actions, the degree of cleanup provided by these actions has varied widely, with non-NPL sites generally receiving more thorough cleanup than NPL sites. This has resulted in the need for repeated removal actions at NPL sites.

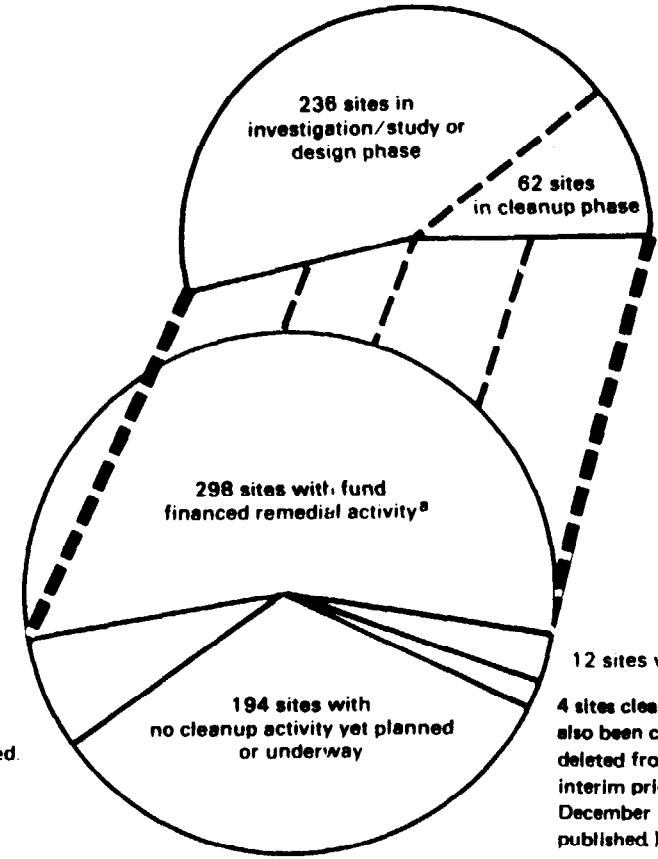
Remedial process has cleaned up few sites

In our March 1985 report entitled Status of EPA's Remedial Cleanup Effort (GAO/RCED-85-86), we reported that the study of problems present at hazardous waste sites has dominated the first 4 years of the remedial program. Although the NPL currently consists of 538 final and 248 proposed sites, EPA reported that as of December 31, 1984, only 10 sites had been completely cleaned up. A major reason for this is that the remedial process requires several time-consuming steps before remedial cleanup actions actually begin. These steps may take up to 2 to 3 years. As a result, most of EPA's remedial activities to date have focused on the early phases of the remedial process, with few sites reaching the final stage of permanent cleanup.

Under EPA's remedial process, once a potential abandoned or uncontrolled site is identified, it undergoes a preliminary assessment that generally entails a cursory review of information about wastes at a given site. Sites with waste problems that are suspected to be serious then undergo a site investigation. This includes an onsite visit, sampling, and analysis of waste problems. Once a site is investigated, the

seriousness of any waste problem is evaluated to determine if the site should be placed on the NPL. Sites on the NPL are designated for permanent remedy under EPA's remedial program. The remedial process for an NPL site generally progresses with detailed investigation and study to identify and determine alternatives for cleaning up contamination at the site; selecting a cleanup alternative on the basis of investigation and study results; and finally design and implementation of the cleanup action selected. The following chart indicates the status of cleanup actions at NPL sites as of December 31, 1984:

Status of Cleanups at 538 Final NPL Sites as of December 31, 1984



30 sites where responsible parties have undertaken study or cleanup. No fund money utilized.

12 sites with removal actions only.

4 sites cleaned up[b] (An additional 6 sites have also been cleaned up and have either been deleted from the NPL or included on the interim priorities list and cleaned up prior to December 1982, when the first NPL was published.)

[a] Fund dollars have been obligated for these activities. The activities may not yet be underway. Also, responsible party and/or removal actions may have been taken at these sites.

[b] Of these 4 sites, all operable units are completed; the sites are being monitored by EPA to assure the remedy is complete.

Source: GAO, on the basis of EPA information.

As the chart on the previous page indicates, 62 sites had been approved for cleanup action as of December 31, 1984. In our review of the status of EPA's remedial activities, we examined files for the 58 sites that had reached the cleanup phase by June 30, 1984 (the cut-off date for our site identification work). Of these 58 sites, the approved actions were considered final remedies for 11 of the sites, while the actions planned at 47 sites were only partial or temporary in nature, with additional cleanup activity anticipated. The following table categorizes the nature of the remedial actions taken at the 47 sites:

Remedial Actions Involving
Partial or Temporary Measures
as of June 30, 1984

Nature of action	Number of sites
Removing or containing surface hazardous waste found in drums, tanks, lagoons and surface soil	31
Providing alternate water supply because of contaminated drinking water	11
Removing or containing subsurface hazardous waste found in buried drums, subsurface soil, and groundwater	4
Permanent relocation of residents from hazardous waste sites	1
Total	47

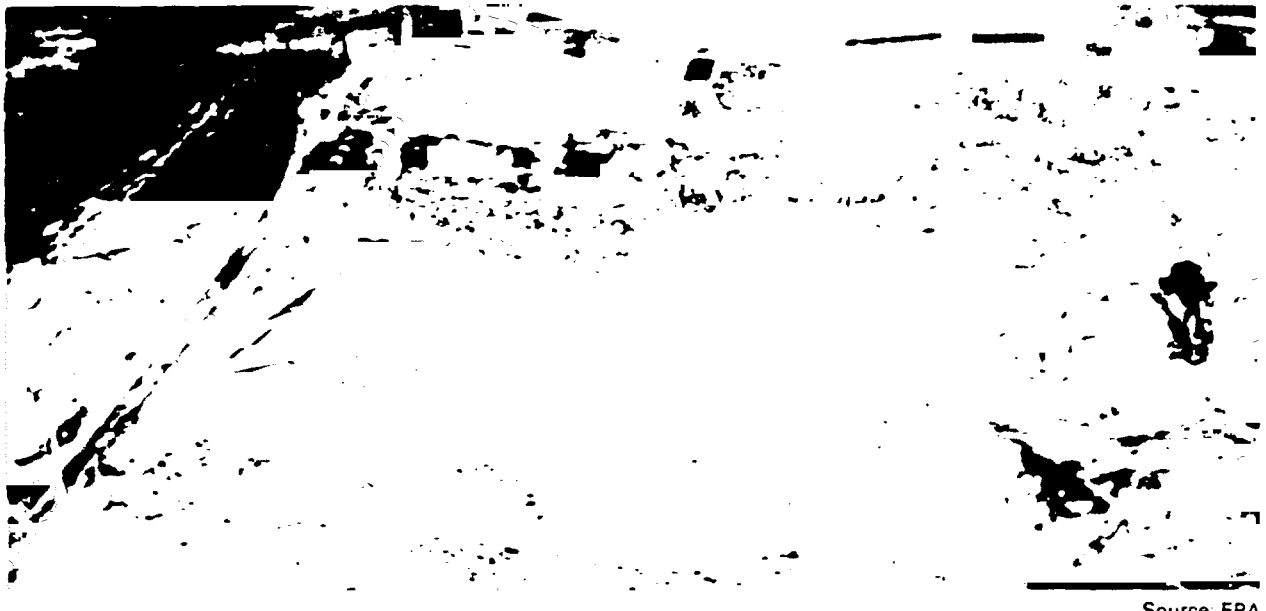
Additional study is required at these 47 sites to determine the extent of contamination remaining and to select a cleanup alternative to deal with the permanent remedy of remaining contamination. For 42 of the 47 sites, this additional study involves groundwater contamination. As part of the final remedies for major groundwater contamination problems, EPA and state officials have estimated that the cost to operate and maintain groundwater treatment for some sites could continue for 20 to 30 years.

Removal actions have provided differing degrees of cleanup

In our February 1985 report entitled Clearer EPA Superfund Program Policies Should Improve Cleanup Efforts (GAO/RCED-85-54), we reported that from December 1980 (when Superfund became law) to February 1984 (when we completed our site identification

work on the removal program), EPA had finished immediate removal actions at 165 hazardous waste sites. (See p. 52 for information on removal actions as of Feb. 15, 1985.) In general, the degree of cleanup provided by EPA's removal actions has varied widely from site to site. Some removals have completely removed hazardous substances from sites, while others only fenced the sites in, letting contaminants remain on-site. Our review found that EPA's removal actions had generally cleaned up hazardous substances at sites not on the NPL, while removal actions at NPL sites had only contained or temporarily stabilized the hazardous substances. More complete cleanup was not attained at NPL sites because future, long-term remedial action was anticipated. This practice has resulted in the need for repeated removal actions at many of these sites.

EPA's removal actions included installing fences around sites to prevent access, removing drums and tanks, draining lagoons and ponds, treating liquids and sludge, placing drums in larger containers and storing them elsewhere on the site, covering contaminated soil with clay caps, building dikes around hazardous waste lagoons and tanks to prevent runoff, and various other activities addressing immediate and significant dangers. In many cases, immediate removal actions included a combination of the above activities. EPA estimates that spending averaged about $302,000 per action, ranging from about $1,000 to $3.4 million. The photographs on the following page illustrate a typical removal action.



Source: EPA

Midco I Site, Gary, Indiana, before surface cleanup of hazardous waste drums.

Source: EPA

Midco I Site, Gary, Indiana, after surface cleanup action.

Of the 165 hazardous waste sites undergoing immediate removal actions, 72 were priority sites. Of the 72 priority sites, 19 had subsurface contaminations (such as contaminated groundwater). These will require in-depth study before remedial action can begin. The remaining 53 priority sites had hazardous substances on the surface as well as possible subsurface contamination. After immediate removals, some or all of the surface hazardous substances remained on-site at 38 of the 53 locations. The other 15 sites no longer have surface contamination but will require some remedial action to address subsurface problems.

Of the 38 priority sites where hazardous substances remained on the surface after the first immediate removal action, 20 required additional actions to address recurring actual or threatened releases of hazardous substances. These 20 sites required 2 to 5 actions per site, for a total of 54 actions. These 54 actions addressed hazards posed by lagoons, drums, tanks, and soil contamination. The other 18 priority sites have not posed severe enough threats to warrant repeated action. As long as the hazards remain on-site, however, conditions could potentially worsen, requiring more immediate removals before a permanent remedy can occur--a process that could take several years to plan and implement.

We believe that removing surface hazardous substances from priority sites during immediate removals would reduce risks to the public and environment and avoid the costs incurred from repeated actions. Although we could not quantify specific costs, the costs to clean up the spread of contamination, mobilize equipment, and develop plans for each action suggest that savings are possible.

EPA RECOGNIZES SHORTCOMINGS OF CURRENT PROCESS

EPA's proposed revisions to the NCP, dated February 12, 1985, recognized shortcomings in the current cleanup process and proposed changes to clarify and streamline the Superfund program. On the basis of 2 years' removal experience under the current NCP, EPA stated that the existing removal provisions complicate and interfere with responses to threatening situations. As a result, removals are delayed, site conditions deteriorate, and expenditures increase. In the draft NCP revisions, EPA is proposing to eliminate the distinctions between immediate removals, planned removals, and initial remedial measures. This would combine the actions previously taken under all three categories into a single "removal" category.

This change reflects EPA's current practice of using immediate removals instead of initial remedial measures in situations where either could be used. According to EPA's section 301 study, relatively few initial remedial measures have been undertaken because little distinction is made between the

type of on-site activities conducted for initial remedial measures and for removal actions. The criteria established in the NCP for determining whether to conduct an initial remedial measure are essentially the same as the criteria for determining the need for removal actions. However, EPA's policies and guidance have required substantially more documentation for initial remedial measures than for removal actions. This documentation is required to ensure that the action taken is cost-effective and to enable EPA to demonstrate, for cost-recovery purposes, that initial actions are consistent with the NCP. Because of these additional administrative requirements, initial remedial measures are more time-consuming to conduct than removals.

In the proposed NCP revisions, EPA stated that its experience with the remedial program has shown that the basic remedial response structure of the current NCP is workable. EPA's proposed revisions retain that basic structure but make some changes designed to streamline the process. The proposed changes would introduce the concept of "operable units," defined as discrete response measures consistent with a permanent remedy but not comprising the total permanent remedy itself. For example, EPA plans, to the extent possible, to address as preliminary operable units some of the actions now taken under an initial remedial measure, such as surface cleanup of a site. Additional analysis would be required to select and implement remedial measures addressing more complex problems such as groundwater contamination. Thus, EPA would be able to take a short-term remedial action to clean up the surface while leaving the more complex subsurface cleanup to a later operable unit.

To the extent that EPA's revised cleanup strategy will be based on whether hazardous substances and contamination lie above or below a site's surface, we believe that it could offer less procedural complexity and provide more cleanup flexibility to effectively resolve hazardous waste problems. EPA's current cleanup process is primarily reactive, in that action is taken in response to serious threats that create a need for prompt action. Waiting for serious threats to occur before action is taken places the public and environment at additional risk of exposure to hazardous waste. A surface/subsurface cleanup strategy would be more planned and less reactive.

EPA could initiate a surface/subsurface cleanup strategy under the current Superfund Act through its proposed revision to the NCP. A major constraint to using the removal program's simpler administrative and technical procedures for all surface cleanups, however, lies in the act's general limitation of removal actions to $1 million and 6 months' duration. EPA is currently studying the impact such limitations place on its actions.

CONCLUSIONS

EPA's Superfund cleanup programs have experienced difficulties during their first 4 years. The remedial program has completely cleaned up few sites; most of the program's activities have focused on preliminary steps such as inspecting sites, performing studies, and designing cleanup actions.

Although EPA has taken many removal actions, the degree of cleanup provided has varied widely, with non-NPL sites receiving more thorough cleanup than NPL sites. As we reported in February 1985, this practice has caused EPA to take repeated removal actions at many NPL sites.

EPA's proposed NCP revisions recognized shortcomings in the current cleanup process and proposed changes to clarify and streamline the Superfund program. We discussed these changes in our February 1985 report and recommended that EPA's immediate removal program should attain more surface cleanup when performed at NPL sites. While EPA's proposed changes are a step in the right direction, it is too early to determine what effect these changes will have.

CHAPTER 5

THE "HOW CLEAN IS CLEAN" ISSUE REMAINS UNRESOLVED

Although Superfund provides funding and authority for cleaning up hazardous waste sites, it does not provide standards for determining the degree of cleanup required at these sites. The absence of cleanup standards is one of the most important issues confronting the Superfund program; it has a direct bearing on the program's cost and the extent to which cleanup actions will protect public health and welfare and the environment. In the absence of Superfund cleanup standards, EPA has proposed a policy of applying environmental standards from other laws at hazardous waste sites. However, those standards do not address all of the substances and conditions found at hazardous waste sites.

Although the importance of this issue is widely recognized, there is no consensus as to how much site cleanup is appropriate. Opinions range from the belief that all sites should be completely cleaned up to pristine conditions, to the belief that cleanup decisions should be made on a site-by-site basis, taking into consideration factors such as cost, risks to the surrounding population, and the availability of appropriate cleanup technology. Part of the difficulty in setting standards lies in the fact that little information is available on how hazardous waste sites affect human health and the environment. Because of difficulties such as this, the issue of Superfund cleanup standards has remained unresolved. EPA's approach of considering existing standards and fund balancing on a site-by-site basis may be a viable measure pending resolution of this question. In light of the importance of the issue, this chapter provides a discussion of different approaches that have been offered for defining "how clean is clean."

SUPERFUND DOES NOT PROVIDE CLEANUP STANDARDS FOR HAZARDOUS WASTE SITES

The enactment of Superfund in 1980 represented a departure from the federal environmental legislation of the 1970's. These laws sought to establish national environmental standards to protect the nation's air, land, and water and to ensure that the standards were enforced consistently throughout the United States. Under the Clean Air Act, for example, EPA established national health-based ambient air quality standards for specific pollutants. Under the Clean Water Act, municipal and industrial facilities are required to meet minimum levels of treatment before discharging wastewater into rivers and streams. Regulations promulgated under the Safe Drinking Water Act established primary national drinking water standards, which set limits on some of the substances found in drinking water. Unlike these laws, Superfund includes no standards for cleanup actions at hazardous waste sites and does not require that standards in other federal environmental laws be applied to those cleanups.

The NCP provides overall direction but no cleanup standards

Although Superfund does not provide cleanup standards, it requires that a plan for implementing the responsibilities and authorities of the act be prepared and incorporated into the NCP. However, like Superfund itself, the revised NCP--issued in 1982--provides no cleanup standards. Instead, it requires that the Superfund remedial action selected at any hazardous waste site be cost-effective and mitigate and minimize damage to and provide adequate protection of public health and welfare and the environment. A good deal of flexibility is allowed by the NCP in meeting these general objectives. Remedial alternatives can range from no action at a site, to on-site containment of wastes, to total site cleanup. For wastes remaining on-site--like contaminated soil and groundwater--the NCP directs no specific level of cleanup. In addition, the NCP requires that the cost of a remedial action be balanced against the amount of money in the fund needed to respond to other hazardous waste problems. This requirement embodies the fund-balancing provisions of Superfund.

EPA provided its rationale for not including cleanup standards in the draft NCP when it published the final NCP in 1982. According to EPA, the NCP's system for determining the appropriate extent of remedy was based on the recognition that experience in developing remedies for hazardous waste sites is limited. Moreover, EPA pointed out that each site has unique characteristics that merit individual attention and often represent factors that have never been dealt with before. EPA stated that it cannot develop standards for the hundreds of substances it will be confronted with in response actions. According to EPA, such a task would also be enormous, costly, and time-consuming and would unduly hamper site cleanup efforts.

EPA has also been hampered in developing standards by a lack of information on the health effects of exposure to the toxic substances found at hazardous waste sites. As discussed in chapter 2, under Superfund, the Department of Health and Human Services was directed to conduct health studies, laboratory projects, and chemical testing to determine relationships between exposure to toxic substances and illness. As reported in our September 28, 1984, report entitled HHS' Implementation of Superfund Health-Related Responsibilities, the department had made less progress in performing these studies than originally planned. The lack of progress was due in part to funding delays and reductions recommended by EPA and to staffing limitations within the Department of Health and Human Services.

EPA has proposed applying existing federal environmental standards to Superfund cleanups

In 1985 EPA proposed applying the environmental standards in other federal laws to Superfund cleanups. This proposal reflects agreements reached in settlement of a lawsuit brought by the Environmental Defense Fund (a non-profit environmental advocacy organization) and the state of New Jersey in 1982 that challenged the NCP in federal court. The principal issue the Environmental Defense Fund and New Jersey raised was the NCP's failure to specify cleanup to appropriate health and environmental standards. EPA entered into a settlement agreement on January 16, 1984, providing for EPA to propose amendments to the NCP that will require that: (1) relevant quantitative health and environmental standards and criteria developed by EPA under other programs be used in determining the extent of remedy at hazardous waste sites and (2) if such standards or criteria are substantially adjusted (e.g, for risk level or exposure factors), the basis for this adjustment must be explained. In implementing this policy, EPA foresees problems applying existing standards at all sites and has identified specific circumstances in which these standards would not be achievable. In addition, many hazardous substances will still be without cleanup standards since the other environmental laws are not applicable or relevant to all substances or conditions found at hazardous waste sites.

According to EPA's proposed revisions to the NCP, the agency believes that applying existing federal standards to Superfund cleanups may not be appropriate at all sites. Existing federal standards are designed to prevent present and future migration of hazardous substances into the environment. Under Superfund, however, EPA must consider response actions that minimize the migration of hazardous substances that have already entered the environment because of inadequate past disposal practices. According to EPA's proposed revisions, at a particular site it may be technically infeasible or not cost-effective to select a remedy that meets applicable or relevant federal standards. Instead, an alternative that most closely approaches the level of protection of the federal standard should be selected.

In addition to noting potential problems in applying existing standards to hazardous waste sites, EPA has acknowledged that circumstances will frequently arise in which clearly applicable standards do not exist for acceptable levels of hazardous substances in soil and other media, and even where standards exist for a particular substance, they may not be applicable to the conditions surrounding the site. For example, in our February 1984 report entitled Federal and State Efforts to Protect Ground Water (GAO/RCED-84-80), we reported that EPA has not yet established drinking water standards and testing requirements for many organic chemicals contaminating groundwater. A report by the Office of Technology Assessment

(OTA) entitled Protecting the Nation's Groundwater from Contamination underlined this fact by reporting in October 1984 that only 22 of the over 200 chemical substances detected in groundwater had mandatory federal water quality standards.

THE ABSENCE OF STANDARDS HAS CREATED POTENTIAL PROBLEMS FOR SITE CLEANUP ACTIONS

Without the guidance provided by specific Superfund cleanup standards, EPA and the states have been faced with making decisions on cleanup actions on a site-by-site basis. Given the broad range of cleanup options available, this process has evoked controversy and raised many questions. For example, the Director of EPA's Superfund program has stated that choosing site cleanups at sites where there are no applicable numerical standards--mostly where there is extensive groundwater or soil contamination--is the most difficult Superfund policy decision facing EPA. Two of our reviews on hazardous waste site cleanup have found potential problems created by the lack of site cleanup standards. Our June 1984 report--EPA's Efforts to Clean up Three Hazardous Waste Sites (GAO/RCED-84-91)--pointed out the difficulty in choosing a cost-effective cleanup alternative in the absence of environmental standards. A proposed report--Efforts to Clean up DOD-Owned Inactive Hazardous Waste Disposal Sites (GAO/NSIAD-85-41)--disclosed considerable variance in the standards set by state and local authorities, a situation that could lead to inconsistent levels of cleanup from state to state.

Our review of cleanup at three hazardous waste sites surfaced a concern over the lack of environmental standards for use in making the cost-effectiveness determinations required by Superfund. As discussed above, Superfund requires these cost-effectiveness studies for all remedial cleanup actions. New Jersey's Director of Waste Management stated that these studies are helpful but that it is not very meaningful to do them in the absence of cleanup standards. The Chief of EPA Region II's Hazardous Waste Site Branch told us that if cleanup standards existed, it would be possible to identify and determine the cost-effectiveness of a range of alternatives that would accomplish those levels of cleanup. In the absence of such standards, this official said that they could only identify remedial alternatives that accomplish various levels of problem mitigation and then decide which alternative provides the most mitigation for the cost involved. He characterized this type of approach as "cost-benefit" rather than "cost-effectiveness" analysis, the difference being that a cost-effectiveness analysis measures different ways to meet a common goal, whereas a cost-benefit analysis has no common goal.

Our review of efforts to clean up Department of Defense-owned hazardous waste disposal sites raised questions involving the need for regulatory standards for cleaning up

groundwater. In the absence of national standards, most states have begun the process of establishing regulatory standards and other administrative requirements for some of the hazardous waste contaminants in groundwater. At the time of our review, however, the standards being established by the states were informal and non-regulatory in nature and subject to change. Morever, the informal standards that have been established for the same contaminants vary considerably among the states. For example, informal, non-regulatory standards for trichloroethylene (a common pollutant) have been set at the following levels: 70 parts per billion by Connecticut, 50 parts per billion by New Jersey, 5 parts per billion by Arizona, and 4.5 parts per billion by California. Data provided by EPA regional offices on 24 states' regulation of organic compounds in groundwater also showed a wide variance in informal standards, with 8 states having no standards at all for regulating organic compounds. Because national standards do not exist and the standards being established for the same contaminants vary among the states, inconsistent cleanup of groundwater from state to state can result.

A BROAD RANGE OF OPTIONS FOR SETTING CLEANUP STANDARDS EXISTS

The debate over cleanup standards has surfaced a broad range of options. The charts on the following pages were developed from our review of current literature on the standards issue. The first option is to completely clean up sites so that the area is the same as it was before chemical wastes were deposited there. A second option is to apply uniform standards at all sites, thus assuring a consistent level of protection throughout the country. A third option is to base the level of cleanup required on the best available technology. A fourth option is to deal only with "immediate and signficant" risks until Superfund cleanup standards are developed.

There are a great number of other potential options, but these four are representative of the principal possibilities. However, until the standards issue is decided, EPA's current approach of using existing standards and fund balancing may be a viable interim measure.

Option 1: Return Site to Its Original Condition by Removing All Contaminants

Advantages

--Provides equitable treatment for affected communities. Communities often played no role in creating the problem, but usually bear the brunt of damages to human health and the environment, as well as financial damages such as lowered property values.

Disadvantages

--May prove technologically infeasible. Technology does not exist at present to remove all toxic substances.

--Possibly not cost effective. The cost of total cleanup would be high. It is unclear if the benefits of total cleanup would be equal to the resources expended.

--Would entail the highest cost of all options available.

Option 2: Set Uniform National Standards for Acceptable Residual Levels for All Chemicals and Classes of Chemicals Found at Superfund Sites

Advantages

--Provides assurance of a consistent level of cleanup and protection.

--Precedents exist in other environmental programs. Lessons have been learned in implementing uniform standards under other environmental laws.

Disadvantages

--Criteria for setting standards are lacking. The environmental criteria that exist are taken from other environmental regulations and are not always applicable to hazardous waste site problems. About 400 toxic substances have been found on hazardous waste sites. Few have been researched and evaluated sufficiently to set standards.

--Sites vary greatly. Types of wastes involved, special populations affected, and economic and technological factors involved differ greatly. Uniform standards would not take into account these differences.

Option 3: Apply the Best Available Technology

Advantages

--Ensures that the most advanced technology would be utilized.

--Guarantees a nationally consistent level of protection and cleanup, since the same standards would be used.

Disadvantages

--Costs would be considerable, although less than those associated with option 1. Considerable resources would be required to procure the best available technology.

--Suitable criteria for determining best available technology are lacking.

--Available technology can only cover a small part of the problem. Relatively little is known about the hazardous waste problem, e.g., only a small fraction of toxic substances has been fully researched. Available technology cannot comprehensively address the issue.

Option 4: Treat "Immediate and Significant" Risks on a Site-by-Site Basis Until Standards Are Developed

Advantages

--The most immediate hazards would be treated.

--Resources could be directed to standards-related research.

Disadvantages

--Would allow serious site problems to remain untreated for a long time, because treating immediate and significant risks may result in containment of wastes on-site rather than their elimination. The problem of hazardous wastes should be addressed as quickly as possible. However, substantial time would be needed to develop standards to define "immediate and significant" and to research and determine appropriate toxicity standards.

The March 1985 OTA study provides further information on the issue of cleanup standards.

CONCLUSION

Neither Superfund nor the NCP include explicit cleanup standards to be adhered to when implementing remedial actions at hazardous waste sites. The degree of cleanup is an important issue, however, and has major implications with respect to the cost of the Superfund program and the level of protection the program provides to public health and welfare and the environment. Given the broad range of cleanup options available, selecting the appropriate remedy in the absence of cleanup standards has evoked controversy and raised many questions. Although EPA has proposed applying the standards in other federal environmental legislation to Superfund cleanups, under the proposed NCP these standards need not be applied in all circumstances. Further, many hazardous substances found at hazardous waste sites will still be without applicable cleanup standards. In fact, the Director of EPA's Superfund program has stated that choosing the method of cleanup at sites where there are no applicable standards is the most difficult Superfund policy decision facing EPA. However, until the standards issue is resolved, EPA's current approach of considering existing standards and fund balancing on a site-by-site basis may be a viable measure.

CHAPTER 6

EPA'S ROLE AT NON-PRIORITY SITES IS LIMITED

In implementing Superfund, EPA has limited its remedial cleanup responsibility to priority sites. These represent relatively few of the nation's uncontrolled hazardous waste sites. EPA projects that it may eventually identify as many as 25,000 potential sites; however, less than 10 percent of these is expected to be eligible for remedial cleanup under EPA's current policy. While the sites EPA has targeted for remedial cleanup action are among the worst in the nation, many of the remaining sites also present serious health and environmental risks. Unlike other environmental laws, Superfund does not give EPA responsibility to set national standards and ensure compliance for all sites. Although EPA does take removal actions at non-priority sites when an "immediate and significant" danger is present, the majority of the nation's sites will receive no federal cleanup action.

In addition to limiting its cleanup efforts to a relatively small number of sites, EPA does not direct, monitor, or oversee state cleanup actions at non-priority sites. Although some states have programs to clean up these sites, a wide variance exists in state resources, authorities, and capabilities. As discussed in the previous chapter, states also lack uniform standards to determine the appropriate level of cleanup necessary to alleviate the risks at a particular site. As a result, the public may not receive uniform protection from the dangers posed by hazardous waste sites.

REMEDIAL CLEANUPS ARE LIMITED TO PRIORITY SITES

Under the NCP, EPA has restricted its remedial cleanup actions to those sites included on the NPL.[1] Given the finite nature of the fund (as well as the extent of EPA's operating budget for implementing the act), the agency believes that this limitation is necessary in order to ensure that the sites presenting the greatest risks receive priority treatment. However, the cut-off point for placing priority sites on the NPL is based on an arbitrary number rather than a significant threshold in the level of risk. As a result, many sites that do not attain priority status still present significant hazards (but generally to smaller populations). Some of these sites are eligible for

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[1]Although EPA's policy is to take remedial actions only at NPL sites, EPA can take an enforcement action to compel responsible parties to clean up non-NPL sites. However, an EPA enforcement program official stated that this happens infrequently because EPA's enforcement program, like its remedial program, concentrates on NPL sites.

removal actions; however, removal actions are intended to abate immediate and significant threats to public health and welfare and the environment rather than to provide a permanent remedy at the site.

The number of priority sites is arbitrary

NPL sites are determined by EPA's Hazard Ranking System. However, each state is allowed to designate a state priority site, regardless of its ranking. The Hazard Ranking System was designed to help fulfill the Superfund requirement that the President identify at least 400 sites in the nation warranting the highest priority for remedial action. This system provides an approach for setting priorities among several thousand widely varying hazardous waste sites. However, it does not provide a rationale for limiting the number of sites eligible for remedial cleanup.

The ranking system measures the relative severity of the problems at the site and the likelihood and potential magnitude of exposure to hazardous substances for humans and sensitive environments. A score is developed for each release or potential release on the basis of its impacts on groundwater, surface water, and air. These three scores are then weighted and combined to yield an estimated hazard-ranking score. The score can range from zero (least hazardous) to 100 (most hazardous). The Hazard Ranking System was not designed to distinguish accurately between the risks presented by two sites whose scores are similar, but it is a meaningful indicator of different levels of risks between sites with large differences. The hazard ranking scores are weighted to increase the scores given to sites that threaten densely populated areas, that have a greater likelihood of exposure to the affected population, or that contain large volumes of waste. Currently, sites are listed on the NPL only if they receive a score of 28.5 or more on the Hazard Ranking System (excepting a state's designated priority site regardless of its score).

Most sites will not receive cleanup action under Superfund

Because of the response criteria outlined in the current NCP, most uncontrolled hazardous waste sites in the nation will not receive Superfund cleanup action. As of December 1984, the NPL included 538 sites, with an additional 248 sites proposed. This represents less than 5 percent of the 19,368 potential uncontrolled hazardous waste sites that EPA had identified as of December 31, 1984.[2] According to EPA's section 301 study, EPA estimates that it may identify as many as 25,000 potential

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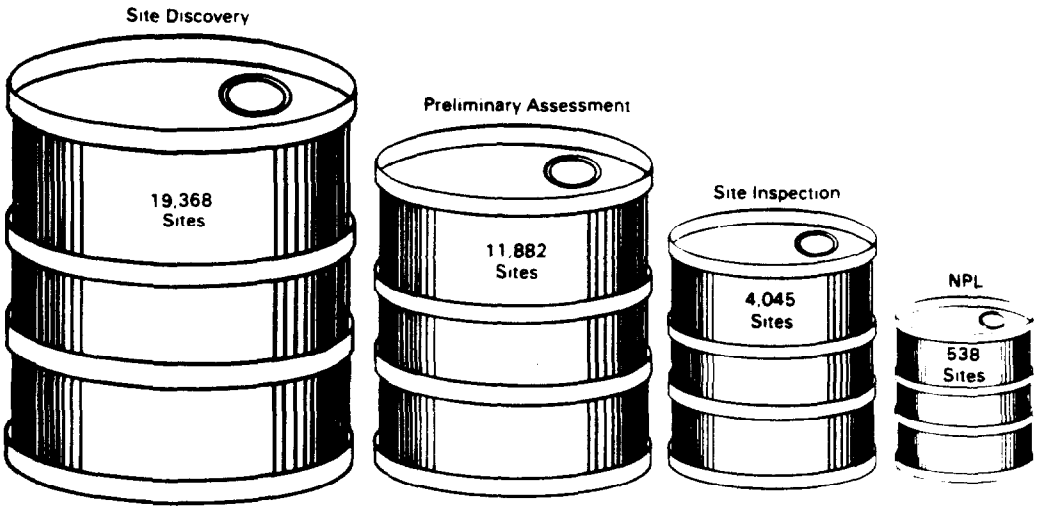
[2]Although 19,368 potential sites have been identified, not all of these will prove to be problem sites requiring cleanup action.

sites over the next several years. However, it estimates that only about 1,500 to 2,500--about 10 percent--of these sites will likely be placed on the NPL and become eligible for remedial cleanup. The following diagram shows the number of sites in various stages of the priority listing process:

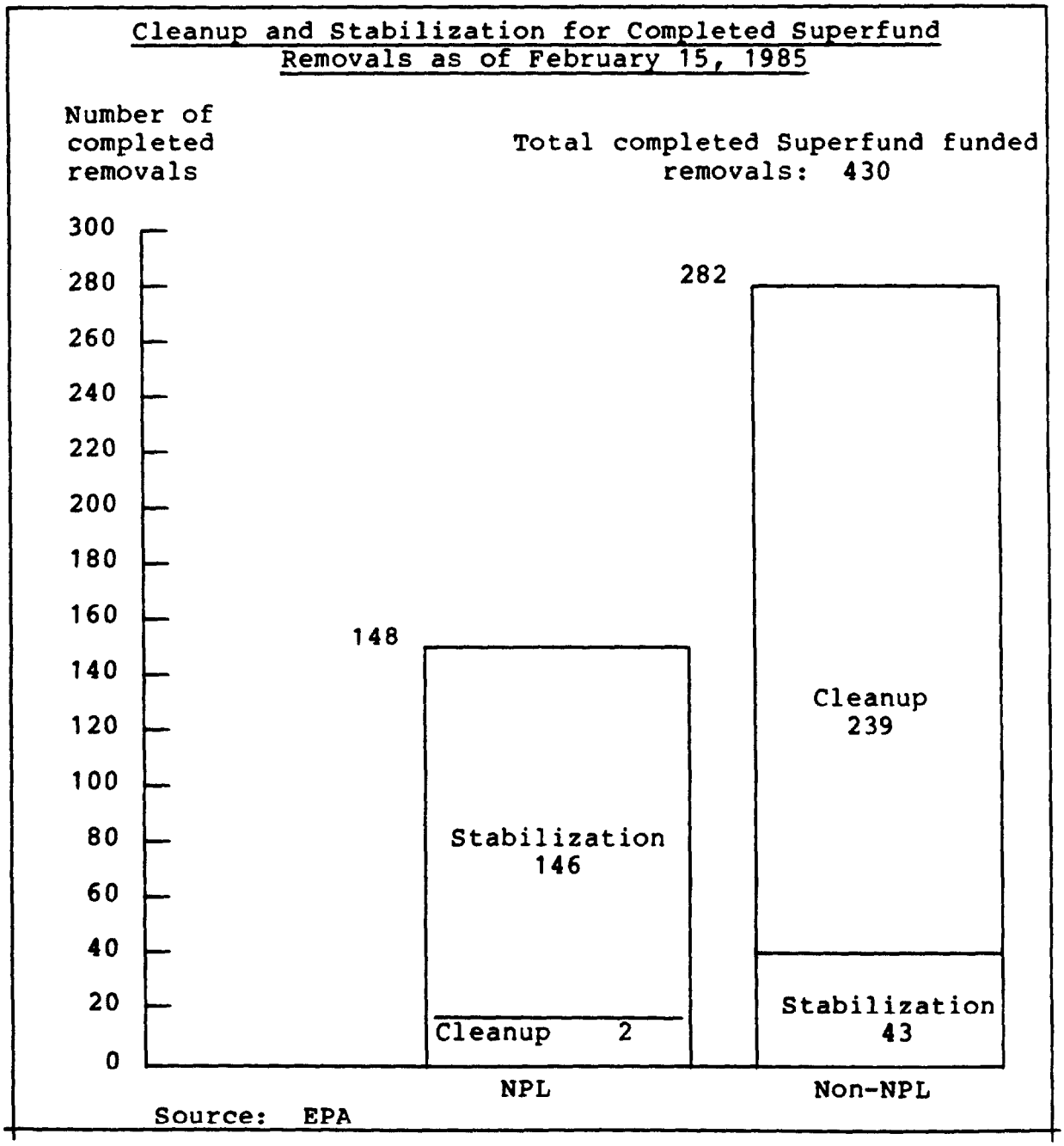
Number of Sites in Various Stages of Process for Priority Listing as of December 31, 1984



Source: EPA

Removal actions, like remedial cleanups, have been limited. Although EPA has in recent years expanded the "immediate and significant" risk criteria necessary for a site to be eligible for a removal action, many site situations do not meet these criteria. Such criteria are based on a degree of perceived threat to public health and welfare and the environment, and not merely on the existence of an uncontrolled waste situation. As of February 15, 1985, EPA had completed approximately 430 removal actions and projects that on the basis of current activity levels, 190 removal actions will be taken annually.

The following graph shows the number of completed removals at NPL and non-NPL sites as of February 15, 1985, and the extent to which these removals provided cleanup or stabilization.



Although sites not currently eligible for removal actions may not constitute an immediate and significant risk, they can still constitute potential hazards to public health and the environment. According to a December 21, 1983, study by the Association of State and Territorial Solid Waste Management Officials, at least 7,113 sites nation-wide require some form of cleanup and at least 10,508 additional hazardous waste disposal sites are a potential threat to public health and the environment. Under current EPA policy, most of these are not eligible for federal funding.

Non-NPL sites pose potential hazards

EPA acknowledges that many non-NPL sites pose a threat to human health, even though the location and nature of these sites suggests that they will affect fewer people than NPL sites. A number of these sites have actual releases into surface water, groundwater, or air that may affect the surrounding population. In its section 301 study, EPA provided the following examples of types of non-NPL sites that pose potential health and environmental dangers:

--Some sites may be isolated from populations but could pose significant environmental damage and health threats through contamination of food chains. Water used for irrigation or stock watering may, over the long term, affect plants and animals that are used for human consumption. Currently, these sites are not addressed by Superfund if human populations are not involved or if there is no immediate hazard.

--A number of sites that pose a direct contact threat to human health are not listed on the NPL because direct contact is not factored into the Hazard Ranking System. These sites may involve substances such as lead, or dioxin in the soil or in airborne particles that could be inhaled, ingested, or absorbed. When there is an immediate threat through direct contact, EPA can take a removal action to control access to the site.

--Some non-NPL sites are located in urban areas with large surrounding populations. Hazardous waste sites here may involve some groundwater or surface water contamination, but the population is likely to be served by municipal drinking water supplies rather than the affected water supplies, so there is little opportunity for contact through these routes of exposure.

--In some areas a number of small sites with minor individual impacts may all affect the same resource. For example, a number of sites located above the same aquifer could have serious cumulative impacts on groundwater.

While sites such as these may not pose immediate and significant threats, according to EPA, they do pose potentially serious long-term health and environmental risks.

ABSENCE OF A CLEAR FEDERAL ROLE AT NON-PRIORITY SITES POSES POTENTIAL PROBLEMS

The NCP does not define who is responsible for assuring that non-priority sites are cleaned up. EPA has not taken on this responsibility and does not direct, monitor, or oversee remedial cleanup actions at non-NPL sites. However, some state governments have programs to clean up these sites. Some states have their own Superfund-like response funds, but most states rely on their enforcement authorities to attain responsible party cleanups. States have varying cleanup resources and capabilities. In addition, they also lack uniform site cleanup standards. Given an unequal ability by the states to respond to hazardous waste site problems and the lack of uniform cleanup standards, there is a potential that the quality and extent of cleanups at non-NPL sites will differ.

States are taking on much of the responsibility for non-NPL cleanups

Since EPA plays no oversight role for state cleanups at non-NPL sites, there are relatively little data on the extent or quality of state cleanup or enforcement actions at non-NPL sites. However, according to the December 1983 study by the Association of State and Territorial Solid Waste Management Officials, most states are taking some kind of action (as resources permit) to clean up hazardous waste sites and spills that are not eligible for federal funding. The association also concluded the following:

--The states responding to the survey had conducted at least 157 short-term site cleanups in fiscal year 1983. (These are cleanup actions costing less than $1 million or lasting less than 6 months.) Since fiscal year 1981, these states had also initiated at least 133 long-term cleanups at sites not on the NPL and had completed 33.

--The states have been especially active in responding to spills of hazardous substances, conducting or overseeing over 8,000 spill responses annually in fiscal years 1981 and 1982. Almost all of these spill responses were paid for by private parties.

--Enforcement has been a high priority among the states. States took enforcement actions at over 2,000 hazardous waste sites between January 1981 and October 1983, with considerable success: about 40 percent of the 1,537 state administrative actions had led to cleanups conducted by private parties, and about 24 percent of the 356 judicial actions had led to cleanups conducted by private parties.

These site and spill cleanups were accomplished under state cleanup authorities and do not include the actions taken by the states in conjunction with EPA on Superfund cleanup actions. The data also indicate that private parties have been financing a large portion of the state-supervised hazardous substance cleanups.

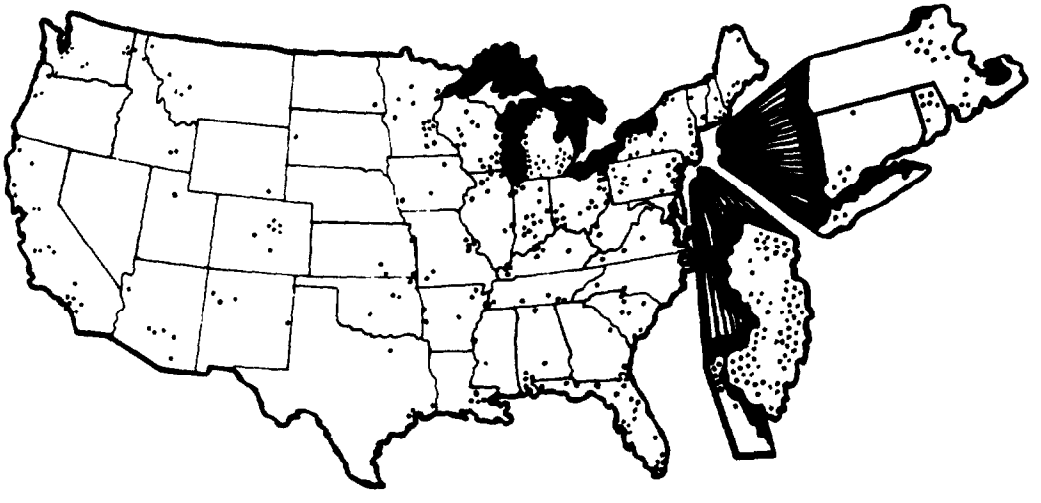
States indicate that wide variance exists in state resources, authorities, and capabilities for site cleanup actions

Although states have taken response actions at many non-NPL sites, they have varying resources and capabilities. In addition, although most states do have general laws that enable them to require responsible party cleanups, such laws differ in every state. According to EPA's section 301 study,

> "States derive their enforcement authority from a variety of state laws, which differ from state to state and are not likely to contain the comprehensive authorities in [Superfund]. Because EPA does not monitor state enforcement activities, there is little data available on the status of these actions."

EPA's section 301 study stated that the amounts that states reported having spent or earmarked for hazardous waste cleanup vary widely. Amounts reported for annual appropriations ranged from $5,000 (South Dakota in fiscal year 1985) to $14 million (Florida in fiscal year 1985). Wide variation is also evident in the lump-sum amounts that states reported. Lump-sum funds ranged from $10,000 (Vermont's pollution contingency fund) to $100 million (raised by New Jersey through its Hazardous Substance Discharge Bond). Not surprisingly, the states that reported the greatest expenditures and projected expenditures tended to contain numerous NPL sites. The following map shows the number of NPL sites in each state.

Locations of NPL Sites



Source: EPA

The state and territorial association study concluded that the states are operating under severe resource constraints and that funding and staffing levels are inadequate to fully address the environmental problems facing the states. The study also stated that with present funding levels, a full cleanup of all sites needing response cannot be completed before the middle of the 21st century. Finally, the study concluded the following:

--It will take 90 years to clean up the 7,113 sites needing response if annual state and federal funding are maintained over this period at fiscal year 1984 levels. This estimate assumes the average remedial action will cost $6 million.

--If the average cost of a remedial action is only $1 million after the most serious 1,500 sites are cleaned up, it will take 28 years to clean up the 7,113 sites. This lower estimate also assumes that private parties

will finance remedial actions at 10 percent of the sites needing a response.

--If the states' optimal staff levels are reached (as distinct from financial resources needed to fund actual cleanup), the states are capable of cleaning up the bulk of the sites needing response in approximately 16 years. Respondents indicated they would need to increase their number of technical staff--engineers and scientific specialists--by 84 percent to achieve optimal staffing levels.

--The average state funding available in fiscal year 1984 per site needing response is $66,836, a low figure.

--Some states now have no funds for hazardous substance cleanup programs.

OTHER MAJOR ENVIRONMENTAL LAWS PROVIDE FOR A GREATER FEDERAL OVERSIGHT ROLE

The Clean Air Act, Clean Water Act, Safe Drinking Water Act, and the Resource Conservation and Recovery Act all give EPA responsibility for setting pollution limits or standards, implementing control programs, and ensuring compliance. The pollution standards that are set seek to establish a base level of protection for all those potentially exposed. States are authorized and encouraged to accept all or part of the responsibility for implementing control and compliance-monitoring programs under delegation or authorization from EPA. Under each law, however, EPA retains the ultimate responsiblity for meeting environmental goals and exercises oversight over state performance of delegated functions. EPA's administration of Superfund is quite different. EPA has decided to concentrate primarily on cleaning up NPL sites, leaving the cleanup of non-NPL sites to the states. EPA has no mandate to set nationwide cleanup standards or conduct oversight over state cleanups at non-NPL sites.

Standard setting

Under the Clean Air, Clean Water, Safe Drinking Water, and Resource Conservation and Recovery Acts, EPA is required to set nationwide standards for the protection of public health and the environment. Under the Clean Air Act, for example, EPA is required to establish national air quality standards to protect health and the environment. Air emissions from existing sources of pollution are regulated so as to meet these standards. Under the act EPA is also required to establish standards for new stationary sources of air pollution, sources emitting specific hazardous air pollutants, and mobile sources of pollution. Similar federal standard-setting responsibilities are contained in the other acts. Generally, the states are free to establish their own standards, but they can be no less stringent than the

federal standards. In contrast, Superfund does not require EPA to set nationwide cleanup standards, as discussed in chapter 5.

Compliance monitoring

For the most part, EPA's responsibility for monitoring compliance with the standards set under the Clean Air, Clean Water, Safe Drinking Water, and Resource Conservation and Recovery Acts can be delegated to the states. For example, under the Clean Air Act, monitoring compliance with new stationary source standards and standards for specific hazardous air pollutants can be delegated to the states. Compliance with national ambient air quality standards and the resulting controls over existing stationary sources of air pollution are a responsibility assigned by the act directly to the states; EPA approval of state implementation plans is required (and federal enforcement of the plan is required if states do not conduct such enforcement). Similar delegation or authorization of state compliance monitoring is authorized under the other acts.

Superfund, on the other hand, does not stipulate (1) who has overall responsibility for monitoring cleanups at sites EPA does not choose to address or (2) what functions can be delegated to the states. According to the NCP, compliance monitoring at NPL sites is EPA's responsibility. States can be involved in overseeing cleanups at NPL sites under cooperative agreements, but EPA retains overall responsibility for these sites. Responsibility for monitoring cleanups at non-NPL sites is not addressed by Superfund or the NCP, and EPA does not view itself as having any role in this respect.

EPA oversight

EPA conducts various types of oversight for its delegated programs under the Clean Air, Clean Water, Safe Drinking Water, and Resource Conservation and Recovery Acts. The oversight methods employed by EPA include required state reporting, mid- and end-of-year program reviews, joint compliance inspections, and special evaluations conducted on an ad-hoc basis. Under Superfund, EPA oversees state-administered cleanups at NPL sites but has not exercised an oversight role at non-NPL sites.

CONCLUSIONS

Under other environmental laws, EPA was given the responsibility for setting national standards and ensuring compliance. However, under Superfund EPA has no mandate for setting nationwide cleanup standards or overseeing state-conducted cleanups. EPA expects to clean up relatively few of the nation's uncontrolled hazardous waste sites. EPA's ability to clean up sites is constrained by how EPA has defined its cleanup responsibilities in the NCP. EPA believes that limiting its remedial cleanup actions to NPL sites is necessary to ensure that the worst sites in the nation receive adequate treatment. Although EPA has not taken an active role at non-priority sites,

some states have programs to clean up these sites. However, a wide variance exists in state resources, authorities, and capabilities. In addition, states lack uniform criteria to determine the appropriate level of cleanup necessary to alleviate the risks at these sites. As a result, the public may not receive uniform protection from the dangers posed by hazardous waste sites.

MATTERS FOR CONSIDERATION BY THE CONGRESS

The resolution of this issue may require the Congress to weigh competing priorities and determine the extent to which it believes an expanded federal role at non-NPL sites is necessary. For example, the Congress could decide to make no change in the law. This would allow EPA to continue focusing its efforts on NPL sites, while taking removal actions at non-NPL sites where necessary to address "immediate and significant" threats to public health and welfare and the environment. Alternatively, the Congress could structure the act like other environmental laws. This change would emphasize permanent, long-term remedies and entail (1) assigning EPA a role in ensuring that a minimum level of protection from all sites is provided, including setting national standards as discussed in chapter 5, and (2) allowing possible delegation of some authority to the states under EPA oversight. Finally, the Congress could require EPA to monitor state cleanup performance and report on the extent and adequacy of state actions. This would provide a data base on which to evaluate the need for a greater federal role at non-NPL sites.

The information we have developed suggests that the Congress should consider the merits of changing the act's structure. The absence of national cleanup standards complicates an already lengthy, complex process for cleaning up hazardous waste sites. The lack of precise data on the health and environmental effects of hazardous waste sites makes standard setting difficult. Nevertheless, if we are to provide consistent site cleanup on a national basis, it is important that, where feasible, reasonably uniform criteria be established to govern both federal and state cleanup decisions.

AGENCY COMMENTS

In general, EPA agreed that the facts presented in this report were accurate and that the alternatives presented for consideration by the Congress were appropriate. EPA also provided detailed comments on specific sections of the report. These comments have been incorporated into the report where appropriate. (See app. IV.)

SUPERFUND PROVISIONS AND THE CLEANUP PROCESS

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, commonly known as "Superfund," was enacted on December 11, 1980, to provide for cleaning up the nation's uncontrolled hazardous waste sites. Superfund authorizes the President to respond whenever any hazardous substance, pollutant, or contaminant is released[1] or threatens release into the environment. The President delegated this authority to EPA by Executive Order 12316, dated August 14, 1981. The act provides for a $1.6 billion fund[2] to be accumulated over a 5-year period from taxes on petroleum and certain chemicals and from federal appropriations. The act also specifies that the parties responsible for the hazardous conditions at the sites should either perform cleanups themselves or reimburse the government for cleaning up the sites. EPA's efforts to compel responsible parties to perform these cleanups or reimburse the government are generally referred to as "Superfund enforcement" actions. As of September 30, 1984, EPA reported obligations of $917 million and disbursements of $521 million. A fiscal year summary follows.

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[1]According to the act, release means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment.

[2]Through fiscal year 1985 EPA, received $155 billion in appropriations.

Summary of Cumulative Trust Fund Balance[a]

	FY 1981	FY 1982	FY 1983	FY 1984	Total[b]
	(thousands)				
Receipts[c]	153,036	340,757	331,559	386,616	1,211,969
Appropriations	74,743	190,000	210,000	460,000	934,743
Obligations	40,283	180,744	230,233	465,619	916,879
Disbursements	8,039	79,576	147,803	285,279	520,697
Unexpended Balance	144,997	406,178	589,934	691,271[d]	691,272

[a]Preliminary figures.

[b]Components may not sum to totals shown due to rounding.

[c]Comprised of interest, cost recoveries, excise taxes, general fund revenues, and Coast Guard transfer.

[d]Includes unamortized interest ($73.7 million) on investment maturing September 1985.

Source: EPA

SUPERFUND PROVISIONS

The act defines two types of responses to hazardous substance releases or threatened releases: removal and remedial. Section 101 defines removal actions as the cleanup or removal of released hazardous substances from the environment; action needed when a release is threatened; action needed to monitor, assess, and evaluate actual or threatened releases; the disposal of removed material; or the taking of other such actions necessary to prevent, minimize, or mitigate damage to public health and welfare or the environment. Remedial actions are defined as those designed to prevent or minimize the release of hazardous substances so that they do not migrate to endanger present or future public health and welfare or the environment. Remedial actions are those leading toward a permanent remedy instead of or in addition to removal actions upon release or threatened release of hazardous substances into the environment.

Section 104 of the act provides the general conditions under which EPA may act and the requirements and limitations involved in using removal and remedial actions. For example,

removal obligations from the fund shall not continue after $1 million has been obligated or 6 months have elapsed from the date of the initial response. Remedial actions shall not begin unless the affected state first enters into a contract or cooperative agreement providing certain assurances regarding cost share, future maintenance, and availability of disposal facilities. Section 104 does not classify releases or threatened releases of hazardous substances into those requiring removal or remedial action.

Differences Between Remedial and Removal Actions

Removal actions . . .	Remedial actions . . .
--occur at both NPL and Non-NPL sites;	--occur only at NPL sites;
--are used to address immediate or substantial endangerment of public health and welfare or the environment;	--are consistent with permanent remedy;
--are subject to statutory limitations on cost and duration; and	--have no statutory limitations on cost or duration; and
--do not require cost-effectiveness studies.	--require cost-effectiveness to be demonstrated.

NCP

Section 105 of the Superfund Act requires that a plan for implementing the Superfund's responsibilities and authorities be incorporated into the NCP. This plan, first published in 1968 under the Federal Water Pollution Control Act, initially outlined procedures for oil-spill cleanups. In 1982, under the authority delegated to EPA by the President, the NCP was revised to delineate federal and state response authorities for abandoned or uncontrolled hazardous waste sites. The act did not provide, however, the methods and criteria for when and to what extent a removal or remedial response should be undertaken. Rather, it left those determinations to EPA in revising the NCP.

EPA's revised NCP provided for three types of Superfund actions for incidents involving hazardous waste sites:

--Immediate removal actions are to provide prompt response (within hours or days) to prevent immediate and significant harm to human life, health, or the environment. Examples include averting fires or explosions, installing fences or other barriers to limit access, or moving hazardous substances off-site. Generally, immediate removals are limited to those cleanup efforts that can be completed in 6 months and cost no more than $1 million.

--Planned removal actions are those that allow EPA time to plan the cleanup activities but also require an expedited action to reduce an imminent and substantial danger. The 6-month or $1 million limitation also applies, and states are required to contribute 10 percent of the removal costs. Both types of removal actions can be taken anywhere a hazardous waste threat exists.

--Remedial actions are intended to achieve a permanent and cost-effective remedy or cleanup of hazardous waste sites. Remedial alternatives can mean no action, on-site containment, or total site cleanup. The NCP also requires that the cost of the remedy be balanced against the amount of money in the fund needed to respond to other hazardous waste problems. Remedial actions usually require extensive studies along with state funding contributions. Because of the complexities of these studies, it may take from 2 to 3 years before remedial actions begin. In some instances, initial remedial measures can and should begin before selecting a permanent remedy to limit exposure or threat of exposure to a significant health or environmental hazard. The methods and criteria used in determining the appropriateness of initial remedial measures are those used for planned removal actions but without the time and cost limitations.

To be eligible for a remedial action under the Superfund, a site must be included on EPA's NPL. This designates the nation's worst known sites contaminated with hazardous substances posing the greatest threat to humans or the environment. NPL sites are determined by a national ranking system, and each state is allowed to designate a state priority site regardless of its national ranking. As of December 1984, the NPL included 538 sites, and an additional 248 proposed sites.

Superfund remedial actions can be led by either a state or by EPA:

--States can take the lead role under a cooperative agreement with EPA, which transfers federal dollars to the state. A state then develops a work plan, schedule, and budget; contracts for any services it needs; and is responsible for making sure that all conditions in the cooperative agreement are met. EPA is responsible for monitoring the state's progress throughout the project.

--EPA can take the lead, with the state having an advisory role. EPA, generally using contractor support, manages work early in the planning process. In the later design and implementation (construction) phases, contractors do the work under the supervision of the U.S. Army Corps of Engineers.

Before remedial action is undertaken, the state must assure that: (1) it will provide future maintenance of the site, (2) off-site disposal capability is available, if necessary, and (3) it will pay 10 percent of the costs of remedial action or, if the site was owned by the state or local government at the time of disposal, it will pay at least 50 percent of all response costs.

Under the Superfund program, federal involvement ends when the removal action abates the threats at non-NPL sites. No other federal action is planned at non-NPL sites unless (1) immediate and significant threats recur that necessitate another removal, (2) threats persist that require a planned removal, or (3) the site is added to the NPL for permanent remedial action. The same criteria of preventing or mitigating immediate and significant threats applies to removal actions initiated and performed at NPL sites. Unlike non-NPL sites, however, federal involvement continues at NPL sites through (1) initial remedial measures if serious threats occur and/or (2) remedial action consistent with a permanent remedy.

To better protect human health and the environment and increase removal activity at sites awaiting remedial action, EPA in May 1983 directed a reexamination of all NPL sites to identify those that posed immediate and significant threats. EPA evaluated the need to initiate removal actions to stabilize or contain any critical NPL site until remedial action could be undertaken. This review resulted in an increase in the number of removal actions as well as a need to prioritize, schedule, and manage funds for removals at NPL sites over the next year.

PROPOSED REVISIONS TO THE NCP

EPA proposed a second revision to the NCP in February 1985 that will delete two of the response categories: planned removal and initial remedial measures. EPA will perform removal

and remedial actions as defined in the act. Specifically, EPA plans to make the following revisions to the NCP:

--Modifying the criteria for undertaking removal actions under Superfund.

--Streamlining the remedial response process.

--Modifying and expanding the rules pertaining to listing and deleting sites on the NPL.

--Emphasizing the use of alternative and innovative technology and recycling or reuse as alternatives to conventional technology and practices.

--Clarifying and elaborating the roles and responsibilities, including those of the responsible parties, under Superfund.

SUPERFUND CLEANUP PROCESS

Under EPA's hazardous waste site assessment process, known sites undergo a preliminary assessment that generally entails a cursory review of information about wastes at a given site. Assessed sites with waste problems preliminarily deemed serious enough undergo a site investigation, which includes an on-site visit, sampling, and analysis of waste problems. Once a site is inspected, the seriousness of any waste problem is evaluated to determine if the site should be placed on the NPL. The distinction between NPL sites and non-NPL sites determines whether the area is scheduled for long-term cleanup. Sites on the NPL are designated for permanent remedy. Remedial action under the Superfund generally involves the following sequence of activities:

--Preparation of an initial plan for the collection of information needed to develop a site strategy.

--Investigation to determine the type and extent of contamination at the site.

--Preparation of a feasibility study to analyze various cleanup alternatives and assess their cost-effectiveness. The feasibilty study is often conducted with the investigation as one project.

--Selection of the "cost-effective" remedy, that is, the alternative that balances the need for protection of public health and welfare and the environment against the amount of money available in the fund to respond to other sites.

--Design of the remedy.

--Implementation of the remedy, which might involve, for example, constructing facilities to treat groundwater.

At any point in the process, a removal action may be initiated if circumstances warrant. Also, EPA may negotiate voluntary cleanups at different points in the cleanup process. EPA usually negotiates with the responsible parties (1) before the remedial investigation/feasibility study (in an attempt to get the responsible parties to do the study as well as the selected remedy) or (2) after the study (in an attempt to get the parties to implement the selected remedy). In addition, EPA can either direct or seek a court order to require responsible parties to perform the cleanup themselves or it may take action to require the resonsible parties to reimburse Superfund for the cost of removal and/or remedial actions.

EPA enforcement program

The Superfund Act provides that responsible parties should clean up hazardous waste sites themselves or reimburse the government for expenses incurred in cleaning up the sites. EPA uses its enforcement authority to identify, notify, and negotiate with responsible parties in an attempt to reach a settlement whereby responsible parties conduct or pay for cleanups.

EPA's Superfund enforcement authority is derived principally from sections 106 and 107 of the act. Section 106 authorizes EPA (by presidential delegation) to issue administrative orders that compel the responsible parties to clean up hazardous waste sites when it can be demonstrated that

> ". . . there may be an imminent and substantial endangerment to the public health or welfare or the environment because of an actual or threatened release of a hazardous substance from a facility."

The responsible party and EPA may negotiate an agreement for cleanup, in which case EPA issues a "consent" order, or EPA may issue a "unilateral" order without input from the responsible party. Failure to comply with a section 106 order may result in a fine of up to $5,000 per day and punitive damages of up to three times the cost of cleaning up the site.

Section 106 also authorizes EPA to pursue a judicial remedy instead of an administrative one. Under this section EPA may ask a federal district court to require responsible parties to mitigate any danger or threat of danger from hazardous waste

sites. If EPA and the responsible parties negotiate an agreement for cleanup, they may--subject to court approval--have the court issue a "consent decree." Consent decrees provide certain features that administrative orders do not, such as long-term court oversight of compliance with separate cleanup milestones. Under these settlements the responsible parties can clean up the sites themselves or pay contractors to provide cleanups according to the specifications agreed upon with EPA.

EPA may also clean up sites itself using Superfund money and file an action under section 107 to recover the cost of the cleanup. Section 107 provides that past and present owners and operators of sites and generators and transporters who contributed hazardous substances to sites shall be liable for all cleanup costs. As of August 31, 1984, EPA had successfully concluded cost-recovery actions at 35 sites for about $6.4 million under section 107.

State involvement in Superfund enforcement

Unlike some environmental laws--such as the Clean Water Act, Clean Air Act, and Resource Conservation and Recovery Act--Superfund does not provide authority for delegating EPA's enforcement responsibility to the states. However, states can order responsible parties to take removal and remedial cleanup actions under state laws and can, under two conditions, use section 107 of Superfund to recover their own expenditures for cleaning up sites. The two conditions provided for in the act are that (1) the state bring suit in a federal district court rather than a state court and (2) the cleanup action for which the state is seeking to recover funds be consistent with the NCP.

SUMMARY OF GAO REPORTS ON SUPERFUND AND RELATED ISSUES

REPORTS ISSUED ON SUPERFUND

1. Status of EPA's Remedial Cleanup Efforts (GAO/RCED-85-86, Mar. 20, 1985)

We found that EPA considers only 10 of the nation's worst hazardous waste sites to be cleaned up. However, Superfund-financed remedial activity was in progress at 298 of the 538 priority sites through December 31, 1984. Obligations for these actions totalled $353 million, and expenditures totalled $106 million. Most of the 298 sites in remedial activity had reached only the investigative or study phase: 62 sites had cleanup action approved.

2. EPA's Inventory of Potential Hazardous Waste Sites Is Incomplete (GAO/RCED-85-75, Mar. 26, 1985)*

We found that while EPA and the seven states we reviewed had made varying efforts to discover sites and maintain an inventory, a comprehensive nationwide inventory was non-existent. EPA and the states agreed that more sites remain to be discovered, but EPA had given low priority to its own new site discovery efforts as well as similar state efforts funded by EPA grants. EPA believed its role was to evaluate the extent of hazards at all sites, take emergency action where necessary to reduce serious threats at such sites, and fully clean up only the priority sites.

We recommended that the EPA Administrator

--develop a plan laying out what specific steps EPA intends to take to complete a comprehensive hazardous waste site inventory envisioned by the Resource Conservation and Recovery Act section 3012, what priority and resources EPA plans to devote to this effort, what the states' role should be, and how long it will take to accomplish;

--encourage the states to report the existence of hazardous sites by stressing the importance and need for EPA evaluation of the sites and EPA emergency or other response when necessary; and

--emphasize to EPA's regions the need to incorporate into the EPA inventory sites that are reported by the states.

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*Asterisk denotes reports with open recommendations.

EPA has not had time to provide an official response to this report.

3. Illegal Disposal of Hazardous Waste: Difficult to Detect or Deter (GAO/RCED-85-2, Feb. 22, 1985)

We reviewed efforts to detect or deter illegal disposals of hazardous wastes in California, Illinois, Massachusetts, and New Jersey. This report provided information on the extent to which (1) EPA and these states have knowledge of illegal disposals, (2) regulatory controls have been effective in detecting or deterring such activity, and (3) enforcement actions have been taken against violators.

We also reviewed several methods not covered in the federal regulations that EPA or the four states have considered or used to detect or deter illegal disposals. We concluded that additional regulatory measures may increase deterrence but may not detect the determined violator. The use of awareness and public informant programs appears better suited for detecting such violators.

4. Clearer EPA Superfund Program Policies Should Improve Cleanup Efforts (GAO/RCED-85-54, Feb. 6, 1985)*

EPA limits removal actions to preventing or mitigating immediate and significant risks to humans or the environment so that an inordinate share of the Superfund budget would not be used on less significant sites. This policy, however, inhibits EPA in the permanent, long-term cleanup of waste sites. It has resulted in the worst hazardous waste sites' receiving only stopgap cleanups, leaving hazardous substances on the surface, and requiring repeated stopgap actions at additional cost.

EPA has proposed policy changes that would allow more thorough surface cleanup at sites. We agreed with this change but recommended that EPA include in its policy revision a requirement that removal actions eliminate surface hazardous substances to the extent possible to reduce recurring threats, avoid repeated actions, minimize Superfund expenditures, and contribute to the permanent remedy of priority hazardous waste sites.

EPA has not provided an official response to this report. The agency has 60 days from the report's date of issuance to respond.

5. EPA Could Benefit From Comprehensive Management Information on Superfund Enforcement Actions (GAO/RCED-85-3, Dec. 28, 1984)*

We found that EPA maintained detailed Superfund enforcement information in individual files and had developed information systems for reporting various categories of Superfund enforcement data. However, according to EPA enforcement officials, if the number of Superfund enforcement cases continued to rise as projected, it would become increasingly beneficial for EPA program managers to maintain more comprehensive tracking information to help answer questions such as "How long are different steps in the enforcement process taking?" and "Are the time frames that have been set for the process being met?" We recommended that EPA assess the feasibility of developing and maintaining a comprehensive Superfund enforcement management information system and, if cost effective, implement such a system.

EPA has begun studying the feasibility of maintaining a comprehensive management information system and has initiated actions to improve its existing systems.

6. HHS' Implementation of Superfund Health-Related Responsibilities (GAO/HRD-84-62, Sept. 28, 1984)

The Superfund legislation gave the Department of Health and Human Services considerable latitude concerning how it could implement its health-related responsibilities. The department's progress in implementing its planned Superfund activities had been adversely affected by funding delays and staffing limitations. Furthermore, the legislation and its history did not clearly define congressional expectations in two key areas--the development and maintenance of registries and the provision of medical care for persons exposed to toxic substances.

We suggested that the Congress may wish to consider the department's progress concerning Superfund health-related activities and determine whether changes are needed in how these activities are funded and staffed and whether legislative expectations regarding registries and health care should be clarified.

7. Status of Civilian Federal Agencies' Efforts to Address Hazardous Waste Problems on Their Lands (GAO/RCED-84-188, Sept. 28, 1984)

We found that 11 of 16 civilian federal agencies identified as having hazardous waste activities were aware of 340 potential hazardous waste site locations on their lands or under their control. Assessment, evaluation, and corrective action at their 340 locations ranged from 105, where no action had been taken, to 73, where EPA or other federal agency officials had concluded that no further action was warranted. Some action had been taken at the remaining 162 locations, but additional actions were needed.

We also found that EPA's data system, which shows potential hazardous waste site locations and the status of actions performed, was incomplete. We recommended that EPA update and correct the data system. As of February 1985, EPA was developing a new data base called CERCLIS, which was designed to correct the problems found with the ERRIS data base. It is expected to be operational in March 1985, and should result in an accurate list of hazardous waste sites.

EPA and seven other federal agencies have underway or planned new initiatives to focus civilian federal agencies' attention on hazardous waste site identification, assessment, evaulation, and cleanup issues. In this regard, EPA's ongoing effort to develop a new strategy is key to assuring that federal agencies comply with the act. As of February 1985, discussions with the federal agencies were completed and the strategy was being revised at EPA before being sent to OMB for review and approval.

8. Natural Resource Damage Claims and Assessment Regulations Under Superfund (GAO/RCED-84-196, Sept. 4, 1984)

We reported on the reasons for EPA's and Interior's delays in promulgating regulations to implement the natural resource damage claims and assessment provisions of the act and the impact these delays may have had on potential claims against the fund.

Reasons given for delays in promulgating the regulations included: Superfund's mandate to take emergency and remedial actions to protect human health and the environment had taken priority over restoration of natural resources, frequent changes in EPA's senior management during the past 3 years had caused delays in establishing overall guidance for developing the

regulations, and lack of resources. In addition, officials stated that the regulations were difficult to develop and available information was lacking.

Because of these delays, in December 1983, four states had 57 claims totaling $2.7 billion against the fund. These claims were declared invalid by EPA in January 1984. As a result, state officials in three states filed suit against EPA and Interior to require them to issue the regulations.

9. EPA's Efforts to Clean up Three Hazardous Waste Sites (GAO/RCED-84-91, June 7, 1984)

This report focused on EPA's efforts to clean up three hazardous waste sites in New Jersey, Ohio, and Rhode Island. Cleanup actions taken at the three sites ranged from containing waste on-site to moving the waste to another site. However, these sites still had contamination problems, and studies were underway to determine how best to handle them.

EPA is required to select the most cost-effective method to clean up hazardous waste sites. We reported that until EPA completes studies necessary to define long-term cleanup solutions for each of these three sites and the cost of accomplishing those solutions, the most cost-effective method cannot be determined.

10. EPA's Preliminary Estimates of Future Hazardous Waste Cleanup Costs Are Uncertain (GAO/RCED-84-152, May 7, 1984)

This report evaluated EPA's Superfund Task Force preliminary study on the future resources needed to clean up the nation's worst uncontrolled hazardous waste sites. EPA's study estimated that the federal government could spend between $8.4 billion and $16 billion to clean up these sites. These estimates were based on uncertainties concerning the number of hazardous waste sites, the construction costs needed for the cleanup, and the extent cleanup can be accomplished without using federal funds. Because of these uncertainties, we found that the range could be from $5.3 billion to $26 billion, which suggested a need for better data before a more useful estimate could be developed.

11. State Experiences With Taxes on Generators or Disposers of Hazardous Waste (GAO/RCED-84-146, May 4, 1984)

To raise revenue for hazardous waste cleanup efforts and to provide greater economic incentives for more desirable hazardous waste management practices, the Congress was considering various taxes on hazardous waste generation.

This report discussed the experiences that California, New Hampshire, and New York have had with taxes similar to those now proposed at the federal level. We found that the three states

--had not collected the revenues they anticipated,

--had not determined if the tax achieved its objective of encouraging more desirable waste management practices, and

--were concerned that a similar federal tax may reduce state tax revenue or increase the incentive to illegally dispose of hazardous waste.

In addition, we believed that in order to implement similar federal taxes, more data are needed on the types and quantities of waste generated and the disposal methods used. These data were necessary to realistically estimate revenue, measure changes in disposal practices, and assure compliance with the tax.

12. Evaluation of the Environmental Protection Agency's Inspector General Audit of Superfund Expenditures and Implementation of the Inspector General's Recommendations (GAO/RCED-84-31, Oct. 19, 1983)

On this assignment we reviewed EPA's Inspector General's audit of fiscal year 1982 expenditures from the Hazardous Substances Response Trust Fund (commonly referred to as "Superfund"). Specifically, we reviewed the Inspector General's objective, scope, and methodology in performing the audit; and determined what corrective actions EPA has taken as a result of the report's findings and recommendations.

We found that the Inspector General's objective, scope, and methodology were acceptable. The only exception was that about $22.5 million in interagency agreements relating to Superfund expenditures was not audited. The Inspector General's Chief, Internal Audit Staff, told us that this was not done because of time constraints and other priorities. He said that most of the audits were planned to be completed in fiscal year 1984.

We also found that EPA had begun to implement corrective actions on the Inspector General's recommendations.

13. Environmental Protection Agency's Progress in Implementing the Superfund Program (GAO/CED-82-91, June 2, 1982)

We reported that

--a lack of final policies and guidance had hampered the Superfund program's implementation during its first 15 months,

--a limited number of sites were eligible for remedial action and problems were encountered in developing the list of eligible sites,

--a national hazardous waste site inventory did not exist and thousands of identified sites had not been assessed or examined,

--the cleanup of sites was expected to be a lengthy and flexible process, and

--the funding obligated for program activities lagged behind approved spending levels.

14. Hazardous Waste Sites Pose Investigation, Evaluation, Scientific, and Legal Problems (CED-81-57, Apr. 24, 1981)

We reported that little is known about the possible adverse health and environmental effects associated with the thousands of hazardous waste disposal sites now being discovered throughout the United States. In addition, EPA has found that implementing its mandate to protect human health and the environment from hazardous wastes has been difficult because

--new waste sites were being discovered faster than they could be investigated and evaluated,

--there was no strong scientific basis for determining risks to the health environment, and

--legal action seeking correction of hazardous waste problems was pursued for only a few sites.

Individuals who turned to the courts to satisfy hazardous waste compensation claims faced great difficulties.

OTHER RELATED REPORTS

15. Efforts to Clean up DOD-Owned Inactive Hazardous Waste Disposal Sites (GAO/NSIAD-85-41, draft report)

The Department of Defense's Installation Restoration Program, designed to identify and clean up old hazardous waste sites, (1) will cost $5 billion to $10 billion and (2) had not adequately involved regulatory agencies in its program to clean up inactive DOD-owned hazardous waste sites. We also noted that groundwater pollution standards varied considerably among the states.

16. The Environmental Protection Agency Should Better Manage Its Use of Contractors (GAO/RCED-85-12, Jan. 4, 1985)*

EPA relies on contractor support to augment its staff. In fiscal year 1983, for instance, EPA spent an estimated $215 million for contract employee services. We found that EPA had not (1) monitored contractors' activities to ensure that performance remains cost-effective or (2) performed reviews to ensure that contractor employees were not establishing policy or performing other types of work traditionally reserved for federal employees.

EPA obtains about 88 percent of its contract support through cost-reimbursable contracts. These contracts provide EPA maximum flexibiity in accomplishing program objectives, but offer limited incentive for the contractor to control costs. We believe that EPA is missing opportunities to control costs through the increased use of fixed-price contracts. In addition, we noted that EPA, contrary to its regulations, has directed contractors to perform work outside the scope of their contracts and to award sole-source subcontracts to firms selected by EPA.

EPA is emphasizing the accomplishment of program goals and objectives at the expense of sound contract management. We believe that improved contract management and adherence to federal procurement regulations will help EPA not only improve the quality of contractor work but also assist in meeting program objectives.

To increase EPA's efficiency in using contractors and federal employees and to comply with Office of Management and Budget Circular A-76, we recommended that the EPA Administrator establish procedures for monitoring contracts for cost-effectiveness. If the administrator determines that contracts are not cost-effective, EPA should follow

Circular A-76 guidelines and look for more efficient contracting opportunities and/or prepare a cost analysis to determine if it would be more appropriate to do the work in-house, with government employees. We also recommended that the administrator take the necessary actions to increase the priority given to procurement operations. Finally, to improve controls over EPA's contract management, we recommmended that the administrator require the Procurement and Contracts Management Division to carry out its contract management responsibilities by having the contract officers become more involved with monitoring work assignments as required by EPA and federal regulations. If resources are not available to carry out these responsibilities, the administrator should determine the additional staff needs and provide this information to the appropriate congressional committees for their consideration.

EPA has not provided an official response to this report.

17. Inspection, Enforcement, and Permitting Activities At New Jersey and Tennessee Hazardous Waste Facilities (GAO/RCED-84-7, June 22, 1984)

Facilities where hazardous waste is treated, stored, or disposed of are subject to federal controls. This report presented data on key elements of the hazardous waste regulatory program for New Jersey and Tennessee facilities. Overall, GAO found that

--Eleven of 14 facilities in Tennessee and 5 of 34 facilities in New Jersey did not fully comply with groundwater-monitoring requirements.

--Neither state knew the extent of compliance with financial responsibility requirements that are intended to make funds available for proper facility closure and postclosure care when facilities close.

--Infrequent followup was made, and few enforcement actions were taken to ensure that violations identified through inspections were corrected during our review period.

--EPA and the states have issued relatively few final permits to the estimated 7,500 facilities requiring them. EPA recognized that widespread noncompliance with the RCRA program requirements exists, and it had taken or planned to take actions to improve the inspection, enforcement, and permitting program.

18. Status of the Department of Defense's Installation Restoration Program At Mather Air Force Base and Sacramento Army Depot (GAO/NSIAD-84-56, Feb. 29, 1984)

We made a limited review of the status of the Department of Defense's Installation Restoration Program at Mather Air Force Base and Sacramento Army Depot, both in the Sacramento area of California.

In summary, the Installation Restoration Program work at Mather began in January 1982 with a records search to identify hazardous waste disposal sites. A June 1982 report identified 20 disposal sites that had a potential for contaminant migration. Additional work to determine the types and quantities of contaminants began in September 1982 and was ongoing.

Installation Restoration Program work at the Sacramento Army Depot identified hazardous waste disposal sites in a December 1979 report. The Army concluded its Installation Restoration Program work at the depot in November 1981 and issued a report addressing the potential for environmental pollution on this installation. However, because state and local environmental regulatory agencies raised questions about the report, the Army has resumed some additional Installation Restoration Program work.

19. Federal and State Efforts to Protect Ground Water (GAO/RCED-84-80, Feb. 21, 1984)

Groundwater is the primary source of drinking water for about 50 percent of our population. The nature and scope of groundwater contamination is unknown. However, information we collected from 15 states, EPA, and other sources shows that hazardous waste disposal, petroleum leaks and spills, road salt storage and spreading, and oil exploration activities have caused significant groundwater contamination. A uniform national solution to these problems may not be possible because groundwater contaminants vary from region to region.

Responsibility for protecting groundwater is controversial because it involves the question of state's rights versus federal control. A comprehensive national groundwater protection policy did not exist; however, six federal laws address specific contamination problems. The 15 states we contacted favored a federal role, primarily in the areas of funding and research and development, but generally opposed strong federal regulatory controls. EPA's August 1984 groundwater protection strategy places responsibility for groundwater protection and management on the states.

20. Status of Air Force Efforts to Deal With Groundwater Contamination Problems At McClellan Air Force Base (NSIAD-84-37, Nov. 29, 1983)

This report stated that since 1979, McClellan Air Force Base had been studying groundwater contamination problems at the base. We reviewed a key July 1983 study, prepared by an Air Force contractor, aimed at identifying and evaluating problems associated with past hazardous waste disposal sites at McClellan.

We found that (1) the study had been criticized by regulatory agencies for not adequately addressing the magnitude and extent of the base's environmental contamination problem and (2) these agencies had limited participation during the study. The Air Force had initiated actions to correct most of the deficiencies in the study. Future efforts at McClellan will include more involvement by state and local regulatory agencies.

Although tests indicated that the base's water generally met the state's drinking water criteria, we believed more work may be warranted to substantiate the safety of McClellan's drinking water.

21. Information on Disposal Practices of Generators of Small Quantities of Hazardous Wastes (GAO/RCED-83-200, Sept. 28, 1983)

We reported that the federal government and most states imposed less stringent requirements on firms that generate small amounts of hazardous waste than on those that generate large amounts. This report provided information on federal and state efforts to control disposal practices of these small-quantity generators and provided data on the actual disposal methods used by 48 small-quantity generators in Connecticut, Louisiana, Rhode Island, and Texas. It also discussed the extent to which occupational safety and health and groundwater contamination problems were caused by the disposal of hazardous waste by small quantity generators.

22. Interim Report on Inspection, Enforcement, and Permitting Activities At Hazardous Waste Facilities (GAO/RCED-83-241, Sept. 21, 1983)

Overall, we found that many hazardous waste facilities in the four states sampled were not complying with Resource Conservation and Recovery Act groundwater monitoring and closure, postclosure, and financial responsibility requirements or that their compliance status was

unknown. While most major Resource Conservation and Recovery Act facilities in two of the four states sampled were inspected, over half the facilities sampled had not been inspected by responsible state agencies, and enforcement actions had not been extensive.

EPA and the states had issued relatively few final Resource Conservation and Recovery Act permits to the estimated 8,000 facilities requiring them--a process that because of the complexities involved could, according to EPA, take up to 10 years to complete.

23. Hazardous Waste Facilities With Interim Status May Be Endangering Public Health and the Environment (CED-81-158, Sept. 28, 1981)

This report concluded that EPA had little assurance that hazardous waste facilities with interim status--the period between application and issuance of the final permit--met the minimum national requirements for acceptable management as specified in the interim status regulations. In addition, all facilities were not included in the interim status process.

EPA and state inspection and enforcement efforts had covered only a small percentage of the facilities with interim status. EPA had emphasized the issuance of warning letters, notices of violations, and compliance orders which, because of the nature of the regulations, had concentrated on administrative violations.

Most EPA and state officials believed that additional staffing was necessary to implement a more comprehensive interim status program for hazardous waste facilities.

DISCOUNT AND INFLATION RATES

The discount rates used in chapter 3 were developd by using standard economic theory. Typically, a range of discount rate values is used in economic analysis. A lower bound value corresponds to the rate of return individuals expect on their personal investments of savings in stocks, bonds, etc. This value can be approximated by examining average returns on different investments and subtracting personal income taxes and inflation. A recent review of discount rates[1] cites estimates ranging from zero to 6 percent for this lower bound value. Since our nominal funding estimates incorporate an average 3.5-percent inflation rate, the lower bound nominal discount rate might range from 3.5 to 9.5 percent. Thus, our choice of 5 percent is closer to the low end of this range. The upper bound value for the discount rate corresponds to the before-tax rate of return earned on investment projects available in the private sector. The above review cites an average value of 10 percent for this upper bound value. Since this is not inflated, it corresponds to a 13.5-percent nominal upper bound value.

In addition to the low and high discount rates, we used a discount rate approximating the cost of borrowing for the federal government. We derived this rate from the average yield on outstanding marketable Treasury Department obligations with maturities of 15 to 30 years. This rate was 11.25 percent in nominal terms, or 7.8 percent in real terms.

[1] Discounting for Time and Risk in Fnergy Policy, R.C. Lind, ed. (Washington, D.C.: RFF, Inc., 1982).

AGENCY COMMENTS AND OUR EVALUATION

The following comments represent EPA's official agency position. They were provided orally on February 25, 1985, and approved in writing on February 28, 1985.

In general, EPA agreed that the facts presented in this report were accurate and that the alternatives presented for congressional consideration were appropriate. In addition to these overall comments, EPA provided the following statements concerning specific sections of the report:

(1) In regard to our analysis of estimated Superfund costs in chapter 3, EPA agreed that our analysis was consistent with historical data and that their analysis was based on program goals and policy decisions. EPA also stated that the agency is planning an expanded effort to achieve their cleanup goals through (1) revisions to the National Contingency Plan and related guidance, (2) provisions in the administration's Superfund reauthorization bill, and (3) EPA's settlement policy.

(2) Regarding our statement in chapter 3 that EPA's section 301 study did not include state and local government expenses for administration and enforcement, EPA said that the study did not include these costs because the agency has not paid them in the past. EPA maintained, however, that in the future the agency plans to use multi-site agreements to fund up-front administration and enforcement costs. EPA currently has no estimate of these costs.

(3) Concerning our discussion of the cost of more stringent cleanup standards in chapter 3, EPA said that although more stringent standards would probably increase cleanup costs, the increase in costs might not be great. EPA noted that several standards-related factors can affect costs, such as the following:

--The permanence of the remedy taken at a site. A more permanent remedy may be more expensive initially but may be more economical in the long run.

--The effect of Resource Conservation and Recovery Act requirements for disposal of hazardous wastes. These requirements include pretreatment of wastes and double liners for landfills.

--Site conditions that may not be discovered until actual cleanup begins. In some instances, more extensive cleanup actions may be required to meet standards than originally expected.

(4) In regard to our discussion of the relatively small number of site contaminants that have explicit standards, EPA noted that cleaning up a site to meet the standard for one contaminant may, in fact, provide adequate cleanup of other contaminants which have no established standards.

(5) Concerning our statement in chapter 5 that a number of sites posing a direct contact threat to human health are not listed on the NPL, EPA responded that such sites will be eligible for cleanup action under recent revisions to the National Contingency Plan.

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In addition to the above points, EPA provided some suggestions for minor technical changes to the draft. These changes have been incorporated where appropriate.

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