156742

GAO

United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-270973

April 24, 1996

The Honorable Bud Shuster
Chairman
The Honorable James L. Oberstar
Ranking Minority Member
Committee on Transportation
and Infrastructure
House of Representatives

The Honorable Sherwood L. Boehlert
Chairman
The Honorable Robert A. Borski
Ranking Minority Member
Subcommittee on Water Resources
and Environment
Committee on Transportation
and Infrastructure
House of Representatives

As the Congress deliberates the Superfund program's reauthorization, congressional interest is focusing on the role of federal and state standards in decisions about the extent of the required cleanups at Superfund sites. Under the current Superfund law, cleanups of hazardous waste sites must comply with federal standards or certain state standards if the state standards are more stringent. These standards set limits on the concentrations of contaminants that can be in the groundwater, soil, surface water, air, and sediments. (See enc. I for more background information on standards.)

One criticism of the current law is that relying on fixed numeric standards can sometimes lead to more extensive and costlier cleanups than would be required if the cleanups were based on site-specific assessments of the risks posed to human health and the environment. This inefficiency can occur when conditions at sites, such as the local climate, decrease the health risks posed. Therefore, the House is considering whether to eliminate the requirement to comply with these standards.

In March of this year, we reported to you that (1) 20 of the 21 states that had set standards based them, in part, on estimates of the human health risks posed by

566268

exposure to contaminants and (2) the states provided more flexibility to adjust the cleanup levels derived from soil standards than from groundwater standards to take into account site-specific conditions.[1] This report provides a summary for each state of (1) whether the state has standards for the cleanup of soil and groundwater, (2) whether the standards are based on estimates of health risks, (3) how the state's standards compare with the corresponding federal standards,[2] and (4) whether the state's standards can be adjusted for site-specific conditions. (See enc. II.)

To obtain this information, we conducted a survey of Superfund program officials in the 33 states with the greatest number of Superfund sites, which together covered 91 percent of the sites on the Environmental Protection Agency's (EPA) nationwide list of the hazardous waste sites posing the greatest risks to human health and the environment.[3] We did not independently verify the accuracy of the information provided by the states. State program officials reviewed and commented on the information contained in this report, and we revised the state summaries where appropriate. (See enc. III for a list of the states we surveyed and the types of standards they reported having.)

- - - - -

---

[1]See Superfund: How States Establish and Apply Environmental Standards When Cleaning Up Sites (GAO/RCED-96-70FS, Mar. 20, 1996). See also Superfund: EPA's Use of Risk Assessments in Cleanup Decisions (GAO/T-RCED-95-231, June 22, 1995).

[2]Although there are few federal standards for contaminants in soil, standards have been set for certain highly toxic contaminants, most notably polychlorinated biphenyls (PCB) and lead. However, for groundwater, enforceable federal standards have been set for 68 organic and inorganic chemicals under the Safe Drinking Water Act. These maximum contaminant levels (MCL) restrict the amounts of chemicals or other contaminants that can be in drinking water.

[3]We counted a state as having standards if it had established or proposed–in law, regulation, policy, or guidance–numeric limits on the concentrations of chemicals allowable in soil or groundwater. We did not count a state as having groundwater standards if it had simply adopted the federal drinking water standards. About one-third of the states that had not set their own soil standards said that they use risk assessments to develop cleanup levels for soil on a site-specific basis. About half of the states that did not have groundwater standards said that they had used the federal drinking water standards to set cleanup levels for groundwater.

As arranged with your offices, unless you announce its contents earlier, we plan no further distribution of this report until 10 days after the date of this letter. At that time, we will send copies to the appropriate congressional committees; the Administrator, EPA; and other interested parties. We will also make copies available to others on request.

We hope that this information will assist you in considering the use of risk-based decision-making as a guide in federal environmental programs. If you have any further questions, please call me at (202) 512-6520.

Stanley J. Czerwinski
Associate Director, Environmental
Protection Issues

Enclosures - 3

ENVIRONMENTAL LAW AND CLEANUP STANDARDS

Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which created the Superfund program in 1980, the Environmental Protection Agency (EPA) assesses uncontrolled hazardous waste sites and maintains the National Priorities List (NPL)–its list of the nation's most dangerous hazardous waste sites. As of September 1995, this list included 1,232 sites.

Cleanup standards and the degree of cleanup needed for Superfund sites are discussed in section 121(d) of the CERCLA statute, added by the Superfund Amendments and Reauthorization Act of 1986 (SARA). This section requires that Superfund sites be cleaned up to the extent necessary to protect both human health and the environment. In addition, cleanups must comply with requirements under federal environmental laws that are legally "applicable" or "relevant and appropriate" (ARAR) as well as with such state environmental requirements that are more stringent than the federal standards. Furthermore, Superfund cleanups must at least attain goals and criteria established under the Safe Drinking Water Act and the Clean Water Act, where such standards are relevant and appropriate under the circumstances.

The federal standards most frequently considered relevant and appropriate for groundwater cleanups at Superfund sites are set under the Safe Drinking Water Act. EPA's regulations establish health-based goals, called maximum contaminant level goals (MCLG), for certain contaminants in water delivered by public drinking water systems. The MCLGs have been established at levels (1) at which no adverse effects on human health are known or expected to occur and (2) that will allow an adequate margin of safety. EPA's regulations also establish enforceable standards, called maximum contaminant levels (MCL), that are set as close as feasible to the MCLGs. Feasibility considers both the available technology and cost. EPA's regulations consider MCLs, in certain circumstances, to be relevant and appropriate standards for cleaning up contaminated groundwater that is a potential source of drinking water. For example, the MCL for benzene is 5 micrograms per liter. This concentration would generally be the cleanup level for benzene in groundwater that is a potential source of drinking water unless the state has promulgated a more stringent standard or other requirement that is relevant and appropriate. As of March 1996, the MCLs included numeric limits on 68 contaminants.

There are few federal standards for contaminants in soil that are considered potentially applicable or relevant and appropriate except those for certain highly toxic contaminants, most notably polychlorinated biphenyls (PCB) and lead. Under the Toxic Substances Control Act, EPA sets requirements for cleaning up PCB contamination. In addition, EPA has issued guidance for cleaning up lead in soil.

Early in its investigation of a site, EPA determines, on the basis of the contamination present and the conditions at the site, which chemical-specific and other standards may be considered applicable or relevant and appropriate. As EPA proceeds with the selection of a cleanup method, it adjusts the list of standards to be considered on the basis of the information gained during its investigation. Among the potential standards considered are any state environmental standards that are more stringent than the federal standards for the same contaminants.

In addition to numeric standards for specific contaminants, some states have set more generalized standards or policies that may have to be considered when cleaning up Superfund sites. For example, some states have established "antidegradation" policies for groundwater that could require more stringent cleanups than cleanups based on health risks. These policies are intended, among other things, to protect the state's groundwater as a potential source of drinking water.

If a federal or state standard does not exist for a given contaminant, a party responsible for cleaning up a Superfund site may use a site-specific risk assessment to help establish a cleanup level for that contaminant. A risk assessment evaluates the extent to which people may be exposed to the contaminant, given its concentration and the physical characteristics of the site. For example, the type of soil and the depth of the groundwater may affect whether and how quickly waste will migrate and reach a population. A risk assessment uses exposure and toxicity data to estimate the increased probability, or risk, that people could develop cancer or other health problems through long-term exposure to this contamination. The risk estimate can be used along with the proposed waste management strategy to help determine the extent of the cleanup needed at the site.

EPA has published guidance for conducting risk assessments, a set of documents referred to collectively as the Risk Assessment Guidance for Superfund. These documents outline well-established risk assessment principles and procedures that can be used to gather and assess information on human health risks. The documents also include information on mathematical models that can be used to estimate health risks at a site, given the contaminants present and the means of exposure to them. In addition to this guidance, EPA maintains an Integrated Risk Information System (IRIS), an on-line database on the toxicity of numerous chemicals, and publishes the Health Effects Assessment Summary Tables (HEAST), another source of information on contaminants' toxicity. EPA applies this guidance in conducting baseline risk assessments at Superfund sites, which it uses in deciding whether the human health and environmental risks posed by the contaminants are serious enough to warrant cleaning up the sites. Some states also use EPA's risk assessment guidance in setting their standards for specific chemicals.

CALIFORNIA

SOIL STANDARDS

No chemical-specific standards have been established.

GROUNDWATER STANDARDS

State regulations establish standards for 82 contaminants in groundwater used as drinking water.

Basis for Standards

The state based its standards, in part, on an assessment of the health risks posed by individual chemicals. This assessment incorporated generic formulas and standardized assumptions about both (1) the likely avenue and extent of exposure to a chemical and (2) the level of health risk the state would be willing to accept. The risk assessment formulas were derived from EPA's guidance and the state's own "supplemental" guidance. The standards for carcinogens, or substances that cause cancer, were initially estimated at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, or substances that cause adverse health effects other than cancer (e.g., birth defects or liver damage), the state set its standards at levels equivalent to those EPA used in setting its drinking water standards (that is, at levels that would protect a person from adverse noncarcinogenic health effects over a lifetime's exposure to the chemicals from a drinking water source). The state then adjusted these levels to account for the cost and technical feasibility of achieving the required cleanup levels.

Comparison With Federal Primary MCLs[1]

The state has 60 groundwater protection standards that correspond to the federal primary MCLs. Of the 60 standards, 44 are identical to the federal MCLs and 16 are more stringent.

---

[1]A state's standards may differ from the federal MCLs for a variety of reasons, including the extent to which the state (1) has considered the levels of contaminants that occur naturally in the environment and secondary, or aesthetic, factors such as the taste or color of the drinking water and (2) has adjusted the standards to take into consideration the cost of achieving the required cleanup levels.

Flexibility of Standards

The cleanup levels specified in the standards are fixed for groundwater used as drinking water. However, site-specific conditions can sometimes be taken into account to ensure that public health and the environment are adequately protected. For example, if there are multiple contaminants at a site, the overall risk might be too high if the cleanup levels prescribed in the standards for each contaminant were applied. In such cases, more stringent standards for one or all of the contaminants may be needed to reduce the overall threat. In addition, the nine regional water quality control boards and the state water resources control board can establish more stringent cleanup requirements for a specific site.

COLORADO

SOIL STANDARDS

No chemical-specific standards have been established.

GROUNDWATER STANDARDS

State law/regulations establish chemical-specific standards for 132 contaminants in groundwater. In addition to statewide standards for organic chemicals and radioactive materials, the state has standards (primarily for inorganic chemicals) that differ depending on whether the potential use for the groundwater at the site is domestic or agricultural.

Basis for Standards

Where information on a chemical's toxicity was available in EPA's Integrated Risk Information System database, the state used EPA's guidance to develop standards based on an assessment of the health risks posed by the chemical. The standards for carcinogens were calculated assuming that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, the standards were based on the MCLGs established in EPA's drinking water regulations.[2] If no information was available to calculate a health-based standard, the state used the federal MCLs.

Comparison With Federal Primary MCLs

The state has 65 drinking water standards that correspond to the federal primary MCLs. Of the 65 standards, 51 are identical to the federal MCLs, 13 are more stringent, and 1 is less stringent.[3]

---

[2]MCLGs are health-based goals that have been established at levels (1) at which no adverse effects on human health are known or expected to occur and (2) that will allow an adequate margin of safety. MCLs are enforceable standards that are set as close as feasible to the corresponding MCLGs. Feasibility considers both the available technology and cost.

[3]Under the current Superfund law, cleanups conducted by EPA, or by other parties as required by EPA, must meet federal standards or certain more stringent state standards.

Flexibility of Standards

A party responsible for cleaning up a site cannot adjust the cleanup levels specified in the statewide standards for organic chemicals and radioactive materials. However, some flexibility exists for modifying the standards once the site's groundwater is classified for either domestic or agricultural use. A community may then petition the Colorado Water Quality Control Commission to modify the level of cleanup required by the standard for that use to take into consideration local conditions.

CONNECTICUT

SOIL STANDARDS

State regulations establish standards for 75 to 100 chemicals in soil.[4] The standards address two situations–direct human exposure to contaminants and the migration of contaminants from the soil to groundwater. For direct human exposure, the standards differ depending on whether the land is used for industrial/commercial or residential purposes. Residential uses require more stringent standards. Pollutant mobility standards also differ depending on the classification of the groundwater at the site; the more stringent standards are applied at sites where the groundwater is classified as a source of drinking water.

Basis for Standards

The state based its standards for direct human exposure on an assessment of the health risks posed by individual chemicals. The state used generic risk assessment formulas, derived from EPA's guidance, for both residential and industrial/commercial settings. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, the standards were set at a hazard index of 1.[5] However, the state regulations also ensure that the incremental risk posed by multiple contaminants remains within acceptable limits. The standards for pollutant mobility were established at levels designed to ensure that any contamination that might move through the soil to groundwater would not exceed the groundwater protection standards.

Flexibility of Standards

In general, cleanups are expected to meet the standards, but the state regulations contain provisions for exemptions and variances from listed standards for substances in soil. In such cases, the regulations prescribe procedures for calculating alternative soil standards and indicate how these standards will be approved. If the standards cannot be

---

[4]Rather than specifying the exact number of chemicals covered by their state's standards, some state officials, in response to our survey questionnaire, identified a range.

[5]A hazard index is the sum of the hazard quotients for multiple substances and/or exposure pathways. A hazard quotient is the ratio of the level of exposure to a single substance over a specified time period to a reference dose for that substance over a similar exposure period. A reference dose is the level of exposure below which no adverse health effects would be expected.

met, restrictions on the use of the land and other measures may be required to prevent human exposure to the contaminated soil or to prevent movement of the contaminant. Variances may also be granted for the use of engineered control measures, such as caps placed over waste to physically isolate polluted soil and prevent infiltration.

GROUNDWATER STANDARDS

State regulations establish groundwater protection standards for 88 substances in groundwater classified as a source of drinking water. The regulations also establish standards for volatile substances in groundwater and for contaminants in groundwater that may discharge into surface waters. The latter are referred to as surface water standards.

Basis for Standards

The state developed its groundwater protection and volatilization standards using (1) risk assessment methods similar to those EPA used in setting the MCLs and (2) guidance from the Connecticut Department of Health for determining acceptable levels of human exposure to the contaminants. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individuals' risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, the standards were set at a hazard index of 1. The surface water protection standards were set at levels designed to protect the quality of surface water from groundwater discharges.

Flexibility of Standards

If a cleanup level based on a standard cannot be achieved, the state regulations contain provisions for exemptions and variances from the listed standards. In such cases, the regulations prescribe procedures for calculating and approving alternative standards. An exemption or variance may be granted if, for example, it is not technically practicable to clean up, or remediate, the groundwater.

Comparison With Federal Primary MCLs

The state has 51 groundwater protection standards that correspond to the federal primary MCLs. Of the 51 standards, 46 are identical to the federal MCLs and 5 are more stringent.

FLORIDA

SOIL STANDARDS

No chemical-specific standards have been established. However, the state has developed health-based and leachability-based soil guidelines.[6]

Basis for Standards

In calculating the applicable guidelines for carcinogens in soil, the state assumed that a lifetime's exposure to the carcinogens would not increase an individual's risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, the standards were set at a hazard index of 1. The state also took into consideration the levels at which chemicals could reasonably be detected and their naturally occurring background concentrations.

Flexibility of Standards

The state allows a party responsible for cleaning up a site to adjust the cleanup levels specified in the standards to accommodate practical considerations (when, for example, the natural levels of chemicals exceed the levels allowed by the standards) and site-specific conditions.

GROUNDWATER STANDARDS

State law/regulations establish standards for about 250 chemicals in groundwater designated as drinking water. These standards do not apply to groundwater classified for other uses.

Basis for Standards

The standards were based on the federal MCLs or modified for several reasons, including the state's ability to detect a chemical. For example, if the state could detect a chemical at a lower concentration than was specified in the federal standard for that chemical, then the more stringent level was used. However, if a federal MCL did not exist for a chemical, the state used EPA's guidance to set the standard on the basis of a generic risk assessment. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, the standards were set at a

---

[6]Leachability is the ability of a liquid to pass through soil.

hazard index of 1. The state also took into account naturally occurring background levels, levels that affect taste and smell, and other aesthetic considerations.

Comparison With Federal Primary MCLs

The state has 58 standards that correspond to the federal primary MCLs. Of the 58 standards, 48 are identical to the federal MCLs and 10 are more stringent.

Flexibility of Standards

The state allows a party responsible for cleaning up a site to adjust the cleanup levels specified in the standards to accommodate practical considerations (such as when the naturally occurring levels of chemicals in the environment exceed the levels allowed by the standards).

GEORGIA

SOIL STANDARDS

State law/regulations establish fixed numeric standards for about 300 chemicals. The state has different standards for residential and nonresidential land uses.

Basis for Standards

The state based its standards, in part, on an assessment of the health risks posed by individual chemicals. This assessment incorporated generic formulas and standardized assumptions about both (1) the likely avenue and extent of exposure to a chemical and (2) the level of health risk the state would be willing to accept in both residential and nonresidential areas. The risk assessments were based on EPA's guidance and, in some cases, the state's own exposure assumptions. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 10,000 or 1 chance in 100,000, depending on the type of carcinogen. For noncarcinogens, the standards were set at EPA's reference dose–the exposure level below which no adverse health effects would be expected.

Flexibility of Standards

The state allows a party responsible for cleaning up a site to determine the appropriate cleanup levels by using a site-specific risk assessment as an alternative to the state's fixed numeric standards. If it is too costly or otherwise inappropriate to clean up the site to the levels specified by either the state's standards or the site-specific risk assessment, the responsible party may use other measures to control the contaminants. These may include instituting engineering controls–constructing a fence to prevent human contact, capping the waste to contain the contaminants, or implementing some other measure to stabilize the contamination. The responsible party must demonstrate that these measures will eliminate or reduce present and future threats to human health and the environment.

GROUNDWATER STANDARDS

State law/regulations establish fixed numeric standards for 196 contaminants in groundwater. The standards are the same for both residential and nonresidential land uses.

Basis for Standards

The state's basis for groundwater standards is the same as for soil standards, as described above.

Flexibility of Standards

The state provides the same flexibility for meeting its groundwater standards as it does for meeting its soil standards, as described above.

Comparison With Federal Primary MCLs

The state has 60 standards that correspond to the federal primary MCLs, and all 60 are identical to the federal MCLs.

ILLINOIS

SOIL STANDARDS

State policy/guidance establishes chemical-specific soil standards for 120 to 130 chemicals in soil.

Basis for Standards

The state based its standards on an assessment of the health risks posed by individual chemicals. The state used the same methodology as EPA used to develop its soil-screening guidance. The standards for carcinogens were generally set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, the standards were set at EPA's reference dose--the exposure level below which no adverse health effects would be expected.

Flexibility of Standards

The state allows a party responsible for cleaning up a site to develop cleanup levels for soil using site-specific modeling and other site-specific information rather than the standards developed by the state.

GROUNDWATER STANDARDS

State law/regulations and policy/guidance establish standards for about 60 to 70 chemicals in groundwater that is or can be used as drinking water. The state applies a different set of fixed numeric standards to groundwater that is close to the surface or that is not easily retrievable.

Basis for Standards

If a federal MCL existed for a chemical found in groundwater that the state was using or could use as drinking water, the state adopted a standard equal to the federal MCL. For some chemicals without corresponding MCLs, the state based its standards, in part, on EPA's guidance or on the naturally occurring levels found in community water systems statewide. The state's standards for groundwater that is close to the surface or that is not easily retrievable were based on modifications to the standards for groundwater that is or can be used as drinking water.

Comparison With Federal Primary MCLs

The state has 56 standards that correspond to the federal primary MCLs, and all 56 are identical to the federal MCLs.

Flexibility of Standards

The state allows a party responsible for cleaning up a site to propose adjustments to the cleanup levels specified in the standards to take into consideration site-specific conditions.

KANSAS

SOIL STANDARDS

State policy/guidance establishes standards for 156 chemicals in soil. The state has established different standards for residential and nonresidential land uses.

Basis for Standards

The state based its standards, in part, on an assessment of the health risks posed by individual chemicals. This assessment incorporated generic formulas and standardized assumptions about both (1) the likely avenue and extent of exposure to a chemical and (2) the level of health risk the state would be willing to accept. The state's standards, which are based solely on human health risk, do not take into account any other factors, such as the levels of contaminants that occur naturally in the environment or can be detected with current technology. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, the standards were set at one-third of EPA's reference dose–the exposure level below which no adverse health effects would be expected.

Flexibility of Standards

The state allows a party responsible for cleaning up a site to base the extent of the cleanup on a site-specific risk assessment rather than on the levels established in the state's standards. The state must agree on the assumptions, such as those for human exposure, that are to be used in the risk assessment. The state also allows the responsible party to modify the cleanup levels prescribed in the standards on the basis of such factors as the cost and technical feasibility of achieving the prescribed level of cleanup.

GROUNDWATER STANDARDS

State guidance establishes groundwater standards for more than 25 chemicals. These standards apply only to groundwater used as drinking water.

Basis for Standards

If a federal MCL existed for a chemical, the state adopted it. If no federal MCL existed, the state used EPA's guidance to base its standard on an assessment of the health risks posed by the chemical. The assessment incorporated generic formulas and standardized assumptions about both (1) the likely avenue and extent of exposure to a

chemical and (2) the level of health risk the state would be willing to accept. The state also considered other factors, including the cost and technical feasibility of achieving the level of cleanup prescribed in the standard. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, the standards were set at EPA's reference dose–the exposure level below which no adverse health effects would be expected.

Comparison With Federal Primary MCLs

All of the state's standards for groundwater used as drinking water are the same as the federal primary MCLs.

Flexibility of Standards

In general, a party responsible for cleaning up a site cannot adjust the cleanup levels specified in the standards to take into consideration site-specific conditions. However, a responsible party can use alternative standards that are less stringent than the federal MCLs if people are not currently exposed to the contamination (that is, if there are no drinking water wells in the area). In such instances, the contaminated groundwater must be monitored, and the levels of contamination allowed to migrate into drinking water cannot exceed the levels set in the MCLs. Moreover, restrictions would be placed on the future drilling of wells for drinking water in the contaminated area.

MASSACHUSETTS

SOIL STANDARDS

State regulations establish standards for 106 chemicals in soil. The state set standards for different exposure levels roughly corresponding to three land-use categories: high intensity (residential), infrequent (industrial), and moderate (commercial).

Basis for Standards

The state based its standards on an assessment of the health risks posed by individual chemicals. This assessment incorporated generic formulas and standardized assumptions about both (1) the likely avenue and extent of exposure to a chemical and (2) the level of health risk the state would be willing to accept. The state then adjusted the risk-based cleanup levels to account for other factors, including (1) the need to place upper limits, or ceilings, on the allowable levels of contamination in order to protect public health and the environment and preserve soil as a general resource, (2) the ability of technology to measure the amounts of chemicals present, (3) the concentrations of chemicals that produce noxious odors, (4) the levels of chemicals found in the surrounding environment, (5) the limits on concentrations of chemicals prescribed by other state standards, and (6) the potential for chemicals to migrate from the soil and contaminate groundwater. The risk assessment formulas were derived from EPA's guidance and the state's own methodology. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, the standards were set at one-fifth of EPA's reference dose--the exposure level below which no adverse health effects would be expected.

Flexibility of Standards

A party responsible for cleaning up a site may use (1) the cleanup levels specified in the state's standards, (2) modified cleanup levels that consider the effects of site-specific conditions on the movement of contaminants in the soil, or (3) cleanup levels developed through a site-specific risk assessment.

GROUNDWATER STANDARDS

State regulations establish standards for 106 chemicals in groundwater. The state established standards for different kinds of exposure to groundwater contamination. For example, the state considered whether (1) the groundwater was a current or potential source of drinking water, (2) there was a potential for vapors from volatile chemicals in

the groundwater to escape into closed buildings and threaten indoor air quality, or (3) the groundwater posed a threat to surface water.

Basis for Standards

The state's basis for groundwater standards is the same as for soil standards, as described above.

Comparison With Federal Primary MCLs

The state has 67 standards that correspond to the federal primary MCLs. Of these 67 standards, 64 are identical to the federal MCLs, 2 are more stringent, and 1 is less stringent, although this standard is being revised to be consistent with the corresponding federal MCL.

Flexibility of Standards

The cleanup levels specified in the standards are fixed for groundwater used as drinking water. However, for the two other types of exposure (potential vapors and a threat to surface water), a party responsible for cleaning up a site can (1) modify the cleanup levels to take into account the effects of site-specific conditions on the movement of contaminants or (2) base the cleanup levels on a site-specific risk assessment.

MICHIGAN

SOIL STANDARDS

State law/regulations establish standards for about 200 chemicals in soil. The state established different standards for industrial, residential, and commercial (including two subcategories) land uses. The state is also considering developing standards for recreational land uses.

Basis for Standards

The state generally based its standards on an assessment of human health risks but also considered other factors, including ecological concerns such as the impact of chloride on the soil's ability to support crop growth. The risk assessment formulas used by the state were derived from EPA's guidance as well as the state's own methodology. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 100,000. For noncarcinogens, the standards were based on EPA's reference dose–the exposure level below which no adverse health effects would be expected.

Flexibility of Standards

Cleanup levels can be set at the lowest levels at which chemicals can be detected with current technology or at the levels of contamination that occur naturally in the environment if either of these levels is higher than the risk-based level. In addition, a responsible party may determine cleanup levels on the basis of a site-specific risk assessment, with the state's approval, rather than use the cleanup levels prescribed in the state's standards. In practice, however, this approach is the exception rather than the rule.

GROUNDWATER STANDARDS

State law/regulations establish standards for about 200 chemicals in groundwater. The state established different standards roughly corresponding to the types of land uses. The standards also depend on whether the groundwater may be used as drinking water or empties into surface water.

Basis for Standards

The state based its standards on an assessment of the health risks posed by individual chemicals and on the state's drinking water standards, when such standards

exist. This assessment incorporated generic formulas and standardized assumptions about both (1) the likely avenue and extent of exposure to a chemical and (2) the level of health risk the state would be willing to accept unless a more stringent level were required to control other effects, such as a noxious odor or bad taste. The risk assessment formulas were derived from EPA's guidance and the state's own methodology. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 100,000. For noncarcinogens, the standards were based on EPA's reference dose--the exposure level below which no adverse health effects would be expected.

Comparison With Federal Primary MCLs

The state has 67 standards that correspond to the federal primary MCLs, and all 67 are identical to the federal MCLs.

Flexibility of Standards

The cleanup levels specified in the standards are generally fixed for groundwater that may be used as drinking water but can be adjusted to take into account practical considerations, including the levels of contaminants that occur naturally in the environment or that cannot be detected at risk-based levels using current technology. For groundwater designated for other uses, a responsible party may use a site-specific risk assessment to develop cleanup levels.

MINNESOTA

SOIL STANDARDS

State guidance establishes standards for approximately 100 chemicals in soil. The standards are established only for "unrestricted (residential) land use."

Basis for Standards

Using EPA's guidance and the state's own methodology, the state based its standards on an assessment of the health risks posed by individual chemicals. The assessment incorporated generic formulas and standardized assumptions about both (1) the likely avenue and extent of exposure to a chemical and (2) the level of health risk the state would be willing to accept. For example, the state developed its own exposure values to take into account the effects of climate, such as the likelihood that snow would cover the contamination for a significant portion of the year. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 100,000. For individual noncarcinogens, the standards were set at one-fifth of EPA's reference dose--the exposure level below which no adverse health effects would be expected.

Flexibility of Standards

The state's standards are "quick reference numbers" for screening sites, rather than fixed limits, that are considered when determining whether to further investigate a site. The standards for nonvolatile contaminants can be used as preliminary cleanup goals. Cleanup goals can be tailored to local conditions. For example, if exposure to contaminants in the soil was reduced or eliminated because the soil was inaccessible, the cleanup levels would not need to meet the standards. Alternatively, if multiple contaminants with the same toxic effect were found at the same location, the cleanup level for each contaminant might be more stringent than the standard for it.

GROUNDWATER STANDARDS

State law/regulations establish standards for 130 chemicals in groundwater that is being or could be used as drinking water. There are no standards for groundwater that is not used as drinking water.

Basis for Standards

The state based its standards on an assessment of the health risks posed by individual chemicals. In this assessment, which was derived primarily from EPA's guidance, the state used generic formulas and standardized assumptions about both (1) the likely avenue and extent of exposure to a chemical and (2) the level of health risk the state would be willing to accept. The standards were not modified to take into account the cost or technical feasibility of implementing cleanup actions. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 100,000. For individual noncarcinogens, the standards were set at one-fifth of EPA's reference dose–a default level that assumes 20 percent of an individual's exposure would be from water. However, if available information indicated a different exposure level for a particular chemical, the standard would be modified accordingly.

Comparison With Federal Primary MCLs

The state has 50 standards that correspond to the federal primary MCLs. Of the 50 standards, 16 are identical to the federal MCLs, 23 are more stringent, and 11 are less stringent.

Flexibility of Standards

A party responsible for cleaning up a site can ask to adjust the cleanup levels specified in the state's standards to take into account practical considerations, such as the cost and technical feasibility of implementing the cleanup actions and the levels of contaminants occurring naturally in the environment. The responsible party may not have to comply with the standards, depending on site-specific circumstances that limit the chances of exposure. For example, if the groundwater flows away from sources of drinking water or does not flow into surface water, the responsible party may not have to comply with the standards.

MISSOURI

SOIL STANDARDS

State policy/guidance establishes standards for about 150 to 200 chemicals in soil. All of the standards assume residential use of the property.

Basis for Standards

The standards were based on risk assessments for soil ingestion only, as well as on certain practical considerations such as the levels of contaminants occurring naturally in the environment. The state used its own risk-based formulas in setting its soil standards because EPA's guidance was not issued at the time. However, the state did use the chemical toxicity values from EPA's Integrated Risk Information System (described in enc. I). The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 100,000. For noncarcinogens, the standards were calculated from EPA's reference dose--the exposure level below which no adverse health effects would be expected.

Flexibility of Standards

A party responsible for cleaning up a site contaminated with hazardous waste cannot adjust the cleanup levels specified in the standards to take site-specific conditions into account. If the specified cleanup levels cannot be achieved, the waste site is placed on the state's registry of contaminated properties. This action imposes certain restrictions on the site's use.

GROUNDWATER STANDARDS

The state adopts the federal MCLs as its own water quality standards. The standards are promulgated as Missouri rules. Every 3 years, a state board reviews the standards and updates the Missouri rules to reflect any changes in the federal MCLs. The state does not have water quality standards for any contaminants other than those covered by federal MCLs.

NEW HAMPSHIRE

SOIL STANDARDS

No chemical-specific standards have been established.

GROUNDWATER STANDARDS

State law/regulations establish standards covering about 120 chemicals in groundwater. The standards apply to all groundwater in the state. However, in areas where contamination would not immediately threaten communities, the state may allow the chemicals to break down naturally over time while monitoring their levels to ensure that their toxicity is being reduced.

Basis for Standards

The standards were based on estimates of the health risks posed by the contaminants. For the vast majority of the chemicals, the state used EPA 's existing standards, including MCLs, which already consider risk.

Comparison With Federal Primary MCLs

The state has 64 standards that correspond to the federal primary MCLs, and all 64 are identical to the federal MCLs.

Flexibility of Standards

A party responsible for cleaning up a site cannot adjust the cleanup levels specified in the standards to take site-specific conditions into account. However, the state is flexible on the method that must be used to achieve the cleanup, depending on the value of the resource. For example, if groundwater is located in an urban area and is not likely to be used as drinking water, the state may let the contamination break down naturally over time while monitoring the chemical levels, instead of using another cleanup method, such as pumping and treating the groundwater.

NEW JERSEY

SOIL STANDARDS

State law/regulations and state policy/guidance establish standards for over 100 chemicals in soil. Different standards have been established for residential and nonresidential land uses.

Basis for Standards

Using EPA's guidance, the state based its standards on an assessment of the health risks posed by individual chemicals. The state used generic formulas and standardized assumptions about both (1) the likely avenue and extent of exposure to a chemical and (2) the level of health risk the state would be willing to accept. The state then adjusted the risk-based cleanup levels, taking into account other factors, including the levels of contaminants that occur naturally in the environment, the ability to detect or accurately measure the chemicals, and ceilings (upper limits) on contamination. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 100,000 or 1 chance in 1 million, depending on the type of carcinogen. For noncarcinogens, the standards were set at EPA's reference dose–the exposure level below which no adverse health effects would be expected.

Flexibility of Standards

Under state law, a party responsible for cleaning up a site can develop cleanup levels using a site-specific risk assessment instead of the cleanup levels specified in the state's standards. In practice, however, parties use the standards much more frequently than risk assessments to set cleanup levels. The state provides for some additional flexibility by allowing parties to address contamination through other measures, such as placing a clay cap on the site or placing restrictions on future uses of the land in the deed to the property.

GROUNDWATER STANDARDS

State law/regulations establish standards for 100 to 125 chemicals in groundwater. The standards are set for different types/uses of groundwater: suitable for drinking, not used as drinking water, and having special ecological significance that must not be degraded.

Basis for Standards

The standards are based on risk assessments that incorporate standardized assumptions about human exposure and state-determined risk levels. The state then adjusts the risk-based cleanup levels, taking into account other factors, such as the levels of contaminants that occur naturally in the environment and the lowest levels of contaminants that can be measured accurately. The state used EPA's guidance in developing its risk assessment formulas. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 100,000 or 1 chance in 1 million, depending on the type of carcinogen. For noncarcinogens, the standards were set at EPA's reference dose–the exposure level below which no adverse health effects would be expected.

Comparison With Federal Primary MCLs

The state has 58 standards that correspond to the federal primary MCLs. Of the 58 standards, 28 are identical to the federal MCLs, 29 are more stringent, and 1 is less stringent.

Flexibility of Standards

As discussed above, a party responsible for cleaning up a site can determine the cleanup levels by using a site-specific risk assessment instead of the cleanup levels specified in the state's standards. In practice, however, this approach is the exception rather than the rule. The cleanup levels prescribed in the standards may also be adjusted to take into account certain practical considerations, such as the levels of contaminants that occur naturally in the environment and the feasibility of measuring the chemicals at low concentrations.

NEW YORK

SOIL STANDARDS

No chemical-specific standards have been established. However, the state issued a guidance document that establishes numeric soil cleanup goals (called objectives) for cleanups of inactive hazardous waste sites. These goals cover over 100 chemicals and assume residential land use.

Basis for Standards

The state based its guidelines on an assessment of the health risks posed by individual chemicals. This assessment incorporated generic formulas and standardized assumptions about both (1) the likely avenue and extent of exposure to a chemical and (2) the level of health risk the state would be willing to accept. The state also considered whether the contaminated soil posed a threat to groundwater. The state then adjusted the risk-based cleanup levels to take into account other factors, such as the lowest levels at which contaminants could be detected or measured accurately using current technology. The state used the same methodology as EPA used to develop its soil-screening guidance. The cleanup objectives for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, the cleanup objectives were set at EPA's reference dose–the exposure level below which no adverse health effects would be expected.

Flexibility of Standards

The cleanup objectives for soil specified in the guidance document are routinely modified to take into account site-specific conditions, including the type of soil, the potential use of the land, and the potential or actual impact of the contamination on groundwater. The final cleanup levels also take into account the feasibility of implementing various alternative technologies and the cost-effectiveness of the technologies.

GROUNDWATER STANDARDS

State law/regulations establish standards for individual substances and classes of compounds in groundwater. Most of the groundwater in the state is classified as a source of drinking water. State guidance establishes cleanup values for other contaminants.

Basis for Standards

The state based its standards and guidance, in part, on risk assessments incorporating standardized assumptions about both (1) the likely avenue and extent of exposure to a chemical and (2) the level of health risk the state would be willing to accept. In developing the standards and guidance levels, the state took into consideration factors such as the federal MCLs and the levels of contaminants that would cause noxious odors or have an adverse impact on the environment (protection of fish, wildlife, and habitat, for example). The risk assessment formulas were based on EPA's guidance and the state's own methodology. When these formulas were used, the standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, the standards were set at EPA's reference dose–the exposure level below which no adverse health effects would be expected.

Comparison With Federal Primary MCLs

The state has 47 standards that correspond to the federal primary MCLs. Of the 47 standards, 11 are identical to the federal MCLs, 29 are more stringent, and 7 are less stringent.

Flexibility of Standards

The state's groundwater standards apply to all sites. However, in determining the specific cleanup remedy for a site, the state takes into consideration site-specific conditions and the cost-effectiveness of the different cleanup alternatives. In some cases, the state may determine that it is not necessary to clean up the groundwater beneath a site because it is not being used, is not affecting other users of the groundwater, and cannot be cleaned up cost-effectively. In such cases, the state may require measures to prevent further contamination from leaving the site without requiring measures to clean up the contamination that has already left the site.

NORTH CAROLINA

SOIL STANDARDS

No chemical-specific standards have been established.

GROUNDWATER STANDARDS

State law/regulations establish groundwater standards for about 88 chemicals. The state set different standards for groundwater, depending on whether it is classified as a source of drinking water or as usable for other purposes.

Basis for Standards

Using EPA's guidance, the state based its standards on an assessment of the health risks posed by individual chemicals. The state used generic formulas and standardized assumptions about both (1) the likely avenue and extent of exposure to a chemical and (2) the level of health risk the state would be willing to accept. The state then adjusted the cleanup levels after considering other factors, including the federal MCLs (if they are more stringent than the levels derived using the formulas) and secondary criteria, such as the levels of contaminants that cause noxious odors. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, the standards were set at EPA's reference dose--the exposure level below which no adverse health effects would be expected.

Comparison With Federal Primary MCLs

The state has 38 standards that correspond to the federal primary MCLs. Of the 38 standards, 20 are identical to the federal MCLs and 18 are more stringent.

Flexibility of Standards

The cleanup levels specified in the standards cannot be adjusted to take site-specific conditions into account. However, the cleanup levels may be modified for practical reasons--if, for example, the levels of contaminants that either occur naturally in the environment or can be measured accurately are higher than the levels of contaminants allowed under the standards.

PENNSYLVANIA

SOIL STANDARDS

State guidance establishes interim standards for about 100 chemicals in soil. The state established different standards for residential and industrial land uses. In addition, it developed two sets of standards, one for contamination that poses a threat to humans through direct contact and one for contamination that poses a threat to groundwater.

Basis for Standards

The state based its standards on an assessment of the health risks posed by individual chemicals. This assessment incorporated generic formulas and standardized assumptions about both (1) the likely avenue and extent of exposure to a chemical and (2) the level of health risk the state would be willing to accept. Standards for contaminants that pose a threat to groundwater were based on EPA's and the state's methodology–the state used its own model to determine how contaminants in soil would migrate into groundwater. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, the standards were set at EPA's reference dose–the exposure level below which no adverse health effects would be expected.

Flexibility of Standards

The state considers the cleanup levels specified in its standards as "worst case" numbers that a party responsible for cleaning up a site can adjust to take into account site-specific conditions. The state also gives the responsible party flexibility in deciding how to achieve the required cleanup levels. For example, the responsible party may propose a site-specific cleanup plan based on risk that includes engineering and institutional controls, such as fences to restrict public access to the contaminated area and clay caps to control the movement of contaminants, rather than measures for reducing or eliminating the contamination.

GROUNDWATER STANDARDS

State guidance establishes interim standards for about 100 chemicals in groundwater likely to be used as drinking water or for agricultural or industrial uses.

Basis for Standards

If a federal MCL existed for a chemical, the state adopted the federal MCL. For a chemical without a corresponding MCL, the state based its standard on an assessment of the health risks posed by the chemical similar to that described above for soil standards.

Comparison With Federal Primary MCLs

All of the state's standards for groundwater used as drinking water are the same as the federal primary MCLs.

Flexibility of Standards

The state provides the same flexibility for meeting its groundwater standards as it does for meeting its soil standards, as described above.

RHODE ISLAND

SOIL STANDARDS

No chemical-specific standards for soil have been established by the state.

GROUNDWATER STANDARDS

State law/regulations establish standards for more than 25 chemicals in groundwater. The state's standards apply to groundwater designated as drinking water and urban groundwater. For urban groundwater, the state developed two sets of standards, depending on whether human contact (1) is likely or (2) is unlikely but the contamination poses a safety threat (for example, the accumulation of vapors from volatile compounds might cause an explosion).

Basis for Standards

The state adopted the federal MCLs for groundwater designated as drinking water. The state developed its own urban groundwater standards for compounds that can easily vaporize using the Occupational Safety and Health Administration's (OSHA) risk-based "permissible exposure limits" for chemical concentrations in air and "lower explosive limits."

Comparison With Federal Primary MCLs

The state has 44 standards that correspond to the federal primary MCLs. Of the 44 standards, 43 are identical to the federal MCLs and 1 is more stringent.

Flexibility of Standards

A party responsible for cleaning up a site cannot adjust the cleanup levels specified in the standards for groundwater used as drinking water to take into consideration site-specific conditions. However, a responsible party may use a site-specific risk assessment to develop cleanup levels for urban groundwater.

TEXAS

SOIL STANDARDS

State law/regulations establish specific numeric limits, known as medium-specific concentrations, for more than 150 chemicals in soil. The state set different cleanup levels for residential and nonresidential land uses and considered both the migration of contaminants from the soil into the groundwater and human contact with the contaminants through inhalation or ingestion.

Basis for Standards

The state based the medium-specific concentrations on already established standards, such as the federal MCLs, where they were appropriate and available. Otherwise, the state used standardized equations to determine health risks and standard factors to estimate human exposure in setting the concentrations. It also used a generic methodology to determine what concentrations of contaminants could remain in the soil and still be protective of the groundwater if the contaminants migrated. The risk assessment formulas were based on EPA's guidance. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 100,000 or 1 chance in 1 million, depending on the type of carcinogen. For noncarcinogens, the standards were set at EPA's reference dose—the exposure level below which no adverse health effects would be expected.

Flexibility of Standards

Although the medium-specific concentrations are relatively fixed, a party responsible for cleaning up a site can adjust these levels to take into account a limited number of site-specific conditions. For example, the cleanup levels can be adjusted to consider the lowest levels at which contaminants can be measured accurately if these are higher than the levels in the standards. However, rather than using the medium-specific concentrations, the responsible party may, at its discretion, clean up the affected area to the levels found in the surrounding environment or to levels determined by a site-specific risk assessment. Using a site-specific risk-assessment provides flexibility when removing the contaminants or decontaminating the site would not be feasible. In addition, this approach allows the use of engineering and institutional controls, such as a cap placed over a contaminated area or a fence erected to limit human exposure.

GROUNDWATER STANDARDS

State law/regulations specify numeric limits for more than 150 chemicals in groundwater. The state requires that the federal MCLs be used for groundwater classified as drinking water. When an MCL does not exist for a chemical, the state sets different cleanup levels for residential and nonresidential land uses, as discussed above.

Basis for Standards

To derive the standards that differed from the MCLs, the state assessed the health risks posed by individual chemicals. This assessment incorporated generic formulas and standardized assumptions about both (1) the likely avenue and extent of exposure to a chemical and (2) the level of health risk the state would be willing to accept. As discussed above for soil standards, the risk assessment formulas were based on EPA's guidance. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 100,000 or 1 chance in 1 million, depending on the type of carcinogen. For noncarcinogens, the standards were set at EPA's reference dose–the exposure level below which no adverse health effects would be expected.

Comparison With Federal Primary MCLs

The state adopted the federal primary MCLs where available.

Flexibility of Standards

The state allows the same flexibility for groundwater standards as it does for soil standards.

VIRGINIA

SOIL STANDARDS

No chemical-specific standards have been established.

GROUNDWATER STANDARDS

State regulations establish standards for 28 chemicals (excluding radioactivity) in groundwater. In general, these standards apply to all groundwater statewide, although a few standards (those for pH, ammonia nitrogen, nitrite nitrogen, and nitrate nitrogen) vary from region to region--the Coastal Plain, the Piedmont and Blue Ridge, the Valley and Ridge, and the Cumberland Plateau.

In addition, the state has established separate standards for 34 chemicals (excluding radioactivity) in groundwater that is used as drinking water.

Basis for Standards

The officials were unable to say how these standards were developed more than 10 years ago. However, they were probably designed to protect surface water from discharges of contaminated groundwater.

Comparison With Federal Primary MCLs

The state has 19 groundwater standards that correspond to the federal primary MCLs. Of the 19 standards, 1 is identical to the federal MCL, 16 are more stringent, and 2 are less stringent.

In addition, 24 of the state's drinking water standards correspond to the federal primary MCLs. Of the 24 standards, 13 are identical to the federal MCLs, 5 are more stringent, and 6 are less stringent.

Flexibility of Standards

A party responsible for cleaning up a site cannot adjust the cleanup levels specified in the standards for groundwater that is a current or potential source of drinking water. However, the cleanup levels may be made more stringent to ensure that the incremental risk posed by multiple contaminants remains within acceptable limits. For groundwater that cannot be used as drinking water, site-specific cleanup levels may be developed.

WASHINGTON

SOIL STANDARDS

State law/regulations establish chemical-specific standards for soil covering about 585 chemicals. Different standards have been established for residential, industrial, and commercial land uses.

Basis for Standards

The state based its standards on an assessment of the health risks posed by individual chemicals. This assessment incorporated generic formulas and standardized assumptions about both (1) the likely avenue and extent of exposure to a chemical and (2) the level of health risk the state would be willing to accept. The state also took into account other factors, such as the levels of contaminants that occur naturally in the environment and analytical limits. The risk assessment formulas were based on EPA's guidance and the state's own methodology. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 100,000 or 1 chance in 1 million, depending on how many carcinogens are present or whether a site is an industrial area. For noncarcinogens, the standards were set at EPA's reference dose--the exposure level below which no adverse health effects would be expected.

Flexibility of Standards

A party responsible for cleaning up a site can modify the cleanup levels specified in the standards to take into account such practical considerations as the levels of contaminants that occur naturally in the environment and analytical limits (not cost). The responsible party can also use the cleanup levels developed through a site-specific risk assessment instead of the cleanup levels specified in the standards, but this approach is the exception rather than the rule. However, the state gives responsible parties considerable flexibility in selecting the methods to use for meeting the specified cleanup levels.

GROUNDWATER STANDARDS

State law/regulations establish chemical-specific standards for groundwater covering about 585 chemicals. The state set different standards for groundwater used as drinking water and groundwater used for other purposes.

Basis for Standards

The state's basis for groundwater standards is the same as for soil standards, as described above.

Comparison With Federal Primary MCLs

The state has 64 standards that correspond to the federal primary MCLs. Of the 64 standards, 11 are identical to the federal MCLs, 26 are more stringent, and 27 are less stringent.

Flexibility of Standards

The state provides the same flexibility for determining the cleanup levels for groundwater as it does for soil.

WISCONSIN

SOIL STANDARDS

State law/regulations establish generic numeric soil standards for about 10 chemicals in soil. The standards are for contamination that poses a threat to human health through either direct contact (ingestion or inhalation) or groundwater. The direct contact standards are different for industrial and nonindustrial land uses.

Basis for Standards

To address threats to human health posed by direct contact, the state based its standards on standardized exposure assessments and risk levels. The nonindustrial cleanup levels were adjusted to address the state's requirement that the environment be restored to the extent practicable. The risk assessment formulas were based on EPA's guidance and the state's own methodology. The standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 1 million for individual compounds and by more than 1 chance in 100,000 for all of the compounds present at the site. For noncarcinogens, the standards were set at EPA's reference dose–the exposure level below which no adverse health effects would be expected.

For contamination that poses a threat to groundwater, the state used a model to determine the maximum allowable levels of contaminants that could be present in the soil and not exceed the state's groundwater standards if the contaminants migrated to the groundwater.

Flexibility of Standards

A party responsible for cleaning up a site can develop standards that take into consideration site-specific conditions. The responsible party can choose either to use the state's generic numeric standards or to develop site-specific numeric or performance standards for the cleanup.

GROUNDWATER STANDARDS

State law/regulations establish standards for about 101 chemicals in groundwater. The state has two sets of standards that establish (1) preventive action limits, or target cleanup levels, and (2) enforcement levels, or minimum standards that must be met. The standards assume that all groundwater in the state is drinking water.

Basis for Standards

The standards for preventive action limits and enforcement levels were both based on risk assessments that incorporated standardized assumptions about human exposure, state-determined risk levels, and the federal MCLs. However, in setting the more stringent preventive action limits, the state adjusted the federal MCLs for carcinogens by a factor of 10 and for noncarcinogens by a factor of 5 (for example, if the federal MCL for a carcinogen is 0.05, the state's preventive action limit is set at 0.005). The risk assessment formulas were based on EPA's guidance and the state's own methodology. For chemicals other than those with corresponding federal MCLs, the standards for carcinogens were set at levels designed to ensure that a lifetime's exposure to them would not increase an individual's risk of developing cancer by more than 1 chance in 1 million. For noncarcinogens, the standards were set at EPA's reference dose–the exposure level below which no adverse health effects would be expected.

Comparison With Federal Primary MCLs

All preventive action limits are more stringent than the federal MCLs. In addition, of the 64 enforcement levels that correspond to the federal primary MCLs, 56 are identical to the federal MCLs and 8 are more stringent.

Flexibility of Standards

A party responsible for cleaning up a site must restore the environment to the extent practicable. This means that contaminated groundwater must be restored to the preventive action limits unless it can be demonstrated that it is not technically or economically feasible to meet these cleanup levels and a variance is granted. The state also allows a variance from meeting the preventive action limits when off-site high background contamination is affecting the contaminated site. However, the cleanup levels cannot be less stringent than the enforcement levels. The state also has a proposed closure flexibility rule that provides some additional flexibility, particularly for sites contaminated with petroleum. Under the proposed rule, no further action may be needed if the responsible party can show that the contamination is being attenuated naturally.

STATES SURVEYED AND STANDARDS REPORTED

State	Number of Superfund sites[a]	Standards	
		Soil	Groundwater
Alabama	9		
Arkansas	12		
California	69		X
Colorado	13		X
Connecticut	14	X	X
Delaware	18		
Florida	48		X
Georgia	11	X	X
Illinois	33	X	X
Indiana	32		
Iowa	16		
Kansas	10	X	X
Kentucky	19		
Louisiana	13		
Massachusetts	22	X	X
Michigan	74	X	X
Minnesota	34	X	X
Missouri	19	X	
New Hampshire	16		X
New Jersey	100	X	X
New York	76	X	X
North Carolina	21		X
Ohio	31		
Oklahoma	9		
Oregon	9		
Pennsylvania	95	X	X
Rhode Island	10		X
South Carolina	23		
Tennessee	14		
Texas	25	X	X
Virginia	18		X
Washington	35	X	X
Wisconsin	40	X	X

[a]Does not include federal facilities.

(160345)

Ordering Information

The first copy of each GAO report and testimony is free. Additional copies are $2 each. Orders should be sent to the following address, accompanied by a check or money order made out to the Superintendent of Documents, when necessary. VISA and MasterCard credit cards are accepted, also. Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

Orders by mail:

U.S. General Accounting Office
P.O. Box 6015
Gaithersburg, MD 20884-6015

or visit:

Room 1100
700 4th St. NW (corner of 4th and G Sts. NW)
U.S. General Accounting Office
Washington, DC

Orders may also be placed by calling (202) 512-6000
or by using fax number (301) 258-4066, or TDD (301) 413-0006.

Each day, GAO issues a list of newly available reports and testimony. To receive facsimile copies of the daily list or any list from the past 30 days, please call (202) 512-6000 using a touchtone phone. A recorded menu will provide information on how to obtain these lists.

For information on how to access GAO reports on the INTERNET, send an e-mail message with "info" in the body to:

info@www.gao.gov

United States
General Accounting Office
Washington, D.C. 20548-0001

Bulk Rate
Postage & Fees Paid
GAO
Permit No. G100

Official Business
Penalty for Private Use $300

Address Correction Requested