Hazardous Waste Management: An Update
A Legislator’s Guide

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edited by
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Preface

This publication was made possible through a grant from the U.S. Environmental Protection Agency. The purpose of this document is to provide state legislators and their staff with a better understanding of federal and state hazardous waste issues and programs.

The author is grateful to Leann Stelzer for her assistance in preparing the countless drafts of this guide. Larry Morandi provided valuable and insightful comments on structure and content. Sharon Schwoch deserves credit for her patience in editing the final draft.

This guide is an update of the 1980 *Legislator's Guide to Hazardous Waste Management* written by Jon Steeler. Although a great deal more activity has occurred in the field of hazardous waste management since that original document, some of its more valuable information was used in the writing of this book.
Executive Summary

The United States generates over 70 billion gallons of hazardous waste per year. In recent years, Americans have seen the results of mismanaged wastes from potential health risks to contamination of water supplies. Hazardous waste, once thought to be a regional problem, has become a national issue. A recent CBS and New York Times poll indicated that 69 percent of all Americans believe hazardous waste regulation cannot be too stringent, no matter what the costs. For these reasons, the regulation of hazardous waste has been an important issue in state legislatures and, from all indications, will be for years to come.

Currently, effective hazardous waste management practices do exist, and they include:

- Reducing the amount of hazardous waste generated;
- Exchanging industrial wastes so they can be reused;
- Recovering materials from the wastes such as sources of energy, which can be reused;
- Treating wastes with incineration, for example, to reduce the level of toxicity.

In 1976, and with amendments in 1984, Congress adopted the Resource Conservation and Recovery Act (RCRA) to encourage the development of these management practices. The program represents a comprehensive federal and state effort to regulate hazardous wastes from “the cradle to the grave.” State standards are set for hazardous waste identification; generation and transportation; treatment, storage, and disposal facilities; and enforcement. States may operate their programs independently of the Environmental Protection Agency (EPA) if they adopt standards that are at least as stringent as those developed by the federal government.

In addition to RCRA, states are developing other areas of hazardous waste management. For example, they are creating or have created comprehensive plans for statewide waste regulation. Also, states have established innovative approaches to deal with the inevitable conflicts that arise when trying to site a waste facility. One area that will be important in legislatures in upcoming years will be providing incentives to businesses that implement alternatives to land disposal of hazardous wastes.

In addition to the management area, states are concerned with hazardous waste cleanup. The decades of mismanagement have created a costly and complicated task of trying to clean up hazardous wastes that have been improperly disposed of. In recent
years, states have come to realize that the federal government's ambitious Superfund program cannot provide all the means to clean up the nation's wastes. Thus, states are developing their own programs.
The Hazardous Waste Dilemma

Hazardous waste is an inevitable by-product of U.S. industrial society. In addition to providing American citizens with the world's highest standard of living, this industrial society generates billions of gallons of hazardous waste each year.

In fact, in 1983, the United States produced 265 million metric tons (71 billion gallons) of hazardous waste. As Table 1 indicates, a handful of states are responsible for a majority of that waste. Ten states generate 62.7 percent of the country's hazardous waste, with the top five—Texas, Ohio, Pennsylvania, California, and Illinois—accounting for approximately 40 percent.

One of the major environmental issues federal and state officials have been wrestling with over the past decade has been how to manage the nation's wastes effectively. For a variety of reasons, the policy has been to dispose of it in the ground. These short-sited management decisions have caused both public health and environmental dangers. Moreover, the hazardous chemicals that contaminated the water at Love Canal and the toxins that converted Times Beach, Missouri, into a ghost town no longer can be seen as isolated incidents. No state or community can afford the environmental, health, and economic costs of mismanaged hazardous waste.
### Table 1.

**Estimated Generation of Industrial Hazardous Waste in 1983, by State**  
(In thousands of metric tons)

<table>
<thead>
<tr>
<th>State</th>
<th>Quantity</th>
<th>Percent of National Generation</th>
<th>State</th>
<th>Quantity</th>
<th>Percent of National Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>6,547</td>
<td>2.5</td>
<td>Montana</td>
<td>662</td>
<td>0.2</td>
</tr>
<tr>
<td>Alaska</td>
<td>52</td>
<td>a</td>
<td>Nebraska</td>
<td>739</td>
<td>0.3</td>
</tr>
<tr>
<td>Arizona</td>
<td>642</td>
<td>0.2</td>
<td>Nevada</td>
<td>379</td>
<td>0.1</td>
</tr>
<tr>
<td>Arkansas</td>
<td>3,729</td>
<td>1.4</td>
<td>New Hampshire</td>
<td>431</td>
<td>0.2</td>
</tr>
<tr>
<td>California</td>
<td>17,284</td>
<td>6.5</td>
<td>New Jersey</td>
<td>12,948</td>
<td>4.9</td>
</tr>
<tr>
<td>Colorado</td>
<td>1,902</td>
<td>0.7</td>
<td>New Mexico</td>
<td>619</td>
<td>0.2</td>
</tr>
<tr>
<td>Connecticut</td>
<td>5,238</td>
<td>1.6</td>
<td>New York</td>
<td>9,876</td>
<td>3.7</td>
</tr>
<tr>
<td>Delaware</td>
<td>894</td>
<td>0.3</td>
<td>North Carolina</td>
<td>3,954</td>
<td>1.5</td>
</tr>
<tr>
<td>Florida</td>
<td>2,981</td>
<td>1.1</td>
<td>North Dakota</td>
<td>269</td>
<td>0.1</td>
</tr>
<tr>
<td>Georgia</td>
<td>3,338</td>
<td>1.3</td>
<td>Ohio</td>
<td>19,692</td>
<td>7.4</td>
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<tr>
<td>Hawaii</td>
<td>202</td>
<td>0.1</td>
<td>Oklahoma</td>
<td>2,673</td>
<td>1.0</td>
</tr>
<tr>
<td>Idaho</td>
<td>1,160</td>
<td>0.4</td>
<td>Oregon</td>
<td>969</td>
<td>0.4</td>
</tr>
<tr>
<td>Illinois</td>
<td>14,810</td>
<td>5.6</td>
<td>Pennsylvania</td>
<td>18,260</td>
<td>6.9</td>
</tr>
<tr>
<td>Indiana</td>
<td>10,189</td>
<td>3.8</td>
<td>Rhode Island</td>
<td>1,745</td>
<td>0.7</td>
</tr>
<tr>
<td>Iowa</td>
<td>1,774</td>
<td>0.7</td>
<td>South Carolina</td>
<td>3,669</td>
<td>1.4</td>
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<tr>
<td>Kansas</td>
<td>2,564</td>
<td>1.0</td>
<td>South Dakota</td>
<td>159</td>
<td>0.1</td>
</tr>
<tr>
<td>Kentucky</td>
<td>4,647</td>
<td>1.7</td>
<td>Tennessee</td>
<td>12,159</td>
<td>4.6</td>
</tr>
<tr>
<td>Louisiana</td>
<td>13,801</td>
<td>5.2</td>
<td>Texas</td>
<td>34,866</td>
<td>13.1</td>
</tr>
<tr>
<td>Maine</td>
<td>337</td>
<td>0.1</td>
<td>Utah</td>
<td>1,139</td>
<td>0.4</td>
</tr>
<tr>
<td>Maryland</td>
<td>2,989</td>
<td>1.1</td>
<td>Vermont</td>
<td>226</td>
<td>0.1</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>4,536</td>
<td>1.7</td>
<td>Virginia</td>
<td>4,038</td>
<td>1.5</td>
</tr>
<tr>
<td>Michigan</td>
<td>12,399</td>
<td>4.7</td>
<td>Washington</td>
<td>5,523</td>
<td>2.1</td>
</tr>
<tr>
<td>Minnesota</td>
<td>2,212</td>
<td>0.8</td>
<td>West Virginia</td>
<td>5,642</td>
<td>2.1</td>
</tr>
<tr>
<td>Mississippi</td>
<td>1,816</td>
<td>0.7</td>
<td>Wisconsin</td>
<td>3,297</td>
<td>1.2</td>
</tr>
<tr>
<td>Missouri</td>
<td>6,046</td>
<td>2.3</td>
<td>Wyoming</td>
<td>572</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>265,595</td>
<td>100.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- a. Less than one-tenth of 1 percent.

Source: Congressional Budget Office, 1983.

Although expensive, the technologies to effectively manage hazardous wastes do exist. The comprehensive Resource Conservation and Recovery Act encourages industries to develop and implement these management technologies, some of which are discussed in the next chapter.

A number of federal and state initiatives have been implemented in recent years with the full support of the public. In fact, a recent CBS and *New York Times* poll indicates that 69 percent of the American public favors stringent hazardous waste regulations, no matter what the costs.
Management of Hazardous Waste

Once a hazardous waste is generated, any one of three management strategies can be employed. The first is waste treatment, which is an attempt to reduce the quantity and chemical content of the substance. The second method is to collect and store the waste at a given site. The third strategy is to dispose of the waste, which requires the transportation and eventual burial of the waste, ideally in a chemically secure landfill.

To a large extent, costs determine if a specific hazardous waste management strategy will be used. In the past, technologies to reduce the amount of hazardous waste generated in industrial processes have not been employed due to their relatively high costs. On the other hand, some commonly used land disposal techniques are comparatively inexpensive but have caused a number of environmental problems, including groundwater pollution.

Of the total hazardous waste generated, 67 percent is treated, 51 percent is stored, and 21 percent is disposed of. The total adds up to more than 100 percent, which indicates that some wastes are treated and stored before being disposed of.

Ninety-six percent of all regulated hazardous waste is managed on-site; that is, at the same place where the waste is generated. These sites, however, represent only 14 percent of the total number of generators. Thus, most hazardous waste management is occurring in a relatively few industries and at the same site where the
waste is generated. In fact, chemical and petroleum industries, which make up 30 percent of the management facilities, account for 85 percent of all hazardous waste management activity.

Attempts to manage hazardous waste over the last decade have shown that there is no “quick fix” to the chemical waste problem. Preventive management techniques must be used to avoid future environmental disasters.

Industry can use a number of management technologies to ensure that the minimum amount of hazardous waste is disposed of securely in land. A brief description of the most common of these management practices and processes follows.

**Waste Reduction.** This is the most preferred management tool because it completely eliminates the hazardous waste that otherwise might be released into the environment. Industry has not fully utilized such strategies because of their high start-up costs relative to those of land disposal methods and because of a general lack of information on the technologies.

Table 2 categorizes various waste reduction measures.

**Waste Exchange.** These programs identify and bring together the generators of hazardous waste and those who potentially can reuse the wastes. In essence, the wastes become recycled into the manufacturing process. Although the amount of waste that can be exchanged is a small percentage of the overall waste stream, many states and regions have developed or are developing such exchange programs.

**Resource Recovery.** These measures attempt to recover energy and other valuable materials from the hazardous waste. For example, energy and certain materials can be recovered from concentrated liquid hazardous wastes and metals from industrial sludges. EPA estimates that with extended resource recovery efforts as much as 20 percent of waste can be taken out of the waste stream.

**Waste Treatment.** Hazardous waste treatment techniques serve any one or a combination of the following four purposes:

- Separate hazardous elements of the waste stream from the nonhazardous elements;
- Reduce the level of toxicity in the wastes;
- Reduce the amount of waste requiring disposal;
- Reclaim energy or materials from the waste.

These waste treatment techniques can be achieved through chemical, physical, or biological procedures.
Table 2.

Categories of Hazardous Waste Reduction

<table>
<thead>
<tr>
<th>Categories</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Waste abatement: Substitution of a new primary industrial process for an old process to eliminate or reduce the quantity of waste produced</td>
<td>• Replacement of cyanide in electroplating solutions</td>
</tr>
<tr>
<td></td>
<td>• Replacement of solvent-based paints by water-based ones</td>
</tr>
<tr>
<td>2. Waste minimization: The reduction of the quantity of waste through good housekeeping practices or by the application of concentration technology. Often included is the reduction in hazardousness of waste through simple in-plant treatment</td>
<td>• Separation of waste streams to permit recovery</td>
</tr>
<tr>
<td></td>
<td>• Recovery of metals from electrodialysis</td>
</tr>
<tr>
<td></td>
<td>• Neutralization of waste and precipitation of smaller volume sludges</td>
</tr>
<tr>
<td>3. Waste reuse: The direct reuse of a waste stream, as is, or with very minor modification either by the plant that produces the waste or by others</td>
<td>• Use of solvents from electronics industry in manufacture of paints</td>
</tr>
<tr>
<td></td>
<td>• Use of refinery caustic in pulping of wood</td>
</tr>
<tr>
<td></td>
<td>• Use of paint sludges as sealants</td>
</tr>
<tr>
<td>4. Waste recycling: The reconciliation of value from waste streams through the application of unit processes such as distillation</td>
<td>• Waste oil refining</td>
</tr>
<tr>
<td></td>
<td>• Solvent distillation</td>
</tr>
<tr>
<td></td>
<td>• Secondary aluminum smelting</td>
</tr>
<tr>
<td></td>
<td>• Iron salts from pickle liquor</td>
</tr>
</tbody>
</table>


Incineration is a treatment technique that is growing in popularity. Temperatures of 800 to 3,000 degrees Fahrenheit break wastes down into smaller, less hazardous products. The heat destroys certain wastes or reduces their toxicity. Although incineration produces by-products and ash, which eventually must be disposed of, proponents of this treatment method believe these by-products pose far less of an environmental threat than the original hazardous waste. They argue that incineration is a viable alternative to land disposal and is being used at only 50 percent capacity. Critics, on the other hand, argue that more study is needed not only on the incineration by-products but also on how the process affects other environmentally sensitive areas such as air quality.
Land Disposal. Disposal is the final step for hazardous wastes that have not been eliminated, recycled, or made nonhazardous through the waste reduction, recovery, recycling, or treatment procedures. There are primarily two methods of hazardous waste disposal: deep well injection and landfills.

Deep well injection, the most frequently used waste disposal method, accounts for nearly 60 percent of all hazardous waste disposal. This form of disposal consists of pumping liquid hazardous waste into subsurface formations that permanently isolate the waste. To minimize the environmental ramifications of this disposal method, the location of such formations, referred to as injection zones, should:

- Have no value as a resource, i.e., drinking water or energy;
- Be geologically equipped to take the anticipated amounts of liquid waste;
- Be sealed above and below the formations that are adequate to prevent irrigation;
- Be in a seismically inactive area to reduce the risk of danger from earthquakes.

Landfills and surface impoundments account for about one-third of all the hazardous waste disposed of. Landfills are formations constructed in the ground and specifically designed to receive bulk and containerized waste. Three types of landfills exist—general purpose landfills, which are the most popular; sanitary landfills, which are designed to reduce hazards by spreading and compacting wastes and covering them with other materials; and secure landfills, which attempt to keep different hazardous wastes from coming into contact with each other (this is accomplished through liners, separate cells for specific wastes, and monitoring). Surface impoundments are natural or man-made pits or ponds that hold various liquids or sludges.
The RCRA Hazardous Waste Program

In the past, industries have disposed of their waste in the least costly manner. Some of the methods, however, have come back to haunt nearby communities, creating major environmental and health risks as well as exorbitant cleanup costs for industry and government.

In 1976, and with amendments in 1984, Congress adopted the Resource Conservation and Recovery Act, which is an attempt to require industries to adopt preventive measures when managing hazardous waste. The intent of the program is to enable the federal government and the states to develop a cooperative program to regulate hazardous waste from its cradle to grave. The program calls for the states to administer a series of federally approved hazardous waste programs. Subtitle C of RCRA sets the legislative framework and provides the Environmental Protection Agency with the rulemaking authority to set and enforce the federal hazardous waste management standards.

States have the opportunity to implement their own programs in lieu of the federal program if their standards are at least as stringent as the federal ones. States choosing this option must have their program approved and authorized by EPA. If a state
does not develop a hazardous waste program or if it fails to obtain federal approval, EPA will preempt its program and subsequently operate the federal program in the state.

This approach ensures that state regulation of hazardous wastes will be at least as stringent as the federal requirements dictate. At the same time, states are given the flexibility to develop and administer their own hazardous waste programs, which can be developed according to their particular needs.

**Should States Operate a Hazardous Waste Program?**

State hazardous waste management programs are expensive. Congress has approved funding to assist states in developing and implementing authorized programs. The amount of federal funds set aside for fiscal year 1985 was approximately $55 million, which goes up to $60 million annually through 1988. EPA administers the grants to the states. Past experience indicates, however, that federal grants are not enough to operate a state program. Legislatures will have to consider alternative funding mechanisms for their hazardous waste programs.

Why should states have their own hazardous waste programs? Why shouldn't states let EPA run them?

Although a state program is expensive, it has a number of advantages. First, a state can design a program to suit its particular needs. Second, the federal program, due to its size and its limited resources, may not provide the best means of protecting the public's health and the environment in a particular state. Third, a state's numerous regulated businesses (mostly small) and local governments may find it easier to implement the complex regulations if they are able to deal with the designated state agency as opposed to EPA.

Since the enactment of RCRA, states have adopted a wide range of programs to ensure proper regulation of hazardous wastes. To be approved, state programs must comply with a number of federal regulations covered under RCRA that deal with the following areas:

- Hazardous waste identification;
- Generation and transportation;
- Treatment, storage, and disposal facilities; and
- Enforcement.
This chapter discusses these major components of RCRA, including their 1984 amendments, and also outlines state experiences in each area. It is important to keep in mind that the federal government establishes only minimum standards for state programs. States may go beyond these standards and develop ones that are more stringent and that suit their own particular needs. This chapter does not cover all of the issues under RCRA. Key 1984 provisions also will be addressed in Chapters 4 and 5. Important state hazardous waste issues not covered in RCRA are included in Chapter 6.

**Identification of Hazardous Waste**

**Federal Standards**

The first step in establishing an effective hazardous waste management program is to identify which wastes are hazardous and subject to control. RCRA defines a hazardous waste as a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may:

- Cause or significantly contribute to an increase in mortality, irreversible or incapacitating illnesses;
- Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed.

Section 3001 of RCRA establishes the overall framework of the hazardous waste management system by directing EPA to define and identify which substances will be considered hazardous wastes under RCRA. EPA regulations, promulgated under Section 3001, specify that a solid waste will be considered hazardous if it meets any one of three conditions:

1. Exhibits any of the characteristics of a hazardous waste such as ignitibility, corrosivity, reactivity, or Extraction Procedure (EP) toxicity. These characteristics can be identified by waste generators
through separate testing procedures that estimate the potential for hazardous constituents in a particular waste to cause groundwater contamination;

2) Is generated from the treatment, storage or disposal of a hazardous waste, such as a sludge, spill residue, ash, emission control dust or leachate;

3) Is listed by EPA as a hazardous waste, or is a mixture of a solid waste and a listed hazardous waste. The EPA rules put the burden of proof on the waste generator to show that a listed waste is not hazardous. If the generator proves this to the EPA's satisfaction, the waste may still be deemed a hazardous waste if it meets any of the characteristics mentioned above.2

EPA updates and revises the list of hazardous wastes from time to time as further information is collected.

State Action

As state hazardous waste programs develop, an effective identification program becomes essential. From planning a hazardous waste strategy to deciding which substances to ban from land disposal, identification is an integral component of an effective state program.

Most state legislation defines hazardous waste by certain characteristics and then directs the designated state agency specifically to incorporate the EPA's regulatory definition into the state's universe of controlled wastes. Utah,3 Ohio,4 Minnesota,5 Idaho,6 Illinois,7 and Arizona8 are good examples of this approach. All have similar language in their legislation. Generally, these acts define hazardous waste similar to that in Ohio's legislation:

a waste or combination of wastes resulting from industrial, commercial, or other activities which, because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in deaths or an increase in serious, irreversible or incapacitating reversible illnesses or pose a substantial threat to human health or to the environment if improperly treated, stored, disposed of or otherwise managed.9

To ensure compliance with the federal regulations, most state laws additionally require the designated state agencies to adopt those wastes that EPA has identified as hazardous. For example,
in addition to the definition just given, Ohio includes the language, “any substance identified by regulation as hazardous waste under RCRA.”

A different identification approach is to define hazardous waste on the basis of its degree of hazard. The waste then is managed and regulated based on the hazard it poses. This method enables extremely hazardous wastes to be managed more strictly than other, less hazardous wastes.

California and Washington have adopted this type of identification procedure. California’s law describes two degrees of waste: hazardous and extremely hazardous. The definition of a hazardous waste under California law is similar to that of those states mentioned earlier. California defines hazardous waste as:

a waste, or combination of wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may either:

a) cause, or significantly contribute to, an increase in serious irreversible or incapacitating reversible illness;

b) pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

California’s law defines extremely hazardous waste as:

any hazardous waste or mixture of hazardous wastes which, if human exposure should occur, may likely result in death, disabling personal injury or serious illness caused by the hazardous waste or mixture of hazardous wastes because of its quantity, concentration, or chemical characteristics.

The legislation requires the designated state agency to adopt lists of hazardous and extremely hazardous wastes and establish criteria for identifying hazardous and extremely hazardous wastes. The agency also is directed to incorporate federal regulations promulgated under Section 3001 of RCRA.

Washington’s law uses the terms dangerous waste and extremely hazardous waste. Dangerous wastes refer to nonradioactive wastes that
are disposed of in such quantity or concentration as to pose a substantial present to potential hazard to human health, wildlife or the environment because such wastes:

a) have short-lived toxic properties that may cause death, injury, or illness, or have mutagenic, teratogenic, or carcinogenic properties; or
b) are corrosive, explosive, flammable, or may generate pressure through decomposition or other means.\(^\text{15}\)

An extremely hazardous waste, a subset of dangerous wastes, is considered a dangerous waste if it:

a) will persist in a hazardous form for several years or more at a disposal site and which in its persistent form:
   • presents a significant environmental hazard and may be concentrated by living organisms through a food chain or may affect the genetic makeup of man or wildlife; and
   • is highly toxic to man or wildlife.

b) is disposed of at a disposal site in such quantities as would present an extreme hazard to man or the environment.\(^\text{14}\)

The legislation gives the authority to the designated state agency to determine the classification of a specific hazardous waste.

Both California and Washington incorporate this approach into their hazardous waste management programs by specifying different standards of control and regulation for the different types of wastes.

**Generator and Transporter Standards**

**Federal Standards**

To comply with the RCRA requirements, a generator must determine if a waste is hazardous. This determination is based on the lists promulgated by EPA under Section 3001 of RCRA and the identification sections of the state programs. Once a generator
determines that it produces a hazardous waste, the next step is to comply with generator and transportation standards.

According to the federal standards established under Section 3002 of RCRA, a generator of a hazardous waste must ensure that it reaches the appropriate permitted facility. This is done through a tracking system that requires a set of shipping papers, or manifest, to follow the waste from its generation to disposal. The manifest, signed by the generator, must accompany all off-site shipments of the waste until its ultimate disposal. At that time, the owner or operator of the treatment, storage, or disposal facility must return a copy of the manifest to the generator. If the generator does not receive the manifest within 35 days of shipment, he must contact the transporter and the owner/operator of the disposal facility to determine the status of the waste. If, after 45 days from shipment, the generator does not receive the manifest, he must file a report with the regional EPA office.

To allow generators and states flexibility in meeting federal standards, EPA decided to require only certain information on the manifest as opposed to requiring a specific form. The manifest must contain:

- The name, address, telephone number and EPA identification number of the generator, transporter and one designated treatment, storage or disposal facility;
- A description of the waste;
- A statement of the total quantity of each type of waste;
- A certification of compliance with Department of Transportation and EPA rules including, as mandated by the 1984 RCRA amendments, a certification “that the generator of the hazardous waste has a program in place to reduce the volume or quantity and toxicity of the waste to the degree determined by the generator to be economically practicable,” and [that] “the proposed method of treatment, storage or disposal is the method currently available to the generator which minimizes the present and future threat to human health and the environment.”

The generator is required to package, label, mark, and placard the waste in appropriate containers according to Department of Transportation regulations before shipping the hazardous waste.

The regulations also require the generator to maintain extensive records on the shipment of the wastes. A new 1984 amendment requires generators to submit reports to EPA summarizing this information every two years.
Transporters must comply with the tracking system by acknowledging receipt of properly labeled waste and ensuring that the manifest accompanies the waste. Once the transporter takes delivery of the hazardous waste, he is responsible for its handling, including cleaning up discharges that occur during transportation, until the waste is delivered to another transporter or the designated disposal facility. Similar to generators, transporters also must maintain detailed records of the waste.

RCRA requires EPA to consult with the Department of Transportation to ensure that the regulations are consistent with those of DOT promulgated under the Hazardous Materials Transportation Act. Since there is some regulatory overlap between DOT and EPA, the two agencies determined that DOT's standards should apply in the area of waste transportation, while EPA's standards are applicable to waste management and ensuring compliance with the manifest system.

State Action

Most states authorize a designated state agency to establish hazardous waste generator and transporter standards. The agency then becomes responsible for developing the appropriate hazardous waste manifest system for the state program.

Some state legislation goes beyond just enabling the designated agencies to develop permit standards by setting specific guidelines for them to follow. For example, Idaho's statute gives broad authority to the state Board of Health and Welfare to set transportation regulations. According to the act:

> The board shall promulgate hazardous waste transportation rules and regulations to control the intrastate and interstate transportation of regulated types and quantities of waste. The rules and regulations must be consistent with the rules and regulations issued by the Department of Transportation and the Environmental Protection Agency.

In addition to this rulemaking authority, the act also mandates that standards be established for the containerization and labeling of wastes, the placarding of hazardous waste shipments, special routing procedures under certain circumstances, hazardous waste trip permits, and prohibiting disposal facilities from accepting hazardous wastes without a permit.

Idaho's act also specifies the establishment of a waste tracking system, which requires all transporters to obtain an identification
number, all waste shipped or received off-site to be accompanied by a manifest, and a copy of the manifest to be sent to the generator with all copies retained for three years.

An Indiana law also goes beyond broad enabling legislation and sets hazardous waste transportation standards. In addition to giving broad authority to the Indiana Environmental Management Board to adopt a manifest form and prescribe its use, the legislation also calls for both the generator and owner or operator of a treatment, storage, or disposal facility to submit a copy of the manifest to the land pollution control division of the board. If the facility generates more than 1,000 kg of waste per month, a copy of the manifest must be submitted to the land pollution control division within five days.17

Texas was one of the first states to develop a manifest and establish standards for a tracking system. The Texas Department of Water Resources established a system whereby the generator must furnish the transporter of the waste with a shipping ticket that identifies and describes the waste and designates an authorized receiver to accept it. Transporters cannot haul waste unless it is accompanied by a shipping ticket. The ticket must be filled out and signed by both the transporter and the authorized recipient of the waste, and then returned to the generator. All parties must keep copies of the ticket. This system ensures that the hazardous waste will eventually reach a permitted facility.18

Treatment, Storage, and Disposal Facility Standards

Federal Standards

The next step in an effective management program is to ensure that wastes identified as hazardous are handled in an environmentally acceptable manner at treatment, storage, and disposal facilities. Sections 3004 and 3005 of RCRA establish the standards for these facilities.

EPA regulations define hazardous waste treatment, storage, and disposal facilities as follows:

- Treatment facility—An operation using:
  Any method, technique, or process, including neutralization, designed to change the physical, chemical or biological character or composition of any hazardous waste so as to neutralize such wastes, or so as to
recover energy or material resources from the waste, or so as to render such waste nonhazardous, or less hazardous; safer to transport, store or dispose of; or amenable for recovery, amenable for storage, or reduced in volume.

- Storage facility—A facility used for:
The holding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed of, or stored elsewhere.
- Disposal facility:
A facility or part of a facility at which hazardous waste is intentionally placed into or on any land or water, and at which waste will remain after closure.¹⁹

Section 3004 directs EPA to promulgate regulations establishing performance standards for waste treatment, storage, and disposal facilities. RCRA sets broad guidelines for the development of such standards, including:

- Maintaining records for all hazardous waste;
- Satisfactory reporting, monitoring, and inspection including compliance with the manifest system;
- Acceptable operating methods, techniques and practices;
- The facility site’s location, design and construction;
- Contingency plans for effective action to minimize unanticipated damage;
- Maintenance of operation including training and financial responsibility standards; and
- Compliance with permit requirements.²⁰

The Federal Permit Process Requirements

Hazardous waste treatment, storage, or disposal facility standards are implemented through a permit process mandated under Section 3005 of RCRA. According to this section, the construction or operation of a facility is prohibited except in accordance with a permit. Permits must be renewed every 10 years, and land disposal permits must be reviewed every five years. Renewals are subject to new regulations and must reflect the necessary technological changes since the previous permit was issued. The decisions on final permit applications submitted prior to November 8, 1984, must be made in accordance with the following deadlines:

- Land disposal facilities—November 8, 1988;
- Incinerators—November 8, 1989; and
Each permit is mandated to include the following information:

- The composition, quantity and concentration of the hazardous waste and the frequency or rate of which a hazardous waste is disposed of, treated, transported or stored; and
- The site of the facility.21

Obtaining a facility permit is a two-part process: interim status and final facility authorization.

**Interim Status.** The first step in the facility permit process is the interim status requirements. These requirements are for the period between when a permit is applied for and when it is issued or denied by the EPA. Section 3005 requires that after November 19, 1980, owners or operators of existing facilities who have applied to the EPA for a facility permit must comply with the interim status standards. These contain an abbreviated version of the final ones including a limited framework of technical performance standards and administrative and nontechnical operating standards. They are designed so the hazardous waste facilities can comply with some performance standards immediately without significant capital expenditures. The list of some of the administrative and nontechnical operating standards includes:

- Chemical and physical analysis of wastes;
- Spill preparedness and prevention arrangements;
- A contingency for waste releases and emergencies;
- Compliance with manifest, recordkeeping, and reporting requirements;
- Closure and post closure plan requirements;
- Facility security requirements;
- Training for facility personnel;
- Separation of ignitable and reactive wastes from ignition or reaction sources;
- Groundwater monitoring;* and
- Financial responsibility requirements.*zz

The technical standards include various requirements for the use of containers; tanks; surface impoundments; waste sites; land treatments; chemical, physical, and biological treatment; and underground injection.

* The 1984 RCRA amendments establish that interim status will terminate on November 8, 1985, for those facilities granted such status before November 8, 1984, unless the facility is in compliance with groundwater monitoring and financial responsibility requirements.
The final permit application deadlines also have an impact on the interim status phase of the permit process. Interim status terminates for a facility according to the schedule in Table 3.

Table 3.

Deadlines for Interim Status

<table>
<thead>
<tr>
<th>Types of Facilities</th>
<th>Interim Status Terminates</th>
<th>Unless the facility owner/operator applies for a final determination regarding the issuance of a permit by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Disposal</td>
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<td>October 1985</td>
</tr>
<tr>
<td>Incinerators</td>
<td>October 1989</td>
<td>October 1986</td>
</tr>
<tr>
<td>Other</td>
<td>October 1992</td>
<td>October 1988</td>
</tr>
</tbody>
</table>

Final Facility Permits. The final facility permits establish more technical requirements for hazardous waste treatment, storage, or disposal. The 1984 RCRA amendments mandate a number of new features for final facility permits including exposure assessments, waste minimization, and permits for research and development facilities.

Also, after August 8, 1985, permit applications for landfills and surface impoundments must be accompanied by an assessment for potential public exposure from hazardous substances released from the facility site.

In addition, effective September 1, 1985, all permits require reports conducted at least annually that document that the volume and/or quantity and toxicity of a hazardous waste have been reduced to the maximum degree economically practicable. Also, the generator must document in the permit the method currently available that minimizes the present and future threat to public health and the environment.

RCRA allows for some flexibility in meeting the permit requirements. EPA is authorized to issue temporary permits for facilities that propose to use an innovative and experimental hazardous waste treatment technology or process for which permit standards have not been established. The permits are limited to one year and are renewable each year for up to four years.
State Action

Most legislatures that have considered and adopted hazardous waste treatment, storage, and disposal facility standards have recognized the technical and complex nature of this area and have empowered the appropriate state agency with the necessary rule-making authority. A number of legislatures have set the guidelines for the permit standards developed by the state agency.

A good example of this enabling approach is the Environmental Protection Act enacted by the Illinois General Assembly. The act specifies, among other things, that

- The state Board of Environmental Quality is given the authority to require a permit for the construction, installation or operation of any type of facility, equipment or vehicle;
- The potential applicant (owner or operator) shall apply to the state agency for the permit;
- The state agency is required to adopt procedures for the state's permit process.23

This gives the agency the flexibility and authority to incorporate at least the minimum federal permit standards into the state program as they are released by EPA.

Arkansas' law not only allows a designated state agency to prescribe the provisions of a permit but also mandates that certain permit provisions be met. Similar to Illinois' approach, the Arkansas Hazardous Waste Management Act states that

no person shall construct, substantially alter, or operate any hazardous waste treatment or disposal facility or site, nor shall any person store, transport, treat or dispose of any hazardous waste without first obtaining a permit from the Department for such a facility, site or activity.24

Furthermore, "permits shall be issued under such terms and conditions as the Department shall prescribe."25

In addition to this broad enabling language that gives rulemaking authority to the state agency, the act also requires certain design and operating standards, financial responsibility provisions, and other procedures to ensure compliance before a permit is issued. For example, the law mandates owners and operators of facilities to adopt various monitoring techniques, maintain records, certify personnel operating the facilities, and comply with any other provisions the department deems neces-
sary. The department also is authorized to establish fees to cover the administrative costs of the permit procedures.

Similar to other state permit standards, Arkansas' law requires evidence of financial responsibility and liability insurance, in an amount determined by the state department for the life of the facility. The Department of Pollution Control and Ecology also is directed to establish requirements for the closing of a site and the long-term care of a site after it is closed. The law mandates that these provisions include monitoring, financial responsibility, spill prevention plans, and safety procedures.

Once the facility or site is closed and the owner's responsibilities have ended, the state takes over the long-term care of a facility (see Chapter VI). One of the most important issues facing states is how to fund such a program. Arizona, Connecticut, Kentucky, Michigan, Ohio, and Wisconsin all authorize their departments to establish a fee structure to cover the costs of such a program.

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**Enforcement**

**Federal Standards**

Strict enforcement of the program is the key to accomplishing the purposes of RCRA, such as controlling waste management practices that endanger the public's health or the environment and promoting resource conservation and recovery. Strict enforcement means devoting adequate financial and human resources to ensure that the hazardous waste is controlled from the cradle to the grave. In addition to adequate resources, there must be strict penalties for violations of the regulatory requirements. Section 3008 of RCRA sets up the minimum standards for enforcement programs.

Section 3008 authorizes EPA to issue orders assessing civil penalties for any past or present violations and also requiring compliance immediately or within a specified period of time. Any penalty assessed must not exceed $25,000 per day of noncompliance for each violation.

In addition to civil penalties, Section 3008 also establishes criminal penalties. According to RCRA, criminal penalties can be levied against any person who

- Knowingly transports hazardous waste to a non-permitted facility;
- Knowingly treats, stores or disposes of any hazardous waste without a permit, or in violation of a permit, or in violation of any applicable interim status regulations or standards;
- Handles hazardous waste and who knowingly destroys, alters, conceals or fails to file any record, application, manifest or report required by EPA under RCRA;
- Knowingly transports (or causes to be transported) hazardous waste without a manifest;
- Knowingly exports a hazardous waste without the consent of the receiving county.

Those convicted of violating these standards shall pay a fine of not more than $50,000 for each day of violation or face imprisonment of up to two years (five years for the first two violations just listed). For repeat offenders, the respective penalties are doubled.

RCRA also sets forth standards for those who, during the process of managing hazardous wastes, knowingly endanger the lives of others. Section 3008 mandates that any handler of hazardous waste who knows his actions place others in imminent danger of death or serious injury can be fined up to $250,000 and given up to a 15-year prison term or both (if the defendant is an organization, the maximum fine is raised to one million dollars).

There is also a public participation requirement in state enforcement programs. Section 3008 gives EPA authority to establish and conduct extensive public hearings in conjunction with the enforcement process. Other forms of public participation may take the form of allowing citizens the right of intervention in any civil or administrative action to obtain remedies or some assurances that enforcement officials will investigate and provide written responses to citizen complaints.

Furthermore, states seeking authorization must include a compliance evaluation program that provides reports and notices; independent inspection and surveillance; entry, inspection, and monitoring authority; and proper evidence-gathering procedures.

**State Action**

Providing an effective enforcement program is a two-part process: providing resources to properly investigate irregularities in the management system, and also establishing penalties that deter potential program violations.

The first step is setting up the necessary funding mechanisms to finance an effective investigative and enforcement program. States have adopted a number of innovative approaches other than general fund appropriations. One method is to statutorily
earmark the money recovered from offenders in civil action for investigation and enforcement costs. Arkansas is one state that has adopted this approach.\textsuperscript{35} Idaho funds its program in a different way by statutorily holding any person in violation of the state’s hazardous waste regulations liable for the “state’s costs for any nonroutine investigations, inspections, monitoring, or surveys which lead to evidence of the violation.”\textsuperscript{36}

Legislation enacted in California has established a different, more stable enforcement finance system that requires each operator of a hazardous waste disposal site to pay a fee to the state based on the number and weight of shipments the site receives.\textsuperscript{37} The fees are deposited in the Hazardous Waste Control Account, which is used to pay for the attorney general’s administrative program costs. The money is appropriated by the legislature and used to support the attorney general’s Toxic Substance Enforcement Program. The attorney general is required to present a report once a year to the legislature on the uses of the appropriated funds.\textsuperscript{38}

The next enforcement step is to impose stringent penalties for violations of a state’s hazardous waste laws. Most states follow the criminal and civil suit guidelines established under RCRA. For example, legislation enacted in Arkansas imposes civil penalties of up to $25,000 per day of violation.\textsuperscript{39} The Florida Legislature has gone a few steps beyond these minimum standards by subjecting violators to criminal penalties of up to $25,000 per day of violation and up to one year in prison. For repeat offenders in Florida, the fine goes up to $50,000 and the prison term to two years.\textsuperscript{40}

The Illinois legislature, taking a different approach in 1985 when it amended the Environmental Protection Act, categorized penalties by degree of severity. The first group of violations is referred to as “Calculated Criminal Disposal of Hazardous Waste.” These are people who

without lawful justification knowingly dispose of hazardous waste with conscious disregard thereby placing another person in danger of serious bodily harm or creat[ing] an immediate or long term danger to the public health.\textsuperscript{*}

Persons convicted of this violation are subject to fines of up to $500,000 for each day of violation in addition to any other penalties prescribed by law.

* Serious bodily harm means “death; or bodily injury which involves a substantial risk of death; or unconsciousness; or extreme physical pain; or protracted and obvious disfigurement; or protracted loss or impairment of the function of a bodily member, or organ, or mental faculty.”
The second category under the Illinois statute is the “Criminal Disposal of Hazardous Waste.” This offense is defined as the knowing disposal, without legal justification, of hazardous waste. In addition to other penalties that may be imposed by law, the fine is up to $250,000 per day of violation.

The next category is defined as “Unauthorized Use of Hazardous Waste,” which refers to violators who knowingly

1) Treat, transport, or store hazardous waste without a permit;
2) Treat, transport, or store hazardous waste, violating the terms of the permit;
3) Transport hazardous waste to an unpermitted facility;
4) Transport hazardous waste without a permit.41

Those convicted of violations 1 through 3 above are subject to a fine of up to $100,000. The fourth violation carries a maximum $1,000 fine.

The fourth category of violations is referred to in the law as “Unlawful Delivery of Hazardous Waste.” Except as authorized by the state or the federal government, delivering hazardous waste is illegal. Those convicted are subject to a fine of up to $250,000 per violation.

Another category is the “Reckless Disposal of Hazardous Waste.” This refers to any person who disposes of such waste in a “gross deviation from the standard of care which a reasonable person would exercise in the situation.” The fine for this category is up to $50,000 for each day.

The final category is called “Concealment or Criminal Disposal of Hazardous Waste.” Any person who conceals the disposal of hazardous waste with the knowledge that the waste was disposed of improperly, is subject to a fine of up to $50,000 per day. Furthermore, the act specifies that persons giving false information either on a label, manifest, report, or permit also can be fined up to $50,000.42

In addition to the enforcement powers of the state, Pennsylvania’s law adopts an approach that gives the right to any citizen “having an interest which is or may be adversely affected, to intervene in any action” to pursue civil penalties and obtain a court injunction. The act also declares that any violation of the hazardous waste regulations is a “public nuisance.” A person creating a nuisance is liable for the costs of abating any pollution caused by the violation. The act also creates a presumption that any person who treats, stores, or disposes of hazardous wastes is liable—without proof of fault, negligence, causation, or violation.
of regulations—for all damages, contamination, or pollution within 2,500 feet of the perimeter of the area where the activities took place.\textsuperscript{43}

In addition to the California enforcement program, legislation also requires that a reward be offered to any person who provides information leading to a civil penalty or a conviction of a person who violates the state's hazardous waste laws. The state is required to pay such rewards for civil penalties and local counties are responsible for rewards leading to criminal fines. The rewards are mandated to be equal to 10 percent of the amount of the civil or criminal fine collected, up to $5,000.\textsuperscript{44}

State Authorization Process

Congress envisioned the overall national hazardous waste program to be implemented through state-authorized programs, which would be guided by federal regulations promulgated under the different sections of RCRA. Sections 3006 and 3009 of RCRA lay the groundwork for the state authorization process.

Section 3006 sets the authorization standards and deadlines for the state hazardous waste programs. To receive final authorization, a state must demonstrate that its program is at least "equivalent" to and no less stringent than the federal requirements.

State programs in existence 90 days after the promulgation of rules in Sections 3002, 3003, 3004, and 3005 may apply to EPA for temporary authorization to carry out the existing program. If EPA judges the program to be "substantially equivalent" to the federal program, it may grant interim authorization. The 1984 amendments extended the interim authorization deadline to January 31, 1986, by which time a state would need to have achieved final authorization or have its program run by EPA.

The 1984 amendments also make a number of additional changes in the authorization process. Regulations adopted under the RCRA amendments are effective immediately in all states. RCRA requires that newly promulgated regulations shall take effect "in each authorized state program on the same date the program takes effect in the other states."\textsuperscript{45} States may apply for interim and final authorization for these new amendment regulations if final authorization has been granted under the original 1976 program.

EPA also can enter into cooperative agreements with the states to assist them in implementing the RCRA requirements. This provision will have the greatest impact on those states incor-
porating the new RCRA regulations into their permit programs. Until a state receives authority to write permits with the new regulations, permits will have to be issued jointly with EPA.

The 1984 amendments also establish that the standards by which states must be measured to receive final authorization be those in effect either immediately prior to the state's application or on January 23, 1983, whichever is later.
As related in the previous chapter, Congress in 1984 made a number of changes to the national hazardous waste management program developed in 1976. One of the main purposes behind the 1984 amendments was to expand the universe of regulated hazardous waste and limit its disposal into the ground. These two provisions—the small-quantity generator exemptions and the land disposal restrictions—undoubtedly will have a major impact on state hazardous waste programs. Therefore, a detailed discussion of these new provisions is the focus of this chapter.
Small-Quantity Generators

Federal Standards

The original EPA regulations issued in 1980 excluded firms generating less than 1,000 kilograms (kg) (approximately 220 pounds) of hazardous waste per month from the RCRA requirements. Annually, these firms produce an estimated four million metric tons of hazardous waste, all of which were not required to be disposed of in RCRA-approved facilities.¹

According to an EPA report, between 600,000 and 660,000 firms generate between 100 kg and 1,000 kg of hazardous waste per month, with a total annual production of approximately 940,000 metric tons. These figures represent 98 percent of the hazardous waste generators nationally who produce, however, less than .05 of 1 percent of the total quantity of generated hazardous waste. Those generators who produce less than 100 kg of hazardous waste per month, however, contribute a far greater percentage to the waste stream.²

The EPA study further concluded that those generators of between 100 kg and 1,000 kg per month, referred to as small-quantity generators, are located predominantly (70 percent) in major population centers. Also important to note is that 85 percent of these small-quantity generators are nonmanufacturing industries, primarily vehicle maintenance shops (50 percent) and construction firms (10 percent). Among the manufacturing industries, metal manufacturing accounts for 10 percent of the small-quantity generators.³

Furthermore, between 70 and 80 percent of the waste from small-quantity generators is shipped off-site. Two-thirds of the shipped waste is sent to recycling facilities, 5 percent to hazardous waste sites, and the remainder to solid waste facilities or unknown destinations.⁴

Approximately 20 percent of small-quantity generators manage their waste on-site, with one-fourth of them recycling it. The remaining 10 percent manage their waste on-site but ship it off-site for burial.⁵

In excluding small-quantity generators from the RCRA regulations, EPA reasoned that regulating the large number of small generators who produce only a small percentage of the waste stream would be inefficient and an enormous enforcement burden for EPA and the states. In 1980, EPA did indicate, however, that it planned to phase in a lower small-generator exclusion of 100 kg per month over the following years to regulate hazardous waste management practices more fully.
The 1984 Amendments. While EPA was considering these phase-in measures, Congress decided in amending RCRA in 1984 to lower the exemption for hazardous waste generators to 100 kg per month. Subsequently, EPA was given a strict timetable to promulgate standards for these small-quantity generators. EPA issued these regulations on March 24, 1986, with many of the requirements being the same as those imposed on large-quantity generators. These new regulations require all generators of waste above 100 kg per month to:

- Determine whether their wastes are hazardous;
- Obtain an EPA identification number;
- Offer their wastes only to transporters and facilities with an EPA identification number;
- Comply with the Department of Transportation (DOT) and EPA requirements for shipping wastes off-site;
- Use a multipart uniform hazardous waste manifest to accompany the waste to its final destination; and
- Maintain copies of the manifests for three years.

Although these rules apply to all generators of hazardous waste above 100 kg per month, some important RCRA regulations apply differently to or exempt small-quantity generators. First, small-quantity generators are allowed to store waste on-site for up to 180 days, or 270 days if the waste must be shipped over 200 miles. All large generators of more than 1,000 kg per month can store hazardous waste for no more than 90 days. This extension allows small-quantity generators to accumulate volumes of waste that are more economical to ship, treat, and dispose of. Second, unlike other regulated generators, small-quantity generators are not required to submit biennial reports. A third difference is that these generators are not required to notify EPA, under the Generator and Transportation Standards, if a copy of the manifest is not returned. These new regulations became effective on September 22, 1986.

One of the most significant changes affecting small-quantity generators is that their previous exemption from the treatment, storage, and disposal facility requirements no longer applies. This change will affect the operations of the approximately 200,000 businesses that manage their own wastes dramatically. These businesses will have to either obtain a RCRA design permit or ship their wastes off-site. This standard will apply to small-quantity generators starting March 24, 1987.

Costs of the New Regulation. EPA has attempted to estimate both the per firm costs and the national costs of the new small-quantity generator requirements. Compliance with the new standards will impose an initial $2,267 per firm and an annual recurring
cost of $222 per firm. The costs of accumulating hazardous wastes within the 180-day or 270-day limitation initially will be $1,447 and then $53 annually. EPA concludes that treatment and storage costs for the 100 to 1,000 kg per month generators will be lower if they ship their wastes off-site. The transportation costs will depend on how much waste needs to be shipped off-site. For example, firms shipping approximately 600 kg of waste a short distance twice a year will have to pay $838; to transport 6,000 kg a farther distance twice a year will cost $1,882. In addition to the transportation costs, off-site treatment and disposal will range from $150 to $1,200 per metric ton, depending on the technology employed and the type of waste. The on-site costs will vary greatly.

Overall, EPA estimates that the average incremental cost for the new changes will be about $180 per metric ton. The aggregate compliance cost for the new small-quantity generator rule will be approximately $46.9 million per year.

Realizing the impact that these new regulations will have on small-quantity generators of hazardous waste, Congress also has directed EPA to set up a public education program. Congress mandated that within 30 months of enactment of the 1984 amendments, EPA must inform small-quantity generators of their new responsibilities. To perform this task, $500,000 per year was authorized for fiscal years 1985 through 1989.

State Action

All regulations promulgated under the 1984 amendments became effective immediately in the states. In the case of the requirements for small-quantity generators, EPA began enforcing the new rules in all the states on September 22, 1986. However, for states with standards similar to the new federal requirements or more stringent ones, EPA has pledged to enter cooperative agreements with the states to avoid duplicative efforts.

Prior to the 1984 amendments, 32 states had adopted exemption levels for hazardous waste generators of up to 1,000 kg per month. As of either September 22, 1986, or March 24, 1987, these state exclusion levels have been dropped to 100 kg per month.

Of the remaining 18 states, one state's exemption level is between 100 and 1,000 kg, eight states exempt wastes at the 100 kg level, and six states exempt them below the 100 kg level. As mentioned earlier, a number of states have adopted a "degree of hazard" approach to regulating hazardous waste. Under this approach, even the smallest amounts of certain hazardous wastes must be managed and regulated. Based on this system, the re-
remaining three states have varying exemption levels. Table 4 gives all states’ exemption levels for small-quantity generators prior to the 1984 RCRA amendments.

Table 4.

State Exemption Levels for Small-Quantity Generators

<table>
<thead>
<tr>
<th>State</th>
<th>Kilograms Per Month</th>
<th>State</th>
<th>Kilograms Per Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>1,000</td>
<td>Montana</td>
<td>1,000</td>
</tr>
<tr>
<td>Alaska</td>
<td>1,000</td>
<td>Nebraska</td>
<td>1,000</td>
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<td>Arizona</td>
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<td>Nevada</td>
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<tr>
<td>Arkansas</td>
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<td>New Jersey</td>
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State Issues. The new rules for generators of 100 to 1,000 kg per month of hazardous waste will cause all states to reassess their programs for regulating and assisting small-quantity generators. To implement these new standards, state programs will go through a three-part procedure.

First, the newly regulated community must be notified and educated about its responsibilities. Many states are operating and sponsoring programs to provide assistance to small-quantity generators concerning the new laws. Delaware, for example, has
enlisted the cooperation of the state Chamber of Commerce to conduct regional seminars to help small businesses in various aspects of regulatory compliance and also to inform them of other services available. In Colorado, the state EPA, local health departments, and the state Association of Commerce and Industry have joined forces to develop an instructional manual and regional workshops to aid specific types of small businesses in their compliance efforts.

Second, each state must assess the ability of its current system to service the collection, transportation, and treatment needs of the newly regulated small-quantity generators. A number of states have expanded their assistance programs for small businesses to include not only regulatory information but also how to reduce waste and lower costs. The Minnesota Legislature allocated $150,000 for a state technical assistance center. The purpose is to provide all types of hazardous waste generators with information on how to reduce or properly manage their wastes. The center has set up a toll-free hotline and a technical assistance information databank. Minnesota also has authorized money for the creation of a statewide network of collection and transfer stations.

Third, states will have to assess whether they have the resources to enforce the new regulations. If not, state legislatures will be faced in the years ahead with having to appropriate more funds to the enforcement agencies to ensure that environmental standards are met.

Land Disposal Restrictions

One of the main purposes of the RCRA 1984 amendments is to shift waste management practices away from current land disposal methods. RCRA defines land disposal as any placement of hazardous wastes in a landfill, surface impoundment, salt pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave. The 1984 amendments set forth requirements that affect all of these disposal measures.

In one of its boldest provisions, the 1984 amendments ban the land disposal of hazardous waste unless EPA determines that the prohibition is not needed to protect human health and the environment. To gain an exemption from the land disposal restriction, an owner or operator of a hazardous waste site must demonstrate that a hazardous waste will not migrate from the disposal area for as long as the waste remains hazardous. RCRA also directs EPA to develop regulations specifying levels or methods of treat-
ment that reduce the toxicity of the waste, which will reduce the likelihood of its migrating from the disposal area and endangering the public's health and the environment.

The 1984 amendments give EPA a strict schedule to determine whether to ban a particular waste from land disposal. The deadlines include:

- Reviewing all hazardous wastes listed under RCRA Subtitle C to determine if they will be exempt from the land disposal prohibition. By November 8, 1986, EPA must publish a schedule for determining whether to ban these listed hazardous wastes from land disposal.
- Deciding whether to ban dioxin and solvents by November 8, 1986.
- Reviewing “California Wastes,” a group containing metals, strong acids, PCBs, and halogenated organic compounds by July 8, 1986.
- Deciding whether the disposal of hazardous wastes in injection wells will be prohibited by November 8, 1988.
- Establishing minimum technology standards for land disposal facilities and incinerators.

The 1984 amendments also contain other land disposal restrictions:

- Prohibits the placement of bulk liquids and containerized hazardous waste in unpermitted salt domes, salt beds, underground mines and caves until EPA establishes standards and the facility receives a permit.
- Prohibits after May 7, 1985, the injection of hazardous waste where the well is within one-fourth mile of an underground source of drinking water.
- Prohibits the use of contaminated waste oil as a dust suppressant.
- Prohibits after May 7, 1985, the landfilling of bulk or noncontainerized liquids.
- Prohibits after November 8, 1985, the disposal of nonhazardous liquids in hazardous waste facilities.
- By February 8, 1986, EPA must promulgate regulations that minimize the landfilling of containerized hazardous liquids.¹

EPA is authorized to grant variances and extensions from these land disposal restrictions on a case-by-case basis.
The 1984 amendments also declared that surface impoundments that store or treat hazardous wastes banned from land disposal must:

- Remove hazardous treatment residues within one year of the waste's placement in the impoundment.
- Be solely for the purpose of accumulating sufficient quantities to facilitate proper subsequent management.

In addition:

- EPA is directed to promulgate regulations specifying those levels or methods of treatment, if any, which diminish the toxicity of the waste. If the hazardous waste has been treated by the approved method and to the appropriate level, the waste is not subject to land disposal restrictions.

State Action

Groundwater protection is the most important issue for states considering hazardous waste land disposal. Legislators often are confronted with difficult questions, such as to what extent can a state's groundwater table absorb hazardous wastes without threatening the drinking water supply? States with disparate groundwater situations that have enacted legislation in this area have handled this question differently. Solutions range from giving land disposal authority to the designated state agency or department to prohibiting land disposal through legislation.

Most enacted state legislation has chosen the former, entrusting a state agency to determine which hazardous wastes can and cannot be disposed of in land. The state agency uses the annual lists of hazardous waste developed during the identification process to establish the land disposal regulations. For example, Ohio's legislation enacted in 1984 prohibits the disposal of specific wastes if the designated state agency determines that the "potential impacts on human health and the environment are such that disposal of these wastes should not be allowed." The law also prohibits land disposal if a feasible and environmentally sound alternative is reasonably available. The state agency must specify, by June 30, 1987, which hazardous wastes cannot be disposed of in land. Also, the state agency is to develop, by December 31, 1986, a list of feasible and sound alternatives available for potential processing, recycling, and treating identified hazardous wastes.

New York takes a somewhat different course to restricting hazardous waste land disposal. Its law, similar to other state
provisions, authorizes the designated state agency to promulgate rules and regulations prohibiting the land burial of specific identified wastes. The legislation, however, directs the state agency to compile its list of wastes based on three factors:

- The uncertainties surrounding long-term containment of hazardous waste in the land;
- A hazardous waste’s compatibility with land burial facilities; and
- A hazardous waste’s persistence, toxicity, mobility, and propensity to accumulate.\(^3\)

The legislation also empowers the state agency to grant “certificates of exemption” from these regulations. The agency may issue exemptions, however, only in the event that it “makes a written determination that it is not practicable, for the reasonable foreseeable future, to manage such wastes by any other means than land burial.” These certificates of exemption are valid for one year.\(^4\)

The Florida Legislature has long been debating the issue of the land disposal of hazardous waste and in 1984 decided to prohibit any future hazardous waste landfills “due to the permeability of the soil and high waste table in Florida.”\(^5\) Thus, the state Department of Environmental Regulation is not allowed to issue permits for any new hazardous waste landfills.
The regulation of underground storage tanks was an important new provision Congress included in the RCRA amendments of 1984. Although the program is not a component of the hazardous waste development and disposal process, the importance of the issue warrants a discussion of the new provisions.

Since over half the United States population, approximately 116 million people, depend on groundwater for their primary source of drinking water, protection of this vital resource has become an issue of national interest. Many federal and state officials believe that gasoline and organic chemicals that leak from underground storage tanks have become one of the biggest sources of groundwater contamination.

In New York, state officials estimate that 16,000 of the state's 83,000 (19 percent) active underground gasoline tanks are leaking, with another 28,000 having been abandoned in the last 10 years. Officials in Maine estimate that 25 percent of the state's 1,600 gasoline outlets have underground tanks leaking 11 million gallons yearly. In Michigan, a state survey found that 21 percent of 268 groundwater contamination incidents involved petroleum leakage from underground storage tanks. In one incident, 60,000 gallons of gasoline entered the groundwater.

Overall, there are between three and five million underground tanks in the United States that contain some type of hazardous
substance. Of the 1.4 million gasoline tanks nationally, some experts estimate that between 75,000 and 100,000 are leaking and perhaps up to 350,000 will begin leaking in the next five years.  

In 1984, Congress responded to this problem by adding a new section to the Resource Conservation and Recovery Act that develops a comprehensive regulatory program for underground storage tanks. The new program covers all underground storage tanks that store petroleum (including gasoline and crude oil) and substances defined as hazardous under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, also known as Superfund).

The program, under Subtitle I of RCRA, calls for EPA to establish underground storage tank regulations in the following areas:

- Tank notification;
- Leak detection;
- Record maintenance;
- Reporting of tank releases;
- Corrective action;
- Tank closure;
- Financial responsibility standards; and
- Standards of performance for new underground storage tanks.

Deadlines for EPA to promulgate regulations include:

- February 8, 1987, for new tank performance standards;
- November 8, 1985, for the notification requirements; and
- May 8, 1987, for the remaining six areas.

As with the other aspects of the RCRA hazardous waste program, states have an opportunity to regulate underground storage tanks in lieu of the federal program. A state must certify that its underground tank program is no less stringent than federal requirements and provides for adequate enforcement.

Although to date most of the EPA regulations have not been established yet (except for the notification requirements), what follows is a brief summary of the major Subtitle I provisions—all of which affect the states—and some examples of how states with existing programs have dealt with these issues.

**Definition.** RCRA defines an underground storage tank as "any one or a combination of underground tanks (including underground pipes connected thereto) . . . the volume of which is 10 percent or more beneath the surface of the ground." Exemptions include:
- Farm or residential tanks of 1,100 gallons or less used for storing motor fuel for noncommercial purposes;
- On-site tanks storing heating oil;
- Septic tanks;
- Pipelines regulated under other laws;
- Surface impoundments, pits, ponds, or lagoons;
- Systems used for collecting storm water and waste water;
- Flow-through process tanks;
- Liquid traps or associated gathering lines related to operations in the oil and natural gas industry; and
- Tanks found in underground areas such as basements, cellars, shafts, and similar areas.4

In order to comply with RCRA, states are limited to these nine exemptions. States, however, can choose how many of these exemptions they want to include in their laws.

Underground storage tank legislation differs from state to state over the type and number of exemptions allowed. For example, legislation enacted in Iowa,5 Montana,6 South Carolina,7 and Vermont8 provide for almost all of the federal exemptions. California9 and Rhode Island,10 however, allow for very few. Other states with legislation that provides for additional exemptions not included in RCRA, such as Oregon's exemption for farm or residential tanks storing less than 10,000 gallons of motor fuel, may have to change their laws to be in compliance with Subtitle I.11

Notification Requirements. The new federal law also calls for tank owners to notify the designated state agency of an existing tank. This requirement designates specific actions by distributors of regulated substances, owners of operational tanks, and owners of old tanks taken out of operation within the past 10 years but still in the ground. The requirements and deadlines stipulate that

- Owners of existing underground storage tanks must notify the appropriate state or local agency (appointed by the governor) by May 8, 1986, of each tank's age, size, type, location, and uses.
- Owners of underground storage tanks taken out of operation after January 1, 1974, but still in the ground must notify the appropriate state or local agency by May 8, 1986, of each tank's age, size, type, location, the date taken out of operation, and the type and quantity of substances left in the tank.
- Owners of newly installed (after May 8, 1986) underground storage tanks must notify the appropriate state or local agency within 30 days after installation.12
Since the federal notification program went into effect May 8, 1986, states are incorporating its requirements into their programs. States, however, can require more information than the federal standards dictate. For example, the legislation in California says that owners must list the type of leak-monitoring system being used, Maine wants notification if the tank is near a public drinking water system, and South Carolina requires notification of any past failures of the tank or corrective action taken. Concerning the federal regulation that owners of new underground storage tanks must notify the state agency within 30 days, legislation in Florida, Maine, and Rhode Island is more stringent.

**New Tank Standards.** Subtitle I of RCRA directs EPA to establish performance standards for new underground storage tanks that include, but are not limited to, design, construction, installation, release detection, and compatibility standards. Final federal standards were due out by February 8, 1987. States wanting to run their own programs in lieu of the federal one must adopt tank standards that are at least as stringent as the federal requirements.

In establishing new tank standards, states with existing underground storage tank programs have taken two approaches. The first is to turn the authority of setting standards exclusively over to the designated state agency, which gives it the most flexibility to fit them to state needs. The second most popular method is to authorize the state agency not only to establish tank standards but also to set broad guidelines. For example, to prevent old tanks from leaking, the legislation in Florida, Iowa, Maine, and South Carolina all require new tanks to be protected cathodically against corrosion or constructed of a noncorrosive material. Additionally, the legislation in California, Florida, Maine, and Rhode Island require all new tanks to provide for primary and secondary levels of containment such as double walls, which provide the effect of a tank within a tank for added leak protection.

**Leak Detection System.** Subtitle I also requires EPA to establish standards for a leak detection system that may include tank monitoring, tank testing, or inventory control to identify releases. The federal requirements were due out by May 8, 1987.

States have used a number of different leak detection strategies. Inventory control, most common among the states, directs the tank operator to keep daily records of regulated substances added to or withdrawn from a tank. Florida's act combines inventory control with in-tank and groundwater-monitoring systems. South Carolina enacted legislation combining inventory control with periodic tank-testing requirements. California's statute provides for variations of all three systems—tank testing, tank and groundwater monitoring, and inventory control. However, the legislation in Iowa, Montana, and Vermont leaves the
development of the specific leak detection system exclusively to
the designated state agency.

Reporting of Releases and Corrective Action. Subtitle I also
directs EPA to establish requirements for reporting any releases
and corrective action taken in response to a leaking underground
storage tank.

All state underground tank programs mandate immediate re-
porting of tank leaks. States differ on whether the response time
should be mandated legislatively or set by the state agency. Iowa’s
and Vermont’s legislation have authorized the appropriate state
agency. On the other hand, Florida requires a response within three
days, while California and Rhode Island have 24-hour time limits.

Tank Closure. The new federal law also requires that EPA
include in its underground storage tank program requirements
for the proper closure of tanks to prevent future releases of regu-
lated substances.

Most states that have adopted legislation in this area give the
designated state agency broad authority to adopt tank closure
procedures. Iowa, Maine, Rhode Island, and Vermont do so.
California, Florida, and Rhode Island, however, specifically out-
line tank closure procedures.

Corrective Action. Subtitle I also directs EPA to include re-
quirements for taking corrective action in response to a leaking
underground storage tank.

States have enacted different legislative approaches in the
corrective action area. The legislation in California, Iowa, Mon-
tana, and Vermont authorizes the state agency to develop its own
corrective action measures. Other state legislation specifies cer-
tain corrective action procedures. For example, Florida, Maine,
Rhode Island, and South Carolina all require that once a leaking
tank is found, its contents must be emptied. Also, both Florida’s
and Maine’s legislation mandates restoration of the environment
to a “satisfactory” level.

Financial Responsibility. Finally, Subtitle I of RCRA also directs
EPA to set requirements for maintaining evidence of financial re-
ponsibility for damages caused by a leaking underground storage
tank. RCRA also establishes the issues upon which financial respon-
sibility is based.

Although most states allow the designated state agency to
determine financial authority, they also provide guidance to the
agency to ensure that the state regulations will be at least as
stringent as the federal government’s. For example, Iowa and
Vermont enacted legislation that uses the same language as the
financial responsibility section of RCRA.
The National Conference of State Legislatures has developed model state legislation for underground storage tanks. The legislation's purpose is to assist states in developing an underground tank program.
The preceding chapters discussed EPA’s minimum requirements for state hazardous waste management programs. Additional issues, however, surrounding hazardous waste management go beyond the federal requirements. These hazardous waste issues have been important in state legislatures in the past and, from all indications, will be in the future. These program areas include:

- Planning a hazardous waste management strategy;
- Establishing procedures for siting hazardous waste facilities;
- Developing alternatives to land disposal; and
- Setting household hazardous waste standards.

This chapter addresses these areas and provides examples of some innovative state approaches.
Planning

Planning a hazardous waste management strategy is one of the most important tasks in developing an effective state hazardous waste program. Planning serves to identify the state’s hazardous waste problem and also assess its needs in terms of quantity and the type of facilities necessary to manage hazardous wastes safely. Subtitle D of RCRA encourages state planning to “assist in developing and encouraging methods for the disposal of waste which are environmentally sound and utilize valuable resources.”

Developing a comprehensive state plan is a two-part process. First, the appropriate agency must identify the amounts and types of wastes being produced within a state. Second, it must examine and choose the appropriate technologies to manage them. There are two ways hazardous waste can be identified within a state. The first approach is to use the information obtained through the notification requirement in Section 3001 of RCRA. This provision requires all owners of treatment, storage, and disposal facilities and all generators and transporters of hazardous waste to notify the appropriate state agency, identify the wastes being handled, and provide a general description and the location of the activity. The alternative method is for the agency to conduct a statewide survey, whereby generators respond to a series of written questions. Requested information may include waste characterization, means of storing and transporting the waste, and treatment and disposal methods.

Once the information is collected, the second step in the planning process is to analyze the data to determine the best way to manage the waste effectively. Recommendations may include suitable treatment techniques, appropriate disposal methods, and adequate storage systems. Some states have taken this process a step further by promoting the development of these recommendations through financial incentives or by pursuing state ownership of hazardous waste facilities.

State Action

A number of states have been active in the area of planning. Two extensive and innovative state planning programs—in Minnesota and New York—merit close examination.

In 1980, the Minnesota Legislature enacted the Waste Management Act, the purpose of which was to improve and coordinate waste management efforts in the state. The act created the Waste Management Board (WMB), which is responsible for carrying out
the act’s functions. Some of these include planning hazardous waste management, promoting better waste management practices, and also siting hazardous waste facilities.

The Waste Management Board is made up of at least nine members—eight permanent members appointed by the governor and representing each one of the state’s congressional districts and a full-time chairman—and a fluctuating number of temporary members representing each one of the state’s potential disposal sites. The WMB has three primary hazardous waste management responsibilities:

1) Develop a comprehensive state hazardous waste management plan;
2) Select preferred areas for hazardous waste processing facilities; and
3) Select a hazardous waste disposal site or long-term storage facility.

The WMB submits reports and legislative recommendations in these areas to the statutorily created Legislative Commission on Waste Management.

The board’s first responsibility, mandated under the 1980 act, was to develop a hazardous waste management plan (WMP) for the state that included:

- The types and quantities of hazardous waste that will be generated through the year 2000;
- Objectives for reducing, to the greatest extent possible, the need and use of land to dispose of hazardous waste;
- An estimate of the minimum amount of land disposal required through the year 2000; and
- Recommendations to assure the availability and development of needed disposal capacities.

The plan was developed in 1984 and clearly directs Minnesota’s hazardous waste management policies toward alternatives to land disposal. The WMP promotes waste reduction, recycling, and treatment over land disposal, and encourages the private sector to adopt the plan’s recommended management practices. For example, the plan outlines new state programs that offer financial and technical assistance to private businesses developing waste reduction measures and also new waste treatment and collection facilities.

Second, the act requires the Waste Management Board to search for preferred areas for commercial hazardous waste processing and disposal facilities. According to the law, the WMB must select at least three types of processing facilities—chemical
waste treatment plants, hazardous waste incinerators, and a transfer/storage facility for the collection and temporary storage of waste. As of 1985, the WMB has cited 21 preferred areas. State assistance is available to potential developers in these areas.³

The third primary responsibility for the Waste Management Board is to select a long-term hazardous waste landfill facility. The law requires the board to select six candidate sites for a disposal facility. These sites must be certified by the Pollution Control Agency as environmentally suitable as a potential landfill. Once the candidate site is selected, a member representing it will be added to the board. The legislature delayed the search, however, awaiting a new report from the WMB assessing the need for a disposal site in Minnesota.

Since its inception in 1980, the Minnesota Waste Management Board has been an excellent example of a planning program that has not only assessed the state's hazardous waste needs, but also set goals and objectives for its hazardous waste program and incorporated these into specific management strategies.

In 1981, the New York Legislature also went a step further in its planning efforts. The Industrial Materials Recycling Act enabled the development of the Environmental Facilities Corporation (EFC). The corporation was developed to work with municipalities and private industry to "plan, finance, design, construct, maintain, operate and render advisory services" in connection with a variety of environmental projects including waste resource recovery, treatment, storage and disposal facilities.⁴

The corporation promotes preferred state waste management practices through financial incentives and technical assistance. It is authorized to grant low-cost loans to private industry for solid and hazardous waste facilities, including resource recovery. The corporation finances the loans by selling special tax-exempt bonds. It promotes waste reduction and recycling and also conducts waste exchanges that attempt to put producers in touch with users to return wastes to the manufacturing process.⁵

**Siting**

To implement the federal and state programs of regulating hazardous waste from its generation to its disposal, a state must find sites for environmentally sound waste management facilities. The massive amounts of hazardous wastes generated each year will require some disposal mechanism even after the most sophisticated reduction and treatment measures.
A strong case can be made for siting more hazardous waste facilities. The growing population and economy (especially in the segments of the economy that produce a large amount of hazardous waste such as high-tech industries) inevitably will add to the country's generation of hazardous waste, thus increasing the need for secure disposal measures. Furthermore, new federal and state regulations on the disposal of certain hazardous wastes will necessitate new and better facilities.

There are many reasons for supporting new hazardous waste facilities, but a number of equally understandable reasons exist for opposing a site in a local community. Generally, hazardous waste facilities are unwelcome in communities. This public opposition stems from fear and a basic lack of confidence in the facilities to manage the wastes properly, the mismanagement of which may lead to a disaster. To the residents, the potential health and environmental risks associated with a nearby hazardous waste facility far outweigh the benefits of accommodating the disposal needs of the state and region. This response has been referred to as the NIMBY (not in my backyard) syndrome.

History has shown that siting efforts generally fail. The state locates a potential site, the local opposition begins to form and generate pressure, inevitably creating a conflict with the proposed facility. The conflict usually ends up being resolved in the courts. If the community is successful in blocking the proposed site, which is usually the case, the state starts over and considers other possible locations for the hazardous waste facility. In essence, the courtroom becomes the forum for resolving facility siting disputes, while the genuine disposal needs of the state and region remain.

One way to improve the siting process, which has been implemented in a number of states, is to allow for adequate public participation in the decision-making process. This allows the local residents to express their specific concerns and also keeps them informed of the siting procedures. Although this participation does not eliminate all opposition, it can generate support for the siting process, which is vital to accommodate growing disposal treatment needs.

**State Action***

According to a national hazardous waste siting survey conducted by the Massachusetts Hazardous Waste Facility Site Safety Council, state siting procedures employ any one or a com-

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* Unless otherwise indicated, information for the state siting laws is from the Massachusetts Hazardous Waste Facility Site Safety Council, "Approaches to Hazardous Waste Facility Siting in the United States."
bination of three strategies: those that allow for extensive local participation and influence in the siting procedure; those that allow limited involvement; and those that totally preempt the local government and provide for no local participation. Some states employ more than one of these methods.

**Major Influence of the Host Communities.** Two basic siting procedures allow for extensive local community input and influence. The first is a negotiated siting agreement between the developer and the potential host community. Under this approach, the developer must negotiate a siting agreement with the host community. Although the state has the final siting decision, this is a good method of incorporating the local concerns into the permit process. Upon receiving a permit from the state agency, a developer may have to compensate the community or implement certain facility designs in order to obtain an agreement with the local community. Rhode Island, Massachusetts, Wisconsin, and Connecticut have adopted this approach.

In Rhode Island, once the state’s Department of Environmental Management approves a site construction permit, the site developer must negotiate an agreement with the local communities. The potential host communities are represented by a local assessment committee (LAC), which assesses the environmental risks (including the potential risk to the nearby communities).

Based on the findings, the site developer and LAC must reach an agreement. The agreement may include the construction of a site, proper maintenance and closure mechanisms, monitoring devices, compensation and services to the community, and other health and safety measures. The LAC is required to conduct a public hearing, and any negotiations with the potential developers must conclude in 90 days. State legislation allows local areas to prohibit some facilities in certain areas.6

Wisconsin’s siting laws require the potential site developers to notify all affected communities. All communities wanting to participate and negotiate in the siting procedures must pass local siting resolutions. The interests of the local communities are presented in the negotiations by local representatives. Any negotiated agreement must be approved by the host governing body or it is void. If an agreement cannot be reached, the state Waste Facility Siting Board may be petitioned to initiate arbitration. If no agreement is reached, the governor makes the final decision.7

The second procedure that allows for extensive local influence is a method whereby the community representatives review and make the final siting decision. State agencies are involved in issuing permits but cannot overturn the communities’ decision. In the
states using this method, it is only part of the siting strategy. Only Kentucky, Colorado, and Tennessee employ this method, and all of them also use other siting procedures.

In Kentucky, potential developers must submit siting proposals to the county fiscal court that represents the local communities. The court reviews the application and has the ultimate decision of approving or denying the facility. As part of Nebraska’s siting program, the potential site developer sends an application to the state Department of Environmental Quality. The department, in turn, sends the application to the governing authority of the host community. After conducting public hearings, the local authorities decide whether to allow the development of the site.

Restricted Involvement of the Host Communities. Under this procedure, the host community can express its concerns, but they are only one of the many considerations taken into account, such as those of the hazardous waste industry and the state. States following this course have adopted one of two methods. In the first method, the local community is represented on a board where members of differing perspectives oversee the siting procedures. The board has the authority to approve or deny a site application. New York, Pennsylvania, Minnesota, Indiana, and Ohio use this approach.

Under New York law, the developer must apply to the state’s Department of Environmental Conservation for a certificate of necessity. Once the application is complete, the governor appoints an eight-member siting board that has two members from the host community. After the board holds public hearings and gathers information, it has 60 days to approve or reject the proposed site. If the application is denied, the process ends. In Ohio, the state Environmental Protection Agency sends siting applications to the Hazardous Waste Facility Approval Board. Made up of state officials and scientists, the board conducts public hearings and makes the final decision on the proposed facility.

Another way of allowing limited local involvement is to include the host communities in devising the overall state hazardous waste plan, which covers the siting of a hazardous waste facility. The community, however, does not have authority in decisions on specific projects. Florida, Minnesota, and New Jersey all use a version of this method in their state programs.

As mentioned in the planning section of this chapter, the Minnesota Legislature in 1983 created the Waste Management Board to establish the state’s hazardous waste plan and select preferred areas for hazardous waste facilities. The board has nine permanent members and four additional members from the potential facility area. Although there is a great deal of participation from
the local communities, the board has the final authority to approve or deny the development of a facility. Its decision overrides local laws.\textsuperscript{11}

Local Preemption. This strategy sets up little or no community involvement in the siting process. At least four states have developed boards that oversee the siting process but do not have community representation. These boards are made up of state officials and other representatives who are usually appointed by the governor. Kansas and Maryland use this siting procedure.

The Kansas Department of Health and Environment takes applications for hazardous waste facilities. If approved, the application goes to the state's Hazardous Waste Disposal Facility Approval Board, which consists of three state officials and two members appointed by the governor. The board makes the final decision on the facility. Parties have 30 days to appeal that decision in district court.

Another form of limited local participation in the siting process is to leave the siting decisions to public agencies. Local concerns cannot be voiced except during public hearings. Arizona, Maine, Nebraska, and New Hampshire use this method as part of their siting programs.

In Maryland, for example, site applications are sent to the state Department of Environmental Protection. The department and other state agencies review them and send recommendations to the environmental rulemaking authority in Maryland, the Board of Environmental Protection. After a public hearing period, the board decides whether to approve or deny the site application.

Facility and Site Ownership. Due to high start-up costs, high risks, and strict regulations, ownership of off-site facilities generally has been limited to large private businesses or public entities. Both types of facilities have their advantages and disadvantages, causing state legislatures to wrestle over which is the appropriate entity to own and operate a waste facility. This section deals with some of the ownership issues facing state legislatures and discusses some examples of state activity.

The main advantage to waste facilities being owned by private industry is that it possesses both the technological and management expertise to operate a waste facility efficiently. Given the high risks involved in maintaining a hazardous or solid waste site, however, financing has been difficult to obtain. Consequently, many states have decided to encourage private development through economic incentives. Possible financial inducements include loan guarantees, where the state guarantees to meet loan payments if the firm defaults. Another form of state financial assistance is facility development revenue bonds, which lower interest rates and encourage private ownership. In addition, states offer subsidies, tax credits, and tax breaks.
In the second option, public ownership of waste facilities, the state or local government owns either the facility or the land. This method has a number of advantages, including ensuring that certain management goals are being met, reducing public opposition to the facility site, and ensuring that the facility is being maintained.

If a state chooses to own a facility, three primary financing measures are available:

- General obligation bonds, backed by the full faith and credit of the state;
- Project revenue bonds, financed solely from revenue generated by the facility;
- State authority or commission bonds, enabling the ownership to incur debt and to issue notes and bonds.

The management of a publicly owned facility can take two separate forms. First, the state may own and operate the facility itself, maintaining the maximum amount of control. Or the state may contract a private firm to manage and operate it.

The publicly owned, but privately operated option can be accomplished by the state designing and building the waste facility and then leasing its operation duties out to a private firm. Another approach is for the state to own the property and then lease out the duties of designing, building, and operating the facility.

Many states have considered the hazardous waste facility ownership issue. Some have decided to encourage private ownership while others have adopted legislation to enable them to own a facility.

New York encourages private ownership of waste facilities by providing incentives. Its Environmental Facilities Corporation, mentioned earlier, is authorized to provide loans to finance a wide variety of private sector projects, including facilities for solid waste disposal; resource recovery; and industrial hazardous waste treatment, storage, and disposal. These loans are funded by the proceeds of tax-exempt bonds issued by the corporation. Depending on whether the facility meets the proper requirements, "there is no limit on the amount of the loan, which can be for a term of up to 40 years. The loan may be used to pay for the cost of land, buildings, equipment, engineering, design, legal, financing and other related costs."12

The Minnesota Legislature has directed the state’s Waste Management Board to work with the private sector to develop waste facilities. Although legislation passed in the 1986 session officially ended efforts to site a land disposal facility for hazardous waste, the state is working in cooperation with industry and local governments to site a facility to "treat, stabilize and contain those indus-
trial wastes that cannot be otherwise reduced or recycled." The facility will take the ash from waste incinerators and sludge and treat the by-products to make them into a stabilized form.

On the other hand, a number of state and local governments pursue public ownership of waste facilities. In California, several facilities are owned and operated at the local level. They are limited, however, in the types and quantities of waste they can accept.

In 1980, Arizona enacted enabling legislation for the state to acquire a site for a hazardous waste disposal facility. The Department of Health Services was directed to select a site and then submit the decision for legislative approval. In 1981, the legislature authorized the department to acquire and develop the site.13

The Illinois General Assembly set up much broader authority in dealing with facility site ownership. The Environmental Facilities Financing Act empowers the state Department Finance Authority to “acquire, construct, reconstruct, repair, alter, improve, extend, own, finance, lease, or sell” a facility. The department also may issue bonds that can be used to finance facility projects.14

**Alternatives to Land Disposal**

It is generally acknowledged that, even with the new stricter RCRA regulations in place, eventual release of hazardous constituents from land disposal facilities are highly probable. Greater use of waste treatment alternatives is, therefore, a major issue, although they too, if not regulated effectively, can release hazardous constituents into the environment. Yet greater use of alternatives to land disposal—treatment, recycling, and especially more investment in waste reduction—could increase industry’s near term costs significantly—perhaps by as much as 50 to 100 percent. But years or decades from now, cleaning up a site from which there are hazardous releases, and compensating victims may cost 10 to 100 times the additional costs incurred today to prevent releases of hazardous materials.

Office of Technology Assessment,
Technologies and Management Strategies for Hazardous Waste Control, March 1983
With new RCRA laws increasing the need for effective hazardous waste management practices and the growing health and environmental risks associated with improperly disposed of wastes, states will be called upon to develop alternatives to land disposal. This section analyzes some of the options available to and employed by state legislatures.

**Financial Strategies.** States use a wide range of financial strategies to encourage alternatives to land disposal. These strategies vary from financial incentives for private industry to develop alternatives, to financial disincentives to discourage land disposal. The three most common are fee structures, tax incentives, and bonds.

Hazardous waste fees often are structured and applied in conjunction with a state’s overall hazardous waste management strategies and goals. Taxes are applied more heavily on the least desirable waste management practices and less heavily on those a state wants to encourage. For example, taxing the land disposal of hazardous waste makes alternatives such as waste reduction, recycling, and incineration more economically feasible. Therefore, the fee structure not only provides a revenue source for the hazardous waste program but also encourages proper waste management practices.

At least 40 states tax or collect fees on hazardous waste, all varying in terms of structure, amount, and use. The most common tax, implemented in 38 states, is the “waste end” tax, which can be imposed on the generation or disposal of hazardous waste. It also can be applied to a type or amount of waste, or certain management practices. At least five states—Alabama, California, Florida, New Hampshire, and New York—have adopted exemptions or graduated land disposal fees for wastes that have been reduced, recycled, incinerated, or rendered nonhazardous. For example, fees in California for land disposal range from $0.50 per ton to $19.84 per ton, depending on the characteristics of the waste.

Another method is to exempt a facility that has incorporated recycling or resource recovery methods from license, permit, and inspector fees. Kentucky, Maine, Michigan, Missouri, North Carolina, and Wisconsin use this approach.

**Tax Incentives.** Tax incentives offer positive inducement to private business and industry to adopt alternative waste management methods. There are a wide variety of possible exemptions, including those on property, equipment, sales, use, and excise taxes. The federal government provides an investment tax credit on new equipment and an additional 10 percent credit for energy recovery and recycling equipment.

State tax incentive provisions vary. Michigan exempts new property used to minimize or reduce waste generation and also
existing plants that change their processes to reduce waste. North Carolina exempts real estate and equipment used for air cleaning, waste disposal, air and water treatment, and resource recovery. Wisconsin exempts the equipment used to treat hazardous waste.

With probably the most extensive program, Oregon provides a 100 percent tax credit to industries that develop facilities for producing items of real economic value from waste products. The tax credit can be taken at 10 percent over 10 years, or 5 percent over 20 years against ad valorem or property taxes.

Accelerated depreciation is another tax incentive. North Carolina allows a 60-month amortization period for equipment or facilities that reduce the volume of hazardous waste.\textsuperscript{17}

**Bonds.** Several states issue bonds to assist in financing resource recovery and waste treatment facilities. New York and Minnesota have the most aggressive programs.

New York's Environmental Facilities Corporation is authorized to make loans to hazardous waste treatment, storage, and disposal projects. There is no limit on the amounts of the loans, which can be issued for up to 40 years. Minnesota's Waste Management Board has bonding authority to finance hazardous waste processing facilities. The board also may award grants to industries for studies and for applying alternative methods or technologies to reduce hazardous waste generation.\textsuperscript{18}

**Legal.** States have enacted a number of legal incentives and disincentives to encourage businesses to develop alternatives to land disposal. Some of these methods are excluding certain materials or facilities from a regulation, allowing different liability standards for alternative facilities, restricting land disposal (which was discussed in Chapter IV), expediting the permitting of facilities using alternative technologies, and excluding certain facilities from permit requirements.

Permit exclusions are the most popular legal exemption among states. Missouri provides a permit exemption for resource facilities that the state certifies supplement or substitute hazardous waste for nonhazardous waste. Also, Indiana requires no treatment permits if the waste is recycled, recovered, or reused at the same site as its generation.\textsuperscript{19}

**Institutional.** In addition to financial and legal incentives, states may encourage alternatives to land disposal by implementing institutional measures. These include developing waste exchanges, providing technical assistance, and starting research and development programs.

Waste exchanges are becoming very popular for states and, to date, have been considered a success. There are two types of exchanges. One type is to act as a clearinghouse of information between waste producer and user. The second is to take possession of
the waste and then market it. There are a number of exchanges nationwide, including the Industrial Material Exchange Service, sponsored by the Illinois Environmental Protection Agency and the Illinois Chamber of Commerce; the Midwest Industrial Waste Exchange; the Southern Waste Information Exchange; the Northeast Industrial Waste Exchange; and the California Waste Exchange. Several states provide information on hazardous wastes and technical assistance to aid businesses in incorporating recycling or reduction in their management practices. The most innovative states in this area are California, Massachusetts, Minnesota, and New York.

### Household Hazardous Waste

While large quantities of industrial hazardous waste are regulated by federal and state laws, another form of waste, household hazardous waste, is receiving more and more attention from state legislatures. Every day, common household products are thrown into the trash by the ton and eventually buried in nearby solid waste landfills. Increasing concern exists, however, that some household products, ranging from aerosols to motor oil, may pose a risk to human health and the environment. Some argue that solid waste landfills are not equipped for household hazardous wastes; thus, these substances are seeping into the groundwater, with the potential to contaminate nearby drinking water. Therefore, these potentially inflammatory substances pose a direct threat to those who handle the waste, the landfill it is eventually stored in, and the groundwater near and under the landfill. As noted, the RCRA program regulates large industrial forms of hazardous waste, but small amounts of waste typically generated by households and small businesses have been exempt from the hazardous waste laws. Thus, the regulation of household hazardous waste has become exclusively a state and local issue.

Statistics vary over how much hazardous waste is generated from households, but some state legislators believe the amount is high enough to warrant legislation.

Although state initiatives differ, most of them call for public education programs and possibly the development of local collection centers for the periodic disposal of identified hazardous waste, which is then recycled, incinerated, or transported to the appropriate disposal site. Developing an effective state household haz-
ardous waste program is a complicated process. The following outlines the major issues, questions, and obstacles states have had to deal with when considering household hazardous waste legislation.

*Identification.* The first step in developing a household hazardous waste program is to identify specific substances that are potentially hazardous and that need to be regulated. Since no definitive scientific information exists on the ill effects of all household products, identifying substances to be regulated is the most difficult aspect of developing a program. States have taken two different approaches in defining hazardous substances in their legislation. The first is to give this scientific task to the state agency that has the most technical expertise in this area. The second is to define the wastes to be regulated in the legislation. California has an innovative method of defining a household hazardous waste. The state’s legislation establishes a nine-member advisory committee to develop a working definition of household hazardous waste and establish regulatory guidelines for its proper disposal. The committee is made up of representatives from government, potentially regulated industries, and the environmental community.20

*Methods of Collection and Disposal.* For those states pursuing the development of collection programs, it is necessary to provide for an effective means to collect and dispose of the household waste. Most legislation calls for local collection outlets where people dispose of their hazardous substances. This drive-up/drop-off method usually takes place in parking lots of public buildings. Licensed waste handling contractors have the responsibility of collecting, transporting, and eventually treating or disposing of the waste. In Minnesota, however, state and local workers have staffed collection proceedings.

*Publicity and Public Education/Assistance.* One of the most important steps in developing an effective state program is to create a means to educate the public on household hazardous waste management. States have made available to the general public information regarding what constitutes a household hazardous waste; the environmental problems that arise from improper disposal (possible contamination of residents' own drinking water); the proper means of disposal; and possible alternative, less hazardous consumer products. This information dissemination can be done in a variety of ways, including media advertising, information packets, and brochures. Also, requiring product labeling has been considered, as well as providing a toll-free telephone number for the public to obtain information and ask questions regarding hazardous substances.
Although a number of states have varying degrees of household hazardous waste programs (Minnesota, Iowa, Washington, and Massachusetts), Florida was the first to implement a comprehensive statewide initiative. Thus, a closer look at this program is warranted.

In 1983, the Florida Legislature amended the Water Quality Assurance Act to create a program known as Amnesty Days. The new law made it illegal, without exception, for any citizen in Florida to dispose of improperly even small amounts of hazardous waste. Permanent transfer stations were set up in counties to collect the small amounts of hazardous waste. To enable citizens to comply with the law, the program called for six separate amnesty days, where individuals could bring their waste and dispose of it at the transfer stations without charge. Counties in the state were divided into three groups. Within each group, the amnesty days lasted from May 1, 1984, to June 30, 1984, and November 1, 1984, to December 31, 1984. The legislature funded the program with a $600,000 appropriation.

The act directed the Department of Environmental Regulation to administer and supervise Amnesty Days and contract with a waste handling company to collect the waste. The collection facilities were set up during these two-month intervals at shopping malls, fairgrounds, and former vehicle inspection stations around the state. Once the household waste was collected, it was shipped out of Florida to federally permitted sites in Pinewood, South Carolina, and Emelle, Alabama.

The media played a major role in promoting the Amnesty Days program. The media campaign included television and radio announcements, informational pamphlets, promotional films on local television channels, newspaper advertisements, and electric and water bill inserts.

The collection stations accepted up to 55 gallons or 450 pounds of waste from each person at no charge. In 1984, 600,000 pounds from 6,500 participants were collected at 37 sites.

Other programs also have had success in collecting household hazardous wastes. In six areas in Minnesota, approximately 969 people participated in the program during which approximately 15,000 items totaling 5,000 gallons of hazardous waste were collected. A two-week effort in Anchorage and Fairbanks, Alaska, resulted in the collection of 9,000 gallons of waste, pesticides, and chemicals. Elsewhere, in the Cape Cod area, which relies on a single-source aquifer for its groundwater supply, publicity of the
potential environmental problems from improper waste disposal alerted residents from 15 Cape Cod towns to contribute 8,000 gallons of household hazardous waste.\textsuperscript{23}

Private industry is also joining in the household hazardous waste collection efforts. Dow Chemical Company gathered 2,964 pounds of household waste from residents of Midland, Michigan, in the spring of 1985. In Minnesota, the Honeywell Corporation's active involvement in the collection effort led state officials to explore the possibility of future community/corporate partnership programs.\textsuperscript{24}
In recent years, American society has experienced the ill effects of improperly disposed of hazardous and toxic wastes. The millions of tons of wastes that have been disposed of in landfills in past decades are beginning to seep into nearby communities, contaminating the water and poisoning the air. Some neighborhood residents leave their homes; others choose to stay, hoping the area can be cleaned up but not knowing the health problems they have contracted or the ones they may face in the future.

Currently, EPA has targeted as many as 25,000 uncontrolled hazardous waste sites as requiring some type of cleanup to alleviate the potential threat to the public's health and the environment. EPA recognizes, however, that the number of sites could grow much larger. In fact, the Office of Technology Assessment estimates that as many as 378,000 waste sites eventually will require some cleanup.

In 1980, EPA referred to our country's practices of disposing of toxic and hazardous waste as "the most grievous error in judgement we as a nation have ever made." The agency further described the situation as "one of the most serious problems this country has ever faced, a ticking time bomb ready to go off."
The Federal Superfund Program

In 1980, Congress responded to this growing crisis by passing the Comprehensive Environmental Response, Compensation and Liability Act, commonly known as Superfund. CERCLA represents an aggressive program to combat the growing threat of uncontrolled hazardous substances leaking into the environment. The law authorizes the federal government to respond to any release or threatened release of hazardous substances and provides for the cleanup of the nation’s uncontrolled hazardous waste sites.

The original Superfund program operated on $1.6 billion, raised between fiscal years 1981-85 (the taxing authority officially expired on September 30, 1985). Eighty-six percent of the fund was financed by taxes on the manufacture or import of certain chemicals and petroleum, and the remainder came out of the federal government’s general fund (the federal government’s share was approximately $44 million per year). Petrochemical taxes made up the biggest share of the fund, approximately $250 million annually. The intent of the tax was to place a fee on the production elements associated with waste generation (referred to as “building blocks”); thus, the cleanup costs were passed on and spread out as much as possible over the means of waste generation. Those producers who shouldered the cost of this tax argued, however, that they incurred a disproportionate amount of the financing costs for the Superfund program and that a number of other groups generating hazardous waste were not taxed proportionately. In all, almost 600 companies paid for the industry’s share of Superfund. Ten companies paid nearly 50 percent of the $250 million annual tax on industry.

One of the major lessons from the first five years of the Superfund program was that hazardous waste cleanup is expensive. Once a site is cleaned up, EPA projects that the average costs will fall between $5 million and $10 million. The prospect of such exorbitant costs has prompted federal and state officials as well as industry representatives to look at expanding the size of federal and state cleanup efforts and also to analyze alternative funding sources.

After a year of congressional gridlock, Superfund was reauthorized on October 17, 1986. The new, expanded Superfund will operate on $9 billion over a five-year period (1986-91). It will be raised from six sources:

- Petroleum companies, $2.75 billion. Of this amount, $125 billion will be derived from a tax of 8.2 cents per barrel on domestically produced oil and $1.5 billion from a tax of 11.7 cents per barrel on imported oil.
• Chemical feedstocks, $1.4 billion.
• A broad-based tax on corporate income, $2.5 billion. This amount will be raised from a tax of $12 per $10,000 of corporate revenue above $2 million.
• General revenues, $1.25 billion, which is six times the U.S. Treasury's current contribution.
• Interest and monies recovered in cleanup costs from "responsible parties," $600 million.
• A 13-cent per gallon tax on motor fuels, $500 million. This money will go into a new leaking underground storage tank cleanup fund.

This chapter discusses the Superfund process, the main components of the program, and also state efforts to clean up hazardous waste.

The Superfund Process

National Contingency Plan. The government's cleanup policies and procedures under the Superfund program are laid out in the National Contingency Plan (NCP). The plan originated in 1968 under the Federal Water Pollution Control Act, which outlines the procedures for cleaning up oil spills. In 1982, the plan was expanded and placed under the CERCLA law to include cleanup of not only oil but also all hazardous substances. NCP establishes the authority for federal and state governments to respond to abandoned or uncontrolled waste sites, and the methods and criteria for when and to what extent a cleanup procedure should be undertaken.

Developing a National Priority List (NPL). Faced with a vast number of hazardous waste sites, EPA must determine which sites pose the greatest risks to the public's health and the environment. The first step is to compile an inventory of sites through state surveys (each state received a $10 million grant to conduct a survey of hazardous waste sites); EPA regional offices; and a requirement in the Superfund law that anyone owning, operating, or taking waste to a disposal facility must notify EPA of that site.

Through this process, EPA had identified, as of December 1984, 24,269 waste sites. The agency estimates that in the years ahead its inventory of sites may grow much higher.

To ensure that the most threatening sites are given cleanup priority, the second step is developing a National Priority List from the inventory. The NPL is determined by a hazard ranking system (HRS), which is used to "score" the sites. The HRS measures the sites' potential for pollution in groundwater and surface water, taking into account factors such as the quantity of the
substance, its toxicity, the population using the water as a drinking source, and the distance of the pollution from the groundwater. After the initial determination of the potential hazard for each of these areas, a composite score is given to each site. EPA's regional offices review the scores from the state surveys and report the sites with scores of 25 and above (in 1983, there were 840 sites with scores of 25 and above) and any other site needing cleanup priority to EPA headquarters. The agency then determines which hazardous waste sites are to be placed on the National Priority List. EPA publishes the list annually.

Overall, the ranking system has been successful in identifying priority sites. One potential problem, however, is that if the information needed for the HRS is unavailable, a site cannot be given a score and likely will not be placed on the priority list for cleanup. Sites can be added to the priority list where new information or a change in the environmental conditions gives the site a higher score under the ranking system. Currently, the National Priority List contains approximately 888 sites. EPA projects that 2,000 sites eventually will appear on the priority list; however, the Office of Technology Assessment estimates that more than 10,000 will require cleanup by Superfund.6

Appearing on the National Priority List has a number of advantages for the potential cleanup of a hazardous waste site. First, EPA requires all sites on the list to be checked routinely to determine if emergency hazardous waste removals are needed. Second, the government can use the adverse publicity of a site's appearing on the list to negotiate cleanup responsibilities with the appropriate parties. Third, the NPL gives the public an opportunity to monitor the success of the cleanup. Finally and most important, a site on the list is then and only then eligible for federal permanent cleanup funds.

**Government Action Under Superfund**

Depending on the situation, the government can respond to hazardous and toxic waste crises in any one of three ways:

1) *Immediate Removals*—This response requires short-term immediate removals of the hazardous materials. For example, if a chemical site explodes creating a fire or if a spilled chemical leak presents an imminent
threat to a community, EPA can step in under CERCLA and use Superfund money to help minimize the danger.

2) Planned Removals—This requires a prompt, but not immediate emergency action to avert the danger to the public or the environment.

3) Remedial Action—These situations require long-term efforts that attempt a permanent solution to a hazardous waste problem. There is no limit to how much can be spent on a cleanup, and to be eligible a site must be on the National Priority List.

Both the immediate and planned removals were limited under the original Superfund law to a six-month time span and $1 million, except in emergencies. The new law expands these provisions to 12 months and $2 million. Also, a site requiring both of these short-term responses does not have to be on the NPL to qualify for these measures.

Although EPA has had considerable success in responding to situations that require both immediate and planned removals, the agency has come under attack to increase the speed and effectiveness of the remedial action process. The cost of such action, however, can run into the tens of millions of dollars and can take years, even decades, to accomplish. Most of EPA's remedial activities to date have focused on the early phases of the process, with few sites reaching the final stages of cleanup. Consequently, since the program began in 1980, 13 sites have been declared officially cleaned up. Also, as of June 1986, 446 of the 888 sites on the priority list are receiving or will receive some kind of remedial cleanup action. As these sites reach the actual cleanup stages, the costs should go up dramatically.

Major Issues in the Superfund Program

How Clean Is Clean? Establishing the appropriate degree of cleanup for a hazardous waste facility is one of the most important and controversial issues surrounding the Superfund program. Addressing this issue in 1982, the National Contingency Plan required cleanup actions to be cost-effective, mitigate and minimize damages, and provide adequate protection for the public's health and welfare and the environment. A great deal of flexibility was allowed in meeting these broad objectives. The result was a wide range of techniques and also varying degrees of overall cleanup.
EPA's decision not to set forth specific cleanup standards in the NCP was based on four important facts that existed in the early years of the program. First, there was a lack of experience in and knowledge of cleanup techniques; therefore, a period of experimentation was needed to determine the most effective cleanup measures. Second, many sites have unique problems and characteristics that may require a special response to cleanup. Therefore, effective cleanup programs could be attained only through flexibility in the law's provisions. Third, EPA concluded that developing standards for the hundreds of substances that could be confronted would not be the most efficient use of limited cleanup resources and would hinder overall efforts. Fourth, the lack of concrete scientific evidence on the potential health effects from exposure to hazardous and toxic wastes presents obvious problems in determining to what degree cleanup efforts should be taken.

Nevertheless, without direction from specific cleanup standards, federal and state officials have been faced with making decisions on a case-by-case basis. The lack of standards coupled with the enormous array of possible measures has hindered officials' efforts to produce consistent, equitable levels of cleanup. The EPA's director of the Superfund program concluded that "the task of choosing site cleanups where there are no standards—mostly where there is extensive soil and groundwater contamination—is the most difficult Superfund policy decision facing EPA."

In 1982, the Environmental Defense Fund and the state of New Jersey, dismayed over NCP's failure to specify standards, filed a lawsuit to force the establishment of some cleanup requirements. An agreement was reached on January 16, 1984, forcing EPA to propose a policy of applying existing environmental standards from other environmental laws that apply to hazardous waste sites. This change in federal policy, however, was not seen as a long-term solution to the issue of how clean is clean because not all hazardous substances are covered by other environmental statutes; therefore, some substances and conditions still will be without cleanup standards.

Four primary cleanup options are available, ranging from completely cleaning up a site to dealing with only the "immediate and significant" risks. The following analysis, published by the General Accounting Office in 1984, lists the advantages and disadvantages for each of the four cleanup options.
### Option 1: Return Site to Its Original Condition by Removing All Contaminants

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<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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<td>- 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 to human health and the environment, as well as financial damages such as lowered property values.</td>
<td>- May prove technologically infeasible. Technology does not exist at present to remove all toxic substances.</td>
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<td>- 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.</td>
<td>- 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.</td>
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<td>- Would entail the highest cost of all options available.</td>
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### Option 2: Set Uniform National Standards for Acceptable Residual Levels for All Chemicals and Classes of Chemicals Found at Superfund Sites

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<th>Advantages</th>
<th>Disadvantages</th>
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<tr>
<td>- Provides assurance of a consistent level of cleanup and protection.</td>
<td>- 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.</td>
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<td>- Precedents exist in other environmental programs. Lessons have been learned in implementing uniform standards under other environmental laws.</td>
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## Option 3: Apply the Best Available Technology

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<th>Advantages</th>
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<tr>
<td>Ensures that the most advanced technology would be utilized.</td>
<td>Costs would be considerable although less than those associated with Option 1. Considerable resources would be required to procure the best available technology.</td>
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<td>Guarantees a nationally consistent level of protection and cleanup, since the same standards would be used.</td>
<td>Suitable criteria for determining best available technology are lacking.</td>
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<td></td>
<td>Available technology can cover only 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.</td>
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## Option 4: Treat “Immediate and Significant” Risks on a Site-By-Site Basis Until Standards Are Developed

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<th>Advantages</th>
<th>Disadvantages</th>
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<td>The most immediate hazards would be treated.</td>
<td>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. Substantial time would be needed to develop standards to define “immediate and significant” and to research and determine appropriate toxicity standards.</td>
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<td>Resources could be directed to standards-related research.</td>
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The new law adopted in 1986 seems to use a combination of these four options. The cleanup standards encourage methods to be "cost-effective in the short- and long-term." Responsible parties must use permanent solutions or alternative treatment technologies that reduce the volume, toxicity, or mobility of the hazardous waste rather than employing nonpermanent methods. This directive encourages the use of incineration as a treatment measure (variation of option 3). Furthermore, the new law specifically requires long-term cleanups to meet all relevant federal standards established in other environmental laws including the Clean Air Act; Solid Waste Disposal Act; Safe Drinking Water Act; Toxic Substances Control Act; and Marine Protection, Research and Sanctuaries Act (variation of option 2).7

In addition, under the new law, specific authority is granted to EPA to enter into settlement agreements with any person, including responsible parties, to perform cleanups. Public participation and comment are mandatory before any such settlement can be finalized.

Liability and Financial Responsibility. The overriding theme of the Superfund law is that responsible parties should clean up a hazardous waste site or reimburse the government for the cleanup costs. Toward this end, EPA uses the enforcement authority found primarily in Sections 104, 106, and 107 of the act to identify and negotiate with the responsible parties to conduct or pay for the necessary cleanups.

Faced with an uncontrolled hazardous waste site that presents a threat to the nearby environment, EPA has two options. First, under Section 104 of the Superfund law, EPA is authorized to disburse Superfund money to clean up the site; then, under Section 107, the government can sue the responsible parties for payment and reimburse the Superfund. The second option, under Section 106, represents a different approach to hazardous waste cleanup. Under this provision, the government can pursue judicial and administrative orders to force the responsible parties to not only pay but also clean up a hazardous waste site. These sections, established in 1980, set the liability standards for the Superfund program.

EPA's policy in the 1980s has been to use its powers under Section 106 to make private parties accept cleanup responsibilities, rather than cleaning up the site with Superfund money and then seeking recovery under Section 107. The broad language in Section 106, however, has raised a number of questions and controversies since the program began in 1980.
In 1980, the language of Section 106 stated:

> [W]hen the President determines 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, he may require the Attorney General of the United States to secure such relief as may be necessary to abate such danger or threat, and the district court of the United States in the district in which the threat occurs shall have jurisdiction to grant such relief as the public interest and the equities of the case may require. The President may also . . . [issue] such orders as may be necessary to protect public health and welfare and the environment.

Waste generators have challenged Section 106 in the courts, arguing that the authority derived from this section can be used to halt only current improper practices and cannot be applied to dangers caused by previous actions. They also challenged Section 106 on the grounds that it does not assign a standard of liability to any one party explicitly. Therefore, they conclude that potential defendants should not be held strictly liable for damages.

Court rulings, however, have held overwhelmingly that even though the language in Section 106 is vague, Congress intended for the same parties to be held liable under both Sections 106 and 107. Section 107 imposes liability for cleanup costs on four broad classes:

1) The owner or operator of a facility;
2) Any person who at the time of disposal owned or operated the facility;
3) Any person who contracted or arranged for transportation to a disposal or treatment facility; and
4) Any person who accepted the substances for transport to disposal or treatment facilities or sites from which there is a release or threatened release.

The courts concluded that strict liability standards can be applied to cleanup situations that may have been caused by previous actions. Therefore, strict liability standards from Section 107 also apply to Section 106.

Furthermore, the courts and enforcement officials are interpreting the Superfund law as holding generators and transporters of hazardous waste jointly and severally liable for the cleanup. During
the latter stages of the 1980 Superfund legislation, the joint and
several liability provisions, which make everyone connected with
the hazardous waste site potentially liable for cleanup, were deleted
from the act. However, convinced that the thousands of toxic waste
sites would be cleaned up only if everyone linked with the waste
were held liable, EPA has pushed for an expansive interpretation
of the statute, which includes joint and several liability standards,
in the courts. The results have been an almost total victory for the
government. Thus, through legal precedent, not legislative mandate,
joint and several liability has become one of the major tools by which
the government enforces cleanup.

Therefore, as the program has evolved, strict joint and several
liability standards have become an important component of the
Superfund program. In 1986, in reauthorizing Superfund, Con-
gress did not adopt any language that would reverse this trend.

Moreover, unlike previous environmental legislation, Super-
fund does not specifically define the substances that are to be
regulated under the act. In fact, the program encompasses all of
the substances regulated under a number of previous environmen-
tal statutes. The result is a broad and long list falling under the
Superfund's authority, including substances regulated by the
Clean Air Act, the Clean Water Act, the Toxic Substance Control

For those industries that deal with hazardous waste, the com-
bination of the broad definition of a hazardous substance and the
possibility of facing strict, joint and several liability standards
from an actual or threatened hazardous release has created what
they consider to be a disastrous situation for them. The joint and
several liability standards allow the government to focus its en-
forcement on a financially sound responsible party who poten-
tially would have to incur the entire cost of the cleanup. To recover
its legal costs, a company would have to take legal action against
the other businesses using the site, which could turn out to be its
own customers or suppliers. In addition, the fear of being held
responsible for the entire cleanup greatly reduces industry's in-
centives for voluntary cleanup action. Therefore, according to the
waste industry, because of the stringency of the Superfund law,
the vast amount of hazardous waste knowledge in the industry
is not being properly used in cleanups.

Like the hazardous waste industry, the insurance industry is
also deeply concerned with the federal Superfund law. According
to the insurers, their level of liability is too great and their pos-
sible liability defenses too limited. In the insurers' view, unless
the federal law is amended, the market for insurance will be
extremely limited if not nonexistent. Consequently, the prospect of not being able to obtain insurance will inevitably force the waste industries to shut down.

On the other hand, those that support extensive liability standards point to a number of environmental as well as economic justifications for a broad application of the Superfund statute. First, unless society regulates the activities of the disposers of waste, these parties will ignore the potential costs their actions might impose on others and on future generations. According to this view, these costs represent inefficiencies in the marketplace and can be minimized only by making those responsible for the costs and damages liable. Therefore, it follows that by broadly applying the Superfund provisions, this induces those industries involved at a waste site to incur the actual market costs. Also, unless parties are held strictly liable for the damages created by their own technology, the incentive to invest in safer technology is diminished greatly.

In addition to being stringent, joint and several liability standards are justified by the theory that making all involved at a site potentially liable will force them to take increased care in dealing with each other and will lead to a more accurate exchange of information among the parties.

Post Closure Liability Trust Fund. The Superfund also establishes a Post Closure Liability Trust Fund, which assumes the liability of hazardous waste disposal facilities when they have been closed for five years and no longer release hazardous substances. Since not many sites fall into this category at present, this part of the program has not received much attention yet. In the years ahead, however, as sites begin to close down, this provision will be an increasingly important component of the Superfund law. In addition to paying for any response action necessary, the fund can be used for monitoring and other maintenance of closed sites.

Efforts have been made to replace the Post Closure Liability Trust Fund with an operational private insurance fund. A 1982 Department of the Treasury report, however, concluded that because of the potential liability costs from a hazardous waste site, "private insurance is not possible now or in the future."

In addition to these major issues, in 1986 Congress adopted a number of new important provisions to the Superfund program. The following summarizes some of those provisions.

Cleanup Schedules. The new law requires EPA to begin cleanup measures at 175 sites within the first three years of the program and an additional 200 sites over the next two years. Deadlines for completing the cleanup work were not specified in the law.
EPA is also to begin cleanup planning studies for those sites on the National Priority List. In addition to those studies already initiated, the EPA will begin studies on 650 more sites over the next five years.9

Health Studies. Congress appropriated a minimum of $275 million for a series of health-related studies to be conducted by the Agency for Toxic Substances and Disease Registry (ATSDR) and EPA. Within six months, ATSDR and EPA must list at least 100 substances most commonly found at Superfund sites. Within 24 months, an additional 100 substances must be added to the list. In each of the following three years, another 25 must be added.

The law requires ATSDR to perform health assessments for each site or release on the National Priority List by December 10, 1989.10

The Community's Right to Know and Emergency Planning. In one of the more controversial provisions, the new law mandates state community right-to-know laws. The purpose is to provide a state and its citizens information on chemicals used by industries in the local communities. These programs will originate with each governor who will appoint a state emergency response commission within six months. The commissions, in turn, will designate within 10 months local emergency planning districts and local emergency planning committees. Then the state's emergency response plans will be developed over the next 12 to 15 months. To assist in these efforts, the Federal Emergency Management Agency (FEMA) is authorized to issue grants, totaling $5 million annually for fiscal years 1987 through 1990.

The new law establishes a number of requirements for certain industry owners. The industries are to notify the state commission within seven months with information including the types, amounts, and locations of chemicals used in a facility, and any possible emission of certain chemicals into the environment. Penalties for noncompliance are established as well as provisions for protecting trade secrets. The law also gives any citizen the right to sue any industry or federal or state official for failure to carry out the right-to-know provisions in this act.11

Leaking Underground Storage Tanks. Superfund authorizes EPA to require owners of underground storage tanks to maintain insurance provisions in case the tank leaks its contents into the environment. The amount of the insurance depends on the size, type, and location of the tank. Furthermore, EPA can order an underground tank owner or operator to perform corrective action measures to clean up the results of a leaking tank. If EPA deems it necessary, the agency can initiate the corrective action and then sue the responsible parties to recover the costs. For this new program, $500 million was appropriated.12
Public Participation. For National Priority List sites, EPA and the states are required to allow for public participation in selecting a cleanup action and in any settlement of an enforcement action. EPA is authorized to make grants up to $50,000 to public groups that may be affected by a release or threatened release at a site.13

Federal Facilities. The new law establishes that all requirements under Superfund also will apply to those facilities owned and operated by the federal government. They are exempt, however, from the insurance and financial responsibility requirements.14

Citizen Suits. Any citizen can sue in federal court any person who is in violation of the Superfund laws.15

Penalties. Increased penalties were established for violations of the act. Maximum criminal penalties are three years imprisonment for the first offense and five years for each additional offense. Civil penalties for violations are up to $25,000 per day per violation.16

State Role in the Federal Superfund Program

States have specific responsibilities and requirements in the Superfund program. It is important to keep in mind these responsibilities because a given state's inability to provide the necessary support for the cleanup program limits its overall effectiveness. The following is a list of the major state issues in the Superfund law.

Cost-Sharing. The Superfund law establishes that before remedial action can take place at a privately owned waste site appearing on the National Priority List, a state must assume it will pay at least 10 percent of the cleanup costs. If the site is owned by the state or a political subdivision at the time of the waste disposal, the state's share of the cleanup costs goes up to at least 50 percent. States also must assume 100 percent of the long-term operation and maintenance costs once remedial action is completed, as well as provide for the necessary off-site disposal facilities.

By requiring state-led cleanup activities, Congress intended to accomplish four main objectives. First, Congress believed that the most equitable cost-sharing system would be to spread Superfund's costs among private industry, the federal government, and state and local governments. Second, Congress wanted equity among the different states using the Superfund, which requires states to pay their share of the cleanup costs before remedial action begins. Third, Congress intended for states to have a voice in determining which of the NPL sites within their own state are given cleanup priority. By giving states funding responsibilities,
Congress enabled them to negotiate with the federal government in setting up their own cleanup priorities. Fourth, the cost-sharing requirements give states increased leverage to decide the appropriate form of remedial action.

From a state perspective, one of the most important parts of the Superfund is what the program does not cover. The Superfund is not designed to clean up all hazardous waste sites. In fact, the federal program focuses its cleanup efforts only on those sites that present the greatest danger to the public's health and the environment (those 888 sites on the National Priority List). Congress intended for the other hazardous waste sites that pose less of a threat to be the sole responsibility of the individual states. Therefore, in addition to fulfilling Superfund's requirements of cost-sharing and long-term maintenance (once the remedial action is completed), states are responsible for hazardous waste sites not on the National Priority List.

Thus, in establishing a national cleanup program where industry and the federal, state, and local governments all participate, Congress also encourages states to raise revenues for their own state-financed “mini-superfund” program. Under the original Superfund program, however, states had to confront a preemption provision in Section 114(c) of the Superfund law, which stated that no person may be required to contribute to any fund, the purpose of which is to pay compensation for claims for any costs of response or damages or claims which may be compensated under Superfund. Nothing in this section shall preclude any state from using general revenues for such a fund, or from imposing a tax or fee upon any person or upon any substance in order to finance the purchase or prepositioning of hazardous substance response equipment or other preparations for the response to a release of hazardous substances which affects such state.17

In other words, Section 114(c) of the Superfund law prohibited states from taxing entities if the purpose of such funds was to pay costs, claims, or damages that were covered also under the Superfund. This provision, seen as a major obstacle for some states, was eliminated in the new law.

Approximately 45 states have some type of hazardous waste cleanup program. The different state initiatives vary considerably. Some cover small cleanups such as transportation spills. Others have funding mechanisms only to meet the federal cost-sharing requirements. Still others are multimillion-dollar state programs that can handle cleanups ranging from the local neighborhood
spill to the major industrial landfill. Generally, the size of a given cleanup program is in direct proportion to the number of hazardous waste sites in that state. California, Massachusetts, Michigan, New Jersey, New York, and Pennsylvania have the largest cleanup programs—and the greatest number of waste sites.

In this age of tight budgets, most states are hard-pressed to adopt expensive environmental programs. States are wary, however, of replaying the horrors of Love Canal and cannot afford to wait.

Waste end taxes and general revenues provide the dollars for the majority of state cleanup programs. Last year, at least 24 states used waste end taxes levied on the generation or the disposal of hazardous waste or a combination of both. This method is beneficial not only to raise money but also to provide incentives for industry to minimize waste generation and limit the use of land disposal. With the restrictions on hazardous waste land disposal going into effect, this tax plan is a good tool to encourage generators to make the transition from relying on land disposal to developing more advanced treatment technologies. Those generators choosing not to develop such techniques and continuing the current land disposal practices would pay higher taxes.

The waste end tax, however, could not be the sole funding source for a cleanup program because once industries begin to make the necessary management changes, their taxes will be lower; thus, the Superfund’s base begins to erode.

Through state appropriations, general fund money can be directed toward cleanup. This is the most stable revenue source of all the options and avoids administrative problems. Use of this plan can be justified on the grounds that since all consumers have benefited from lower prices for waste-related items, society as a whole should bear the environmental and health cleanup costs stemming from these items.

Many of the larger state programs, however, are starting to move toward bonds and chemical taxes to fund their cleanup efforts. For example, California’s program runs on $100 million annually raised from a bond measure. The money is targeted in 1987 for cleanup work at 198 sites in the state, including 21 military sites, 29 on the National Priority List, and the remaining 148 exclusively the state’s responsibility.

In New York, a bond measure passed by the voters on November 4, 1986, will make the state hazardous waste cleanup program one of the largest in the nation. It calls for a 13-year, $4 billion cleanup process. The goal is to “clean up the major hazardous waste sites in New York before the year 2000.” Spread over approximately 30 years, $1.2 billion will come from revenue bonds. The federal government’s share of the cost for sites on the National Priority List comes to $700 million. “Re-
responsible parties” make up the remaining $1.2 billion. This is based on existing sources, such as special assessments on the generation of hazardous waste, petroleum surcharges, and various fees and penalties. A “rainy day” $440 million Environmental Trust Fund also will be established to cover future maintenance costs once the cleanup is complete.¹⁹

The state first will use the money paid in by the responsible parties and the federal government. The New York Superfund Board, made up of citizens, industry representatives, and government officials, oversees the state’s cleanup program.

Although appropriating the necessary state funds is an important component of such a program, the success of long-term hazardous waste cleanup depends upon a state’s ability to recover its costs from responsible parties. States are learning not to depend solely on funding mechanisms to operate their programs. Minnesota’s program, for example, has been successful in recovering cleanup costs and has more money in it now than when it started.

Determining who is the responsible party, however, is a controversial issue. States are keeping a close eye on what is going on at the federal level since most states adopt roughly the same standards as the federal government. Some states, however, in recent years have gone beyond the federal Superfund standards and are charting their own course, applying and experimenting with a wide range of liability requirements.

In 1983, the Minnesota Legislature, for example, adopted the Environmental Response and Liability Act, considered at the time the most comprehensive state act relating to hazardous waste standards. In addition to joint and several liability, the law relaxed the standards of proof for personal injury to assist plaintiffs in gaining legal recourse for damages incurred. Sponsors of the legislation justified it on the grounds that without these provisions, any collection for the injured party would be prevented.²⁰

The insurance industry, however, took the position that the stringent Minnesota liability standards made it impossible for it to quantify risks. Thus, it became unprofitable to offer impairment insurance in Minnesota. Consequently, in 1985, the Minnesota Legislature amended its liability act by deleting some of the more controversial liability provisions. Some argue that insurance in Minnesota has been equally hard to get since the changes were made.

To combat the insurance dilemma, states are responding in a variety of ways. A number of them are considering risk pools to assist the insurance industry and waste operators with sites that otherwise may not be insurable. Under these programs, states would become the insurers of last resort.
In September 1983, the New Jersey Legislature adopted another approach with the Environment Cleanup Responsibility Act (ECRA). The act requires all industrial properties, before there can be a sale or shutdown of a business, to clean up their hazardous waste sites. In one and one-half years under ECRA, 255 sites have been cleaned up at a cost of $70 million. This figure compares with $88 million expended for site cleanup during 10 years of the state’s Superfund. ECRA is an innovative, effective way to use the marketplace to enforce hazardous waste laws. Moreover, ECRA is seen in New Jersey as an economic stimulus for the state. A number of states have considered similar legislation, with Connecticut and Massachusetts having adopted modified ECRA programs.
States are continuing to play an active role in hazardous waste management. A number of innovative programs have been developed from Minnesota's comprehensive state planning efforts, Wisconsin's siting statutes, and Illinois' enforcement efforts, to New Jersey's ECRA program.

As the costs of hazardous waste management continue to rise, however, state legislatures will be under pressure to develop additional funding sources for state programs. In addition, as federal and state restrictions on land disposal take effect, states will be forced to consider measures that develop alternatives to this method. And in the years ahead, states will have to amend, expand, and reconsider some of these programs to protect the public and the environment from the dangers of mismanaged hazardous wastes.
Notes

Chapter II

2. Ibid., p. 4.
3. Ibid., p. 8.
4. Ibid., p. 2.
5. Possible chemical processes include neutralization, precipitation, ion exchange, oxidation reduction, and solidification. Physical treatment processes are solid-liquid separation, absorption, membrane separation, evaporation, distillation, and solvent extraction. Possible biological treatment methods include activated sludge, aerated lagoons, trickling filter, anaerobic digestion, and waste stabilization ponds.

Chapter III

2. Ibid.
3. Utah Hazardous Waste Act of 1979, Sec. 2(c).
4. Ohio 1984 Act, Sec. 3734.01, Substitute House Bill 506.
10. Ibid.
11. California Health and Safety Code Div. 20, Ch. 6.5.
12. Ibid.
13. Washington Rev. Doc. Sec. 70.105.010(5) and (6).
14. Ibid.
17. Indiana Public Law 152-1985, Sec. 2.
20. Ibid., Sec. 3004.
21. Ibid., Sec. 3005.
22. Ibid.
25. Ibid.
27. Connecticut Public Act No. 84-535, Sec. 1.
29. Michigan Public Act No. 64 of 1979 as amended, Sec. 41(1).
30. Ohio 1984 Act, Sec. 3734.05, Substitute House Bill 506.
32. Resource Conservation and Recovery Act, Sec. 3008.
33. Ibid.
Chapter IV

2. Ibid.
3. Ibid.
4. Ibid.
5. Ibid.
8. Ibid.
10. Ibid.
11. Ibid.
12. Ohio 1984 Act, Sec. 3734.12, Substitute House Bill 506.
14. Ibid.

Chapter V

4. Ibid.
5. Iowa 1985 Act, Ch. 162 (C.I., 455 B.471 et seq.).
8. Vermont 1985 Act No. 66 (V.S.A., 10-1921 et seq.).
9. California Health and Safety Code, Sec. 25280, Ch. 6.7.
11. Oregon 1985 Act, Ch. 737 (O.R.S., 468.901 et seq.).
Chapter VI

3. Ibid.
7. Ibid.
8. Ibid.
9. Ibid.
10. Ibid.
11. Ibid.
16. Ibid.
17. Ibid.
18. Ibid.
19. Ibid.
24. “Communities Evaluate Fall Collections, Make Plans for Others This Spring,” Foresite, Minnesota Waste Management Board 6, no. 2 (April 1986): 2.

Chapter VII

5. Ibid.
6. Ibid.
10. Ibid.
11. Ibid.
12. Ibid.
13. Ibid.
14. Ibid.
15. Ibid.
16. Ibid.
Selected References


