GROUNDWATER POLLUTION I: THE PROBLEM AND THE LAW*

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A federal appeals court assessing the validity of regulations restricting the discharge of potentially carcinogenic pollutants into surface waters once remarked that "[w]hat scientists know about the causes of cancer is how limited is their knowledge." Few today would challenge the accuracy of a similar statement concerning the sources, nature, extent, and effects of groundwater contamination. Despite this shortage of information, a considerable and growing body of evidence indicates that the nation's groundwater supplies, particularly in urban areas, are in serious danger from a wide variety of sources. The known instances and volumes of polluted groundwater are increasing, but they are probably just the tip of the existing pollution iceberg. Groundwater resources are crucial for many domestic, commercial, and industrial purposes. Because valuable and possibly irreplaceable groundwater resources may be irreparably damaged in the interim, the nation should not wait until conclusive documenta-

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* This is the first of a series of two articles on groundwater pollution law to be published in consecutive issues of the Kansas Law Review. The two articles are derived from G. COGGIN & R. GICKSMAN, A PROPOSED STRATEGY TO PREVENT GROUNDWATER CONTAMINATION IN KANSAS (1986), a report submitted to the Kansas Department of Health and Environment (KDHE) in January 1986. The report, full copies of which are on file with the authors, the Kansas Law Review, and the KDHE, was prepared with the financial aid of the KDHE and the federal Environmental Protection Agency (EPA) and the administrative assistance of the University of Kansas Center for Research, Inc. (CRINC). The authors gratefully acknowledge the support of these organizations. The views expressed in these two articles, however, are those of the authors alone and should not be attributed to the KDHE, the EPA, or the CRINC.

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tion has been assembled before acting to abate pollution threats. These conclusions are relatively straightforward and uncontroversial. Developing and implementing an effective groundwater pollution control program, however, will not be simple or harmonious. This article is the first of a two-part series. The first article analyzes existing federal, state, and local mechanisms for controlling groundwater pollution under law, emphasizing their shortcomings in preventing the spread of such pollution. Based on this analysis, the second article will propose a comprehensive legal strategy for an effective state groundwater protection program.

These two articles are adapted from a report the authors prepared for the Kansas Department of Health and Environment (KDHE), and they initially focus on Kansas groundwater pollution and Kansas state law applicable to polluting activities. The groundwater quality problems in Kansas, however, are representative of problems in many other states; so too is the State’s approach to them. The strategy proposed in the second article, therefore, can, with appropriate modifications, provide a model for any state seeking to prevent groundwater contamination.

Part I of this article describes the nature and known and potential extent and sources of groundwater contamination both nationally and in Kansas. This description, which is necessarily based on sketchy and sometimes speculative reports, indicates that a great variety of human activities can pollute groundwater if not carefully managed, and that Kansas, like most other states, faces potentially severe groundwater quality problems.

Part II describes present federal law that bears on efforts to prevent and abate groundwater contamination. Many federal statutes regulate some aspects of the myriad activities with potential to pollute groundwater. In combination, these laws address a great many facets of the groundwater pollution problem. Nevertheless, there is no explicit, comprehensive national legislative mandate to prevent such pollution. The relevant federal statutes rarely focus on the protection of groundwater quality as their principal objective. Federal efforts to protect groundwater quality are fragmented among several agencies and departments. Groundwater protection policies and programs are inconsistent from statute to statute and from agency to agency. Consequently, not all sources of groundwater pollution or significant contaminants are subject to federal control. When regulatory coverage exists, it is often deficient: groundwater monitoring

3. The second part of the series, Coggins & Glicksman, *Groundwater Pollution II: An Immodest Proposal to Prevent Future Groundwater Contamination* [hereinafter *Groundwater Pollution II*], will appear as part of a symposium on groundwater quality law in the next issue of the *Kansas Law Review*. 
requirements are insufficient, and guidelines for corrective action, once contamination occurs, are incomplete. Thus, if a state wishes to ensure that its groundwater resources are protected, it must create a groundwater protection program that extends beyond the minimum requirements imposed by federal law. The federal government has left the states ample authority to do so.

The last part of this article examines existing Kansas state law and practice for preventing groundwater pollution. The legal situation in Kansas does not necessarily mirror legal structures in other states, but the similarities between jurisdictions in this regard far outweigh the differences. In some respects, Kansas law for preventing groundwater pollution is more advanced than federal law, but the present Kansas system still falls far short of providing an adequate basis for a comprehensive prevention strategy.

Administratively, too many Kansas state agencies have a piece of the regulatory pie, and the State's primary pollution control agency is not well-organized internally to deal with groundwater pollution. Legally, the Kansas statutes, like those of many other states, hold theoretical promise, but for various reasons do not fully protect groundwater quality. Kansas water pollution control statutes, although applicable to discharges into groundwater, are somewhat fragmented and primitive. This legislation is largely directed at surface water quality, and lacks any real guidance on the preferred means of applying the general water pollution laws to groundwater pollution sources. Kansas has also enacted a virtually incomprehensible morass of apparently overlapping programs governing a variety of specific groundwater pollution sources. In short, like the federal government, Kansas has not yet coordinated its multitude of individual regulatory programs into one comprehensive groundwater protection program, and current State law leaves significant gaps in regulatory coverage.

The second article in this series uses the analysis in this article as a springboard for the development of a proposed strategy to prevent future groundwater pollution. It outlines the broad policy choices that must precede the authorization and implementation of specific groundwater protection programs and methods. After surveying the main approaches adopted or planned by other jurisdictions in response to groundwater contamination, the second article recommends specific elements of a comprehensive strategy to prevent future groundwater pollution. The appendix to the second article contains a proposed Groundwater Conservation Act (GCA), which gives concrete legal form to the second article's specific recommendations.

5. Groundwater Pollution II, supra note 3.
Several initial disclaimers about the contents of both articles are in order. First, given the state of the legal and technical arts in 1986 concerning groundwater pollution, omissions and inadequate treatment of some areas are likely if not inevitable. Second, the wide scope of the subject dictates relatively shallow coverage of some areas. The parts discussing state and federal statutes, for instance, do not attempt to highlight every nuance or to explore every avenue of possible relevance. There is simply too much tangential law to do so. Third, the analysis in the two articles is limited in another important aspect: it does not consider water conservation, either as a method of halting aquifer depletion or as a means of coping with decreasing water supplies. Fourth, the recommendations contained in the second article, while quite specific in some instances, are necessarily somewhat general in others; many of the details necessarily must be left to those charged with implementing any groundwater protection program ultimately adopted. Fifth, some of the recommendations may not be politically feasible, at least in the short term; they were drafted more with an eye toward legality, practicability, and effectiveness than toward immediate or universal political acceptance. Finally, the strategy is not meant to be carved in stone. Prevention of groundwater contamination is in its relative infancy, and the entire area is characterized by inadequate factual and scientific information. The descriptions, analyses, and recommendations in these two articles should be expanded and refined with the progress of science, technology, information, law, and practical experience.

I. THE NATURE AND EXTENT OF GROUNDWATER CONTAMINATION

Neither the nation nor the State of Kansas faces a groundwater quality crisis this year or next. This part of the article demonstrates, however, that ensuring the availability of pure groundwater resources is a critical national and state objective, that groundwater contamination nationally is increasing at an alarming rate, with harmful effects on American health and economic welfare, and that there is ample reason to believe that the national trend is mirrored in the states, including Kansas. After a brief introduction, the second section of this part describes the known extent and nature of groundwater contamination nationally. The facts and surmises on this scale are both instructive in themselves and useful as sources to extrapolate likely or possible similar problems in Kansas and other states. The third section of this part summarizes the available information about ex-

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6. For a fuller analysis of applicable federal and state laws, see the full text of G. Coggins & R. Glickman, A PROPOSED STRATEGY TO PREVENT GROUNDWATER CONTAMINATION IN KANSAS (1986) [hereinafter STRATEGY REPORT].
isting groundwater quality problems in Kansas. The picture is as somber as it is incomplete.

A. Introduction

The Environmental Protection Agency (EPA), in its 1984 "Ground-Water Protection Strategy," concedes that "ground-water contamination looms as a major environmental issue of the 1980's." The EPA predicts that the volume of groundwater polluted (currently estimated at 100-200 trillion gallons) will continue to increase. The federal agency has financed state efforts to seek relevant information and to develop adequate state strategies to prevent future groundwater pollution.

Kansas environmental officials also have recently elevated prevention and abatement of groundwater pollution to a much higher priority. Key personnel of the Kansas Department of Health and Environment (KDHE) are convinced that the general problem in Kansas is real and growing. Their concerns stem from evidence that, while largely sporadic or anecdotal, is impressive in the aggregate. The Kansas Legislature apparently shares the concern of the KDHE for the future of the State's groundwater resources.

Unfortunately, very little hard information is available on any significant aspect of the groundwater pollution problem either nationally or in Kansas. Until very recently, the prevention of groundwater pollution received relatively little attention from federal and state regulators. The waves of environmental legislation in the past several decades have concentrated on more visible, pressing, and abatable pollution problems, such as air and surface water pollution and hazardous waste disposal. Groundwater contamination was out of mind as long as it was out of sight.

10. In August 1986, the Director of the Kansas Water Office declared that for the first time, the emphasis of that Agency's efforts for the next five years would be quality, not quantity. K.C. Times, Sept. 22, 1986, § A, at 6, col. 6.
Widespread recent concern over health and economic problems associated with groundwater pollution has caused scientists and regulators to devote more detailed attention to the problem. Yet the contemporary concern will not be fully informed until scientists attain many years of experience with monitoring, testing, and evaluating groundwater.\textsuperscript{14} Scientists from state and federal agencies have begun conducting many studies of specific sites and problems, but at least in Kansas their findings have never been collected in any usable form.\textsuperscript{15} Moreover, the available studies largely have been ad hoc and uncoordinated; most did not test for a full range of contaminants, and diverse investigatory methods were often employed.

The following sections seek to piece together a coherent picture of national and Kansas groundwater pollution out of the fragmentary information available. They also discuss the potential consequences of failing to alleviate these problems expeditiously.

\textbf{B. The National Groundwater Quality Problem}

Groundwater accounts for 95 percent of the freshwater supply (excluding glaciers) in the world, and groundwater use in the United States is increasing by about four percent annually.\textsuperscript{16} Between 1950 and 1980, groundwater withdrawals increased from 34 to 89 billion gallons per day (gpd) and were predicted to reach 100 billion gpd by 1985.\textsuperscript{17} Groundwater is the primary drinking source for half of the American population.\textsuperscript{18} A very large proportion of people in rural areas depend on wells to supply their water, and nearly 75 percent of the municipal drinking water systems rely in whole or part on groundwater.\textsuperscript{19} Groundwater use is also crucial to the national economy, with the largest volumes devoted to irrigation.\textsuperscript{20}

The primary sources of groundwater contamination in the United States are diverse, and the degree of threat posed by each source

\begin{itemize}
  \item \textsuperscript{14} See OTA Report, supra note 2, pt. 1, at 19-60; National Research Council, Ground Water Quality Protection: State and Local Strategies 10 (1986) [hereinafter NRC Report].
  \item \textsuperscript{15} This conclusion stems from literature searches conducted by these authors and from conversations with Kansas scientists and regulatory agency personnel. See also NRC Report, supra note 14, at 77 (Kansas' state geologist has tried unsuccessfully to get legislative support for developing a comprehensive, integrated data collection program).
  \item \textsuperscript{18} EPA, Ground-Water 1984, supra note 7, at 11.
  \item \textsuperscript{19} See id.; see also National Water Summary 1984, supra note 17, at 120.
  \item \textsuperscript{20} National Water Summary 1984, supra note 17, at 118.
\end{itemize}
category varies.21 Industrial liquid waste impoundments, which include ponds for wastewater treatment, waste evaporation, and waste disposal, leak over 100 billion gallons of waste per year into groundwater.22 The largest generators of impounded liquid waste include manufacturers of paper, petroleum and coal products, primary metals, and chemicals and allied products. These sources cause contamination by materials such as solvents, heavy metals, acids, and cyanide.23 Industrial and municipal solid waste landfills are also significant polluters,24 as are septic systems25 and municipal wastewater systems, including storm and sanitary sewer lines, sewage treatment systems,26 and land spreading of sludge.27

21. A study by the federal Office of Technology Assessment lists 33 principal pollution source categories and estimates roughly the pollution load from each. The list includes subsurface percolation from septic tanks and cesspools; injection wells; land (sludge) application; landfills; open dumps; residential (local) disposal; surface impoundments; waste tailings; waste piles; materials stockpiles; graveyards; animal burial; aboveground storage tanks; underground storage tanks; containers; open burning and detonation sites; radioactive disposal sites; pipelines; material transport and transfer operations; irrigation practices; pesticide applications; fertilizer applications; animal feeding operations; de-icing salts applications; urban runoff; percolation of atmospheric pollutants; mining and mine drainage; production wells; other wells; construction excavation; groundwater-surface water interaction; natural leaching; and salt water intrusion/brackish water upconing. OTA REPORT, supra note 2, pt. 11, app. at 267-88.

22. There are 50,000 such ponds across the nation, most of which are neither lined nor monitored. Henderson, supra note 16, at 12.

23. Id.

24. Id.

25. These contain residential and commercial garbage as well as liquid and solid industrial wastes such as sludges, scrap, solvents, and filter cakes. There are over 18,500 such facilities in the U.S., most of which are not lined or monitored. Many are very close to water-supply wells. They leak over 90 billion gallons of contaminated leachate per year into groundwater.

26. Most of the over 16 million septic tanks or cesspools in the country are connected to individual homes. Over one-quarter of the population relies on these systems for sewage disposal. Septic tanks and cesspools discharge 800 billion gallons of sewage, containing nitrates, phosphates, pathogens (i.e., harmful bacteria), and other substances into the ground each year. Id. See NATIONAL WATER SUMMARY 1984, supra note 17, at 97-98. Furthermore, septic tank cleaning solvents, such as trichlorethylene, are also potential groundwater contaminants. Henderson, supra note 16, at 13.

27. Gravity-fed sewer lines and wastewater holding ponds both leak contaminants such as nitrates, phosphates, heavy metals, pathogens, hydrocarbons, and other substances into groundwater. Since these systems handled an estimated 15 billion gallons of sewage a day in 1977 across the country, they represent a continued threat to groundwater. Henderson, supra note 16, at 13.

28. Industrial and municipal wastewater treatment processes result in residual sludge. This material is often spread on cultivated land as a fertilizer. Applied excessively, sludge spreading can produce nitrate, heavy metal, and salt contamination of groundwater. Because the use of this waste disposal technique by coal-fired utilities, textiles, canning, petroleum-refining, and paper industries has grown significantly, the threat to groundwater quality from sludge application is rising. Id.
Mining activities constitute another significant pollution source. Seepage from tailings ponds, runoff from waste piles, and discharge of mine drainage into soil, surface water, and injection wells may contaminate groundwater with acids, dissolved solids, radioactive materials, and metals.\(^{28}\)

Wells used for the disposal of sewage, industrial waste, storm water, oil field brines, and irrigation return flows pose a particular threat to shallow freshwater aquifers.\(^{29}\) Extraction wells present a different kind of threat. Improper installation, use, or abandonment of water, oil, or gas extraction wells may cause saline intrusion into freshwater aquifers in coastal and arid areas.\(^{30}\) Service stations, storage tanks and transfer facilities, tank cars, and pipelines are major sources of hydrocarbon contamination.\(^{31}\)

Agricultural activities are yet another source of groundwater contamination. Irrigation can cause dissolved salts and agricultural chemicals to leach into groundwater. Chemical fertilizer and pesticide application can result in the direct percolation of contaminants from cultivated fields into the water table.\(^{32}\) Precipitation can also cause leaching of chemical fertilizers applied in quantities exceeding the amounts required by crops.\(^{33}\) Midwestern states in particular face nitrate contamination problems stemming from fertilizer application.\(^{34}\) Runoff from concentrated livestock feeding operations has led to pollution by nitrates, phosphates, and pathogens.\(^{35}\)

\(^{28}\) Coal mining is a particularly significant cause of excess groundwater acidity, but virtually all types of surface and underground mines contaminate groundwater to some extent. Because there are mines in every state in the U.S., mining wastes are a nationwide source of groundwater contamination. Id. at 14.

\(^{29}\) Id.

\(^{30}\) Id. at 15. Improperly cased or abandoned wells may also permit other contaminants, such as oil and gas, to leak from shallow contaminated aquifers into deeper clean aquifers. Id.

\(^{31}\) Congress adopted a new regulatory program for leaking underground storage tanks in 1984. See Pub. L. No. 98-616, Title VI, 98 Stat. 3221, 3277-88 (1984) (codified at 42 U.S.C. §§ 6991-6991i (Supp. III 1985)). Reports indicate that of the 1.4 million underground tanks storing gasoline, about 75,000 to 100,000 are already leaking and that this number will double or triple in the next few years. See Henderson, supra note 16, at 15.

\(^{32}\) Henderson, supra note 16, at 16. Irrigation return flows in the San Joaquin Valley in California apparently have caused toxic levels of selenium concentrations in the Kesterton National Wildlife Refuge. See National Water Summary 1984, supra note 17, at 2; see generally id. at 99-100.

\(^{33}\) National Water Summary 1984, supra note 17, at 99. Dry-land farming, which involves crop-raising without irrigation, is a particular problem in this regard. The soil in many dry-land farming regions has a large supply of natural soluble salts, including nitrates. Instead of being absorbed by native vegetation, precipitation onto fallow dry-land fields percolates through the soil, leaching nitrates and other contaminants into the groundwater. See id. at 100; Henderson, supra note 16, at 16.


\(^{35}\) Henderson, supra note 16, at 16.
Three additional significant sources of groundwater pollution are road salting, air pollution, and surface water pollution. Highway and airport de-icing salts have contaminated groundwater in many areas in the country's snow belt. Runoff from salt storage areas and dissolved de-icing salts percolating into the ground along roadsides and airport runways both contribute to chloride pollution of groundwater.36 Air pollutants, such as lead, cadmium, and mercury, are flushed into soil and groundwater by precipitation.37 Because surface waters are often hydrologically connected with groundwater, any surface water contaminant may ultimately find its way into groundwater.38

In short, virtually all human activities—industrial, commercial, and domestic—have the potential to contaminate groundwater. The need to address such a wide variety of sources may explain the federal government's reluctance to take charge of the effort to control groundwater pollution. Unfortunately, as the next section indicates, state regulators face a problem of similar proportions.

C. The Kansas Groundwater Problem

This section outlines the information available on the uses and abuses of groundwater in Kansas. It assumes that, to the extent pollution sources identified nationally are present in the state, similar groundwater quality problems are likely to be encountered there. This section concludes that Kansas is heavily dependent on groundwater, that pollution of groundwater is reaching very serious dimensions, and that such pollution could have extremely detrimental health and economic consequences.

1. Beneficial Uses of Kansas Groundwater

The State of Kansas is largely rural. Because of its low population density and relative lack of heavy industry, spectacular instances of groundwater pollution fortunately have been rare. These facts, though, should not induce complacency about the need to protect groundwater quality.

Kansas is more dependent than any other state on the quantity and quality of its groundwater. Eighty-five percent of all water withdrawals in the State are groundwater withdrawals. The state with the second highest percentage of groundwater use is Texas, where

36. Id.
37. This problem is obviously a more serious one in the humid, eastern parts of the nation than in the arid western regions. Id. at 16-17.
38. This problem is particularly severe for sand and gravel aquifers associated with stream and river beds. Id. at 17.
groundwater withdrawals compose only sixty-one percent of the total.\textsuperscript{39} Despite Kansas' relatively low population, the State has the fifth highest volume of groundwater withdrawals nationally, 6.6 billion gpd.\textsuperscript{40}

Underground reservoirs in Kansas vary greatly in size, depth, quality, and usefulness. Aquifers tend to be shallow in the east and deeper in the west.\textsuperscript{41} The State's three largest aquifers, holding an estimated 270 million acre-feet of water (an acre foot is roughly 326,000 gallons), are all located in western Kansas.\textsuperscript{42} Western aquifers usually hold "fossil water," while eastern reservoirs are alluvial, meaning that they are closely interconnected with streams and rivers.\textsuperscript{43} Shallower aquifers are more likely to be polluted by surface activities.

The Kansas Water Office estimates that 3.3 million acre feet of groundwater are "mined" annually.\textsuperscript{44} In other words, consumptive use exceeds recharge by that amount. Roughly 1.9 million people in Kansas, 81 percent of the population, depend on groundwater for part of their drinking water supplies.\textsuperscript{45} In rural areas, 86 percent of drinking water is derived from the ground.\textsuperscript{46} The KDHE estimates that 1900 wells serve Kansas communities, and another 117,000 wells provide water for private, usually rural, residences.\textsuperscript{47} Kansans use groundwater, of course, for more than drinking and other household needs. In western Kansas, groundwater supports much of the economy. Indeed, groundwater supplies 98 percent of water demand in western Kansas (compared to about 60 percent in the eastern part of the state).\textsuperscript{48} Groundwater has become essential for crop agriculture and stockwatering as well as for human consumption. Eighty percent of total groundwater supply is used for irrigation, even though only about 6 percent of Kansas farmland is irrigated.\textsuperscript{49} Groundwater provides 92 percent of the State's irrigation water supplies.\textsuperscript{50} In eastern Kansas, despite more abundant rainfall, groundwater is heavily used not only for

\textsuperscript{39} National Water Summary 1984, supra note 17, at 120.

\textsuperscript{40} Id.

\textsuperscript{41} See id. at 217-20.


\textsuperscript{43} See National Water Summary 1984, supra note 17, at 217-20.

\textsuperscript{44} M. Fund, supra note 42, at 33.

\textsuperscript{45} Id. at 35.

\textsuperscript{46} See National Water Summary 1984, supra note 17, at 120.

\textsuperscript{47} Kansas Department of Health and Environment, Groundwater, pt. V, at 1 (1985) [hereinafter KDHE, Groundwater] (this document may be found in Strategy Report, supra note 6, app. VII).

\textsuperscript{48} M. Fund, supra note 42, at 16.

\textsuperscript{49} Id. at 7.

\textsuperscript{50} See National Water Summary 1984, supra note 17, at 120.
drinking, but also for industrial processes, waste disposal, cooling, and like purposes.\footnote{See M. Fund, supra note 42, at 25-27.}

The State’s underground water resources are irreplaceable, because water is an essential precondition to the continuation of human (and all other) life. Kansas is not blessed with an abundance of water other than that located underground. Especially in rural areas solely dependent on wells, contamination of groundwater sources can be disastrous.

2. Pollution of Kansas Groundwater

Information on existing contamination of groundwater in Kansas is often merely anecdotal and is consequently even more sketchy than data on the quality of this resource nationally. Although overall groundwater quality in Kansas appears to be relatively high, the increase in number of proven pollution incidents, and the threat of more such problems in the future, are causes for alarm. In short, the available news is not yet calamitous but is almost certain to worsen unless the State soon takes stronger preventive actions.

Perhaps the most complete source of information on Kansas groundwater quality is Mary Fund’s Water in Kansas: A Primer.\footnote{M. Fund, supra note 42.} The book estimates that the ratio of “acceptable quality groundwater” to total groundwater supply (without, apparently, distinguishing between “man-made” and “natural” pollution) ranges from approximately 25 percent in Russell County to 50 percent in Reno, Sedgwick, Butler, and Sumner Counties to 95 percent in large portions of eastern and western Kansas.\footnote{Id. at 35 (citing Kansas Water Office, Kansas Water Supply and Demand Estimates, Background Paper No. 15, State Water Plan 70 (August 1984)).} Not all groundwater pollution is man-made. In some parts of Kansas, natural leaching of minerals is the main contamination source.\footnote{Id. at 37.}

Fund also locates known and potential industrial sources of groundwater pollution, and indicates that such sources are scattered throughout the State, with especially significant numbers in Ellis, Reno, Sedgwick, Butler, Cowley, Montgomery, Cherokee, Johnson, Douglas, Leavenworth, Shawnee, and Marshall Counties.\footnote{Id. at 36 (citing Kansas Department of Health and Environment, Revision to Kansas Water Management Plan 37 (January 1984)).} The potential sources of contamination in Kansas are as varied as they are nationwide:

Industrial activities pose the most extreme threat to groundwater in Kansas. Petroleum refining, chemical processing, metal plating, petroleum pro-
duct transportation and storage, and oil field activities cause the most pollution. Over 200 known and suspected groundwater pollutions sites exist in Kansas. These problems are especially acute in the Kansas City, Topeka, and Wichita areas.

Each day on the average, the ... (KDHE) ... responds to at least three potential groundwater pollution problems. Over 80 per cent of these problems can be traced to crude oil activities across the state. The greatest number are accidental spills, followed by pipe and storage leakage on oil leases. 56

Specific examples of industrially-related contamination are increasingly common. Salt water from oil and gas operations has seriously affected the central and south central parts of the State. 57 A 1982 paper prepared by the KDHE, Case Histories on Current Groundwater Contamination Problems, describes ten groundwater pollution incidents, all but one involving chloride (salt) contamination, usually from oil and gas operations. 58 According to the KDHE, the incidents were caused by the inadequate design of a now-abandoned salt solution well; leaking brine pits and shallow disposal wells; corroded and leaking repressuring wells or abandoned upslope brine bonds; improper well plugging; a brine blowout, possibly due to repressuring operations; and leaking underground propane storage tanks. 59 These incidents caused the contamination of drinking water aquifers and stockwatering wells in Reno, Graham, Sedgwick, McPherson, and Ellis Counties, among others. 60

The best-known pollution event in Kansas has been the contamination of shallow groundwater by a leaking hazardous waste disposal site near Furley, 61 but other serious incidents in and around Wichita are not hard to find. 62 The abandoned Tar Creek mine in southeast Kansas is "one of the top toxic waste sites in the country," its contamination of ground and surface water is a "critical" problem. 63 Increasing instances of contamination by volatile organic compounds have also been detected, with the highest at Strother Field in Cowley County, 64 a recent addition to the EPA's National Priorities List of

56. Id. See also NRC Report, supra note 14, at 111.
57. M. Fund, supra note 42, at 36.
59. Id.
60. Id.
61. The owner of the site was awarded a damage judgment of over $10 million against the former owners. See Nunn v. Waste Management, Inc., 22 Envtl Rep. Cas. (BNA) 1763 (D. Kan. 1985). Private nuisance actions by neighboring property owners were later settled.
62. Interview with KDHE personnel, James Power presiding (June 11, 1985).
63. M. Fund, supra note 42, at 37.
64. Id. at 38.
hazardous waste disposal sites. In two Groundwater Management Districts, irrigation pumping "has induced saline water into freshwater aquifers." A large damage judgment was recently rendered against a salt mining operation for polluting the adjacent lands and waters.

Additional evidence of the scope of the State's groundwater pollution problem was provided in a paper presented to the Sanitary Engineering Conference in 1982. The authors described "a rash of incidents involving the contamination of municipal ground water supplies with petroleum products, heavy metals, and synthetic organic chemicals," some of which are "proven or suspected carcinogens." Typically, these incidents were caused by storing or piping petroleum products close to municipal wells or by careless handling of chemical compounds in the vicinity of water storage facilities. According to this paper, the principal causes of current concern are fuel, fertilizer, solvent spills and leaks, and salt water penetration into waterbearing aquifers. The more significant contamination instances discovered thus far included gasoline, diesel fuel, and A-methyl styrene leaks into Park City, Ellis, Meade, and Coffey County public water supplies; brine and oil well drilling mud contamination of municipal wells in Kiowa and Hardtner; the threat of contamination of a Doniphan County well by ammonia-nitrate fertilizer; and the overflow of toxic pesticides from a Hugoton landfill toward a nearby city well. These and other similar incidents caused the report's authors to sound the following alarm: "The contamination of public water supplies is a growing problem in Kansas. Virtually every part of the state has been affected; no systems are automatically exempt. The potential for pollution seems to be greater in cities under 10,000 than in the larger communities."

Although these anecdotal descriptions are illuminating, it is difficult to extrapolate from them a clear picture of the scope of groundwater pollution in Kansas. Two agencies have attempted to summarize

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65. K.C. Times, May 21, 1986, § B, at 1, col. 5. The EPA also added to the list a site in Wichita where the dumping of paint sludge near a sand pit lake has caused contamination of residential water wells by solvents and heavy metals. Id. The National Priorities List is discussed infra pt. II, § E(3).
68. Burris & Metzler, Pollution Incidents—Kansas Public Water Supplies, in Transactions, Sanitary Engineering Conference 38 (Univ. of Kansas, 1982) (this document may be found in Strategy Report, supra note 6, app. V).
69. Id. at 1.
70. Id.
73. Id. at 13.
in more coherent fashion the facts concerning the State's known
groundwater pollution. The United States Geological Survey has found
that twenty percent of all Kansas wells sampled (a total of 1,140 wells)
had nitrate/nitrogen concentrations at levels exceeding the criteria
for drinking water established by the EPA.74 This was the second
highest percentage in the nation.75 In 1983, the KDHE found sixty-
seven instances in which contamination of public water supplies ex-
ceeded acceptable drinking water standards: seventeen cases involved
selenium, five involved excess radium and fluoride, and forty involved
nitrates.76 A 1985 KDHE survey indicated that forty public wells are
contaminated by fertilizers and nutrients, one by pesticides, twenty-
seven by volatile organic compounds (VOCs), six by chlorides or heavy
metals, and fifty by "natural" causes. Of the private wells tested
in that year, 107 showed VOC contamination (and 370 were suspected
of it), and 300 drinking water wells had chloride and heavy metal
pollution.77 A 1986 study of farm well contamination, still in pro-
gress, is perhaps even more alarming. The KDHE and the Kansas
State University Office of Hazardous Waste Research sampled 104
wells. The resulting data indicate that seven wells contained pesticides,
three were polluted with VOCs, and thirty-eight were contaminated
by inorganic chemicals in excess of applicable maximum concentra-
tion levels.78

These figures, as bad as they are, are merely indicative of a poten-
tially far larger problem: the 1985 VOC contamination numbers, for
instance, were the result of just a few samples, fifty percent of which
tested positive for these substances.79 Most Kansas groundwater is
not tested for these and many other contaminants.80 Since tests were
conducted primarily where there was some reason to suspect pollu-
tion, the numbers cannot be extrapolated statewide (such an extrapola-
tion would yield a truly frightening scenario), but by themselves
indicate a very serious problem. The KDHE does think, however, that

75. Id. Aside from Rhode Island, the only other state even close to Kansas was Arizona,
with 13.9 percent of its wells exceeding applicable nitrate concentrations. Id. Yet, Ms. Fund
notes that "Kansas experts have been reluctant to correlate agriculture's intensive use of nitrogen
fertilizers to high nitrate levels," and contrasts that reluctance with contrary findings in other
jurisdictions, notably Nebraska. M. Fund, supra note 42, at 38.
76. M. Fund, supra note 42, at 37.
77. See KDHE, Groundwater, supra note 47, § 2.
78. Kansas Department of Health and Environment, Farm Well Contamination Study (1986) [hereinafter KDHE Farm Well] (a copy is on file with the Kansas Law Review).
79. Interview, supra note 62.
80. See KDHE, Groundwater, supra note 47, § 2. The matrix of the form in the KDHE's
survey document requested 48 pieces of numerical information. The KDHE could fill in only
nine blanks, and then only with grossly incomplete figures.
statewide extrapolation of the 1986 data would be accurate within plus or minus ten percent. The KDHE estimates that nearly half a million Kansans are already affected by known or suspected contaminated drinking water wells.

The absence of more detailed information precludes drawing many clear conclusions about the present and future extent of groundwater pollution in Kansas. But no comfort can be gleaned from the known facts. Sources from every major source category identified by the principal national studies are present in Kansas to a greater or lesser extent. Over 200 known or suspected industrial point sources of groundwater pollution have already been identified; more are turning up all the time. Oil and gas operations apparently are the biggest contributors to contamination. Volatile organic compounds, which usually come from industrial uses, are the most worrisome class of pollutants. Nitrate pollution, much of it from agricultural operations, is an increasingly serious problem. At present, the Kansas City, Topeka, and Wichita areas apparently face the most severe groundwater quality problems. Although a general statewide health crisis is unlikely to occur in the immediate future, the present pattern of incrementally growing pollution from a variety of sources is likely to persist unless strong preventive action is taken. Without such action, a groundwater quality crisis is inevitable someday, because pollutants, once established in underground reservoirs, are difficult if not impossible to remove.

D. Summary

The lack of concrete, comprehensive information on the sources, extent, and effects of groundwater pollution requires the analysis in this series of articles to proceed on the basis of several plausible but inconclusive premises. Since groundwater contamination is being found almost everywhere its presence is being investigated, it is fair and prudent to presume that much existing contamination has not yet been ascertained. Furthermore, it is highly probable that many existing facilities and activities in Kansas and elsewhere already have released pollutants that eventually will migrate into groundwater supplies. Though most experts assert that groundwater quality remains fairly good overall, with perhaps no more than one to two percent of national supplies polluted, it is equally clear that the instances and volumes of known contamination are continually increasing. All informed commentators agree that neither the nation nor the State

81. KDHE FARM WELL, supra note 78.
82. KDHE, GROUNDWATER, supra note 47, § 3.
83. OTA REPORT, supra note 2, at 21.
of Kansas can afford the luxury of waiting to act until conclusive documentation has been assembled. By that time, pollution may irreparably damage significant quantities of valuable groundwater resources. Accordingly, unless the existing legal framework provides an adequate foundation for an effective groundwater pollution control program, an overhaul of that framework is imperative. As the remainder of this article demonstrates, current federal regulatory efforts are unfocused, uncoordinated, and insufficient in scope. Kansas groundwater quality programs reflect similar deficiencies, and are probably representative of the programs in most other states.

II. FEDERAL LAW GOVERNING GROUNDWATER POLLUTION

This part describes the federal laws that could affect any state attempt to regulate sources of groundwater contamination. Many federal statutes are relevant, at least in part, and some appear effective in dealing with certain classes of threats to groundwater quality. On the whole, however, federal law is uncoordinated, overly restricted in coverage, and otherwise deficient as the sole or main basis for a state strategy to prevent groundwater pollution.

This part is organized by federal statute. Except for the first and last sections, each section describes the statute and the regulations promulgated under it, discusses the judicial opinions interpreting the law, highlights the statutory provisions pertinent to groundwater, and demonstrates why the federal law has not been adequate to deal with groundwater quality problems. The first section in this part explains that any state desiring to enact and implement its own program for prevention of groundwater contamination must coordinate that program with the federal legislation to avoid preemption. The final section summarizes the findings of the individual statutory analyses.

This part shoots at a moving target: the United States Congress is constantly considering amendments to the applicable laws, and the EPA is constantly promulgating regulations to implement recent amendments. Such statutory or regulatory changes could significantly affect state strategies to prevent groundwater contamination. Further, several United States senators have introduced bills that would regulate threats to groundwater quality more comprehensively than

84. For example, in June 1986, Congress passed extensive amendments to the Safe Drinking Water Act and was considering revisions of the Clean Water Act and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Superfund). See infra pt. II, §§ B, C, E.

any existing federal law; if enacted, a new federal groundwater protection statute could render moot some if not much of the discussion in this part.

A. Relationship of Federal Law to State Law

1. The Growth of Federal Pollution Law

Pollution control was long considered the primary responsibility of states. Before the 1970's, federal pollution legislation was largely limited to research and financial assistance, conceding to states the right to set and enforce the basic standards. Because many states were unable or unwilling to abate air, water, and land pollution effectively, however, the United States government, beginning in 1969, rapidly assumed the leading role in pollution control. The National Environmental Policy Act of 1969 (NEPA) requires all federal agencies to assess in writing the environmental consequences of their major actions, but the law neither regulates pollution nor interferes with state prerogatives directly. Congress first broke the state prerogative barrier in the realm of pollution control with the Clean Air Act of 1970 (CAA). Even though there are connections between air quality and groundwater quality (acid rain leachate, heavy metal emissions depositing on a recharge area, etc.), the CAA's connections to groundwater pollution are too remote to merit discussion in any detail.

The Federal Water Pollution Control Act of 1972, now called the Clean Water Act (CWA), requires all "point sources" discharging pollutants into navigable waters to obtain permits, which require certain federally established, minimum levels of technologically achievable pollutant reduction within a certain time. Although the CWA is largely silent on its application to groundwater, certain of its provisions may provide a limited degree of protection.

Subsequent federal laws have more potential to affect groundwater

89. The major limitations of NEPA as a deterrent to groundwater pollution are explained infra pt. II, § H(2).
93. See id. § 1362(14) (definition of a point source).
94. See id. § 1311(b).
95. See infra pt. II, § B.
polluting activities. The Safe Drinking Water Act of 1974 (SDWA) has been pretty much a paper tiger because of statutory and administrative shortcomings, but recent amendments could give it new vitality as a regulatory regime. The Toxic Substances Control Act (TSCA) of 1976 is another statute passed with good intentions; its limited scope and few mandatory provisions, however, have kept it from making much of an impact on groundwater pollution problems. The Federal Insecticide, Fungicide, and Rodenticide Act, as amended by the Federal Environmental Pest Control Act of 1972 (FIFRA), requires federal testing and registration of economic poisons used to kill unwanted plants, insects, and animals, but the FIFRA adds relatively little to groundwater protection.

Two statutes authorizing relatively extensive control of potential groundwater pollution sources are those dealing with the control of hazardous waste management, the Resource Conservation and Recovery Act of 1976 (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, or Superfund). The RCRA prescribes an extensive "cradle-to-grave" system for controlling the safe location and disposal of hazardous wastes. The CERCLA creates a "Superfund" which is used to clean up leaking inactive or abandoned hazardous waste sites. It also authorizes reimbursement of fund expenditures from responsible hazardous waste generators, transporters, and site owners and operators.

Various other federal enactments have more tangential relevance to groundwater contamination. The Surface Mining Control and Reclamation Act of 1977 (SMCRA) regulates strip mining in part to prevent groundwater pollution. The Nuclear Waste Policy Act of 1982 institutes a process aimed at safe disposal of high-level radioactive wastes, which requires segregating them from the environment, including groundwater, for millenia. Other peripheral laws,

97. *See infra* pt. II, § C.
99. *See infra* pt. II, § F.
101. *See infra* pt. II, § G.
104. *See infra* pt. II, § D.
105. *See infra* pt. II, § E.
107. *See infra* pt. II, § H.
such as the Endangered Species Act of 1973 (ESA)\textsuperscript{110} may, in a few situations, thwart developments that could cause groundwater pollution.\textsuperscript{111}

This brief résumé of federal pollution statutes illustrates both that the federal government has, in a relatively short time, become heavily involved in various kinds of pollution control systems, and that the federal statutes taken together do not form a seamless web. No federal statute attempts direct or comprehensive regulation of groundwater contamination sources. Every one of the statutes mentioned, however, has some mechanism that potentially affects some class of sources, and therefore each must be considered in the development of a comprehensive state groundwater pollution control program.

2. Federalism: Limits on State Regulatory Discretion

The Commerce Clause of the United States Constitution\textsuperscript{112} empowers Congress to legislate in virtually all areas of pollution control because pollution affects interstate commerce.\textsuperscript{113} Conversely, several constitutional provisions significantly limit the permissible scope of state pollution regulation. First, courts have interpreted the Commerce Clause to forbid state action that unduly burdens or discriminates against interstate commerce.\textsuperscript{114} The Supreme Court has held, for instance, that Nebraska could not prohibit the export of its groundwater to other states in the absence of a compelling conservation rationale.\textsuperscript{115}

Second, neither state nor federal governments can regulate so drastically as to destroy the entire economic value of private property; such regulation amounts to a “taking,” for which the government must pay fair market value.\textsuperscript{116} Courts, however, rarely if ever find any pollution control measure, no matter how stringent or economically destructive, to constitute a prohibited taking.\textsuperscript{117}

Third, states must afford all citizens and corporations due process

\textsuperscript{111} See infra note 444.
\textsuperscript{112} U.S. CONST. art. I, § 8, cl. 3.
\textsuperscript{113} E.g., Leslie Salt Co. v. Froehlke, 403 F. Supp. 1292 (N.D. Cal. 1974), aff’d in pertinent part, 578 F.2d 742 (9th Cir. 1978). See also FERC v. Mississippi, 456 U.S. 742 (1982); Hodel v. Virginia Surface Mining and Reclamation Ass’n, 452 U.S. 264 (1981). No federal pollution statute has ever been invalidated as beyond the proper boundaries of congressional cognizance; few parties have even bothered to raise the question.
\textsuperscript{116} The leading case is Pennsylvania Coal Co. v. Mahon, 260 U.S. 393 (1922), although its authority has been diluted by such cases as Andrus v. Allard, 444 U.S. 51 (1979).
\textsuperscript{117} More difficult takings issues are raised by the application of local zoning laws. See infra pt. III, § H.
and equal protection. In the pollution control context, this means that state regulation must be designed to achieve objectives within the scope of the state’s police power (such as protection of the public health and safety); it must reflect a reasonable means of achieving those objectives; it must avoid discrimination among regulated entities; and it must afford affected parties the opportunity to be heard on questions affecting their interests.

Finally, state regulation is subject to the Supremacy Clause of the Constitution. Under this provision, when Congress has acted in an area within its authority, state laws that conflict with the federal law, or that obstruct the federal purpose, are invalid to that extent. Whether a particular federal law preempts state law depends upon congressional intent. If the federal statute states plainly that no state may regulate in a particular area, such a statement is determinative. If Congress does not make its intention clear concerning the permissible extent of state regulation, the courts may determine the extent of regulatory discretion Congress meant the states to retain. Because the federal government is free to preempt state regulation altogether in an area falling within Congress’ constitutional authority, it may also adopt less draconian schemes, such as conditioning state participation in certain ways.

To summarize, any state strategy for prevention of groundwater contamination must be consistent with existing federal law and otherwise within constitutional boundaries.

3. Federal Statutory Accommodation of State Law

Despite the existence of federal constitutional and statutory restraints on state regulatory authority, the federal government has not attempted exclusive regulation of pollution in general or of groundwater contamination in particular. Every major federal statute reserves an important role to the states, allowing them some leeway to take into account local conditions and concerns. Under these laws, the state role ranges from mere consultative participation to equal partner to primary enforcer. The typical federal pollution statute requires a

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118. U.S. Const. amend. XIV, § 1.
120. U.S. Const. art. VI, cl. 2.
121. E.g., Rollins Envtl. Serv., Inc. v. Parish of St. James, 775 F.2d 627 (5th Cir. 1985); Northern States Power Co. v. Minnesota, 447 F.2d 1143 (8th Cir.), aff’d, 405 U.S. 1035 (1971).
125. For a more detailed explanation of federalism at work in the pollution control area, see Pierce, Regulation, Deregulation, Federalism, and Administrative Law: Agency Power to
federal agency to set, apply, and enforce basic standards, to conduct research, and to provide financial assistance to states. The states, however, may create their own programs for statutory implementation and enforcement, and if the state programs meet the minimum federal requirements, the federal agency must approve them. At that point, the states become primarily responsible for implementing the federal law, although the federal agency often retains a veto power over certain state actions (such as the issuance of permits) and the authority to supplement state investigatory and enforcement activities. Virtually all states have opted to take advantage of the federal monies, research expertise, and continued exercise of sovereignty offered by the federal programs.

Because Congress has gone as far as it has in accommodating the needs and desires of states to operate their own pollution control programs, a state need not fear preemption of any sound strategy it devises for prevention of groundwater contamination. Thus far, neither Congress nor the EPA has provided a clear statutory direction in controlling groundwater pollution, although the EPA is offering some money and some ambiguous advice. If Congress enacts a statute dealing more specifically and comprehensively with groundwater pollution that is patterned after prior laws, any active and effective existing state program probably will be accommodated—although some details would probably require revision. In this area, more than most pollution control fields, the states are essentially on their own.

B. The Clean Water Act

The principal and most comprehensive federal water pollution statute is the Clean Water Act (CWA). Although the CWA

127. E.g., Train v. NRDC, 421 U.S. 60 (1975).
129. E.g., Wycoff Co. v. EPA, 795 F.2d 1197 (9th Cir. 1986); United States v. City of Colorado Springs, 455 F. Supp. 1364 (D. Colo. 1978).
130. See supra note 86 and accompanying text.
132. 33 U.S.C. §§ 1251-1376 (1982). The CWA limits pollutant discharges by point sources into the waters of the United States. Through a series of increasingly stringent effluent limitations, see id. § 1311(b), the Act seeks to eliminate all discharges into those waters, id. § 1251(a)(1), and in the interim to provide fishable and swimmable water. Id. § 1251(a)(2). The CWA imposes additional, and usually more stringent, controls on new point source discharges and on sources discharging toxic pollutants. Id. §§ 1316, 1317(a). To comply with the statute, point
establishes a far-reaching program for applying and enforcing both federal and state restrictions to sources of water pollution, most of its provisions either do not authorize regulation of pollutant discharges into groundwater or have not been applied to underground water resources. This section’s discussion is limited to the statute’s application to groundwater pollution.

The CWA’s comprehensive program for controlling surface water pollution has not yet been extended to groundwater pollution except in very limited circumstances. The Act’s central provision prohibits the “discharge of any pollutant,” except in compliance with various statutory requirements, including the obligation to apply for a permit.\textsuperscript{133} The “discharge of a pollutant” is defined as “any addition of any pollutant to navigable waters from any point source.”\textsuperscript{134} Navigable waters, in turn, are “the waters of the United States.”\textsuperscript{135} Thus, the Act’s main regulatory obligations apply to point sources of groundwater pollution only if groundwater is included in “the waters of the United States.”

The courts have disagreed on whether the CWA protects groundwater. According to one federal district court, “[t]he disposal of chemical wastes into underground waters which have not been alleged to flow into or otherwise affect surface waters does not constitute a ‘discharge of a pollutant’ within the meaning of [the Act].”\textsuperscript{136} When the EPA claimed authority to place limits on a source’s waste disposal into wells in connection with regulation of that same source’s discharges into surface water, a court of appeals rejected the EPA’s contention. It found that the statute and its legislative history “believe[] an intention to impose direct federal control over any phase of pollution of subsurface waters.”\textsuperscript{137} But the Court of Appeals for the Seventh Circuit subsequently held that the Act “authorizes EPA to regulate the disposal of pollutants into deep wells, at least when the regula-
tion is undertaken in conjunction with limitations on the permittee’s discharges into surface waters.”\textsuperscript{138}

Two more recent opinions are premised on rationales which would support CWA groundwater regulation. In \textit{Quivira Mining Company v. EPA},\textsuperscript{139} the Court of Appeals for the Tenth Circuit upheld the EPA’s authority to require two mining companies that were discharging pollutants into nearby gullies or arroyos to apply for NPDES permits.\textsuperscript{140} The court’s holding that the arroyos were “waters of the United States” was based in part upon an intermittent surface connection between the arroyos and navigable-in-fact streams.\textsuperscript{141} If the court’s holding extended to discharges reaching surface waters through the flow of water in the underground aquifers, the CWA’s application to groundwater pollution would expand significantly, since most groundwater is somehow hydrologically connected to surface waters.\textsuperscript{142}

A recent United States Supreme Court decision involving the CWA dredge and fill permit program\textsuperscript{143} supports the \textit{Quivira} analysis.\textsuperscript{144}

\textsuperscript{138} United States Steel Corp. \textit{v. Train}, 556 F.2d 822, 852 (7th Cir. 1977). The court did not specify on which of the two possible bases for its holding it relied: the EPA can regulate discharges into groundwater if that groundwater is connected with or otherwise affects surface water, or the EPA can regulate any discharges into groundwater, whether or not that water affects surface water, as long as the limits on groundwater discharge are imposed on an operation that is also discharging into surface waters. \textit{See id. at} 852 n.61 (upholding the EPA’s rejection of U.S. Steel’s factual assertion that its well injected into groundwater that did not affect surface water). \textit{Cf. New York \textit{v. United States}, 620 F. Supp. 374, 381 (E.D.N.Y. 1985) (declining to decide whether the CWA applies to discharges into groundwater since discharges into surface water provided basis for refusal to dismiss complaint for failure to state a cause of action). The second interpretation of the holding in \textit{United States Steel} would be inconsistent with the Fifth Circuit’s earlier decision in \textit{Exxon Corporation}.\textsuperscript{139} 765 F.2d 126 (10th Cir. 1985), \textit{cert. denied}, 106 S. Ct. 791 (1986).

\textsuperscript{140} \textit{Id. at} 130.

\textsuperscript{141} \textit{Id. The evidence indicated that although the arroyos were not navigable in fact, surface flow occasionally occurred, providing a surface connection with other surface navigable waters, independent of the underground flow. In addition, however, the court noted that the arroyos soaked into the earth’s surface, becoming part of the underground aquifers. “[A]fter a lengthy period, perhaps centuries, the underground water moves toward eventual discharge” into surface waters. \textit{Id. at} 129.

\textsuperscript{142} In a decision issued after \textit{Quivira} (but not citing that case), a federal district court in Michigan held that the CWA does not authorize federal regulation of potential sources of groundwater contamination, even if contamination from those sources would eventually migrate from the groundwater into navigable surface waters. \textit{See Kelley \textit{v. United States}, 618 F. Supp. 1103, 1106-07 (W.D. Mich. 1985).}\textsuperscript{143} 33 U.S.C. § 1344(a) (1982). The CWA gives the Army Corps of Engineers the authority to issue permits for the discharge of dredged or fill material into “the waters of the United States.” \textit{Id. §§ 1344(a), (d), 1362(7). The Corps’ permit regulations cover persons discharging dredged or fill material into wetlands adjacent to navigable waters. 33 C.F.R. pt. 323 (1985). The regulations defined wetlands as “areas that are inundated or saturated by surface or ground water” in a manner sufficient to support certain kinds of vegetation. \textit{Id. § 323.2(c).}\textsuperscript{144} United States \textit{v. Riverside Bayview Homes, Inc.}, 106 S. Ct. 455 (1985).
According to a unanimous Court, the Army Corps of Engineers was authorized to apply the dredge and fill permit program to wetlands (which encompass lands saturated by groundwater) adjacent to navigable waters.\(^{145}\) Congress recognized when it passed the CWA that protection of aquatic ecosystems "demanded broad federal authority to control pollution, for '[w]ater moves in hydrologic cycles and it is essential that discharge of pollutants be controlled at the source.'"\(^{146}\) The Court stated that "Congress chose to define the waters covered by the Act broadly."\(^{147}\) The Corps could rationally conclude that the definition included adjacent wetlands because, as the Corps had stated, "'[t]he regulation of activities that cause water pollution cannot rely on ... artificial lines ... but must focus on all waters that together form the entire aquatic system.'"\(^{148}\)

The Supreme Court's decision does not definitively resolve the issue of the CWA's application to discharges of most contaminants into groundwater. The case dealt with the scope of the dredge and fill permit program, not the basic pollution permit program. The former applies only to discharges of dredged and fill material,\(^{149}\) while the latter applies to any pollutant,\(^{150}\) as broadly defined in the Act.\(^{151}\) Furthermore, the Court relied on legislative history specific to dredge and fill permits.\(^{152}\) The decision, nevertheless, bears on the scope of the broader permit program because both programs apply to discharges into "'navigable waters.'" The decision suggests that if the EPA issued regulations applying the general permit program to discharges into groundwater that is hydrologically connected to surface waters, the Supreme Court might well defer to the EPA's interpretation of the statute.\(^{153}\) The EPA, however, has not yet so interpreted or applied the statute.

Even though potential sources of groundwater pollution are not now regulated directly, the CWA still has some application to groundwater resources. First, a state administering an EPA-approved permit program is required in the permits it issues to "'control the disposal

\(^{145}\) See id. at 465.

\(^{146}\) Id. at 462 (quoting S. Rep. No. 414, 92d Cong., 1st Sess. 77 (1972)).

\(^{147}\) Id.

\(^{148}\) Id. at 463 (quoting 42 Fed. Reg. 37,128 (1977)).


\(^{150}\) Id. § 1342(a).

\(^{151}\) Id. § 1362(6).

\(^{152}\) Riverside Bayview Homes, 106 S. Ct. at 462-63.

of pollutants into wells." 154 The EPA's regulations listing the elements of an acceptable state permit program require that state law authorize the state agency "to prevent the pollution of ground . . . waters." 155 This requirement adds little or no protection to what is already provided by other statutes, however, since an approved underground injection control program under the Safe Drinking Water Act 156 also satisfies the requirements of the CWA. 157

Second, the states may regulate groundwater under the state water quality standards provisions of the Act. The states must develop water quality standards based on the EPA's water quality criteria. 158 Those criteria must accurately reflect the latest scientific knowledge on "the kind and extent of all identifiable effects on health and welfare . . . which may be expected from the presence of pollutants in any body of water, including ground water . . ." 159 Further, the EPA must develop and publish information "on the factors necessary to restore and maintain the chemical, physical, and biological integrity of all navigable waters [and] ground waters . . . ." 160 Thus, the EPA's water quality criteria must cover the effects of pollution on groundwater.

The states' obligations are far less clear. They are not compelled to adopt the EPA's water quality criteria, although it is EPA policy to request states to justify departures. 161 One court held in 1976 that if a state fails to adopt water quality standards acceptable to the EPA, the Agency is required to issue standards for the state's waters, including any subsurface waters having a clear hydrological nexus with surface waters. 162 In the intervening decade, however, no other court has addressed the issue.

159. Id. § 1314(a)(1)(A) (emphasis added).
160. Id. § 1314(a)(2). This separate reference to groundwater may indicate that "navigable waters" do not include groundwater, at least for purposes of this section.
161. See Mississippi Comm'n on Natural Resources v. Costle, 625 F.2d 1269, 1273 (5th Cir. 1980).
162. Kentucky ex rel. Hancock v. Train, 9 Env't Rep. Cas. (BNA) 1280 (E.D. Ky. 1976). The court in that case apparently relied at least in part on the EPA's regulatory definition of "waters of the United States" in effect at the time. Id. at 1281-82. The EPA's current regulations still require states to establish water quality standards, which are defined as designated uses and water quality criteria based on those uses for the "waters of the United States." 40 C.F.R. § 131.3(i) (1985). These regulations do not define the latter term, but the EPA's regulations implementing the NPDES program and specifying the requirements for state permit programs apparently omit groundwater from the term "waters of the United States." See id. §§ 122.2, 123.2. In short, there is no firm authority for the proposition that the CWA compels the states to establish water quality standards for groundwater.
Third, the provisions of the CWA dealing with areawide waste treatment management also address groundwater contamination. Section 208 requires each state to develop "effective areawide waste treatment management plans" for areas that have "substantial water quality control problems." Each plan must include several components relating to the protection of groundwater quality, including (1) a process to identify and control, to the extent feasible, salt water intrusion into rivers, lakes, and estuaries resulting from reduction of fresh water flow from any cause, including groundwater extraction, and (2) a process to control the disposal of pollutants on land or in subsurface excavations within the area to protect both ground and surface water quality. In addition, a "208" plan must include a process for identifying and controlling, to the extent possible, potential sources of groundwater pollution such as nonpoint sources (e.g., return flows from irrigated agriculture) and surface and underground mine runoff.

While the section 208 planning process seems ideally suited for some facets of groundwater quality control, the reality has been at odds with the ideal. The section 208 process started slowly, and the EPA's initial emphasis on point source controls encouraged states to avoid the politically sensitive issues surrounding nonpoint source pollution control. Pitched battles developed between state, regional, and local officials, all of whom wanted to protect and enhance their own policymaking responsibilities. Erratic federal funding contributed to further delays in the section 208 planning process. In short, the process has been marked by "uncertainty and confusion" and, due to persistent efforts to reduce federal funding for state programs under the CWA, its future "remains in doubt."

Fourth, the EPA provides grants to the states under the CWA to assist the states in information gathering, program development, and program administration related to groundwater pollution.

164. Id. § 1288(b)(2)(l), (K).
165. Id. § 1288(b)(2)(F), (G). The EPA is required to issue certain information to agencies responsible for implementing § 208 areawide waste treatment management plans. That information concerns methods to control pollution resulting from nonpoint sources, underground mines, the disposal of pollutants in wells or subsurface excavations, and changes in the movement, flow, or circulation of groundwaters. Id. § 1314(f).
166. See J. Bonine & T. McGarity, supra note 87, at 437.
168. Id.
171. See 33 U.S.C. §§ 1285(g), (j), 1288 (1982).
The value of the CWA as a mechanism for groundwater pollution control is at best highly questionable. Most of the Act's principal provisions have not been applied to groundwater pollution at all. Other provisions, theoretically, could be applied to it only indirectly, when groundwater pollution affects the quality of surface waters. Even those parts of the regulatory program that are meant to prevent subsurface contamination have been implemented slowly and with little enthusiasm. The CWA has not been a focal point of the federal regulatory attempt to protect groundwater quality.

C. The Safe Drinking Water Act

The Safe Drinking Water Act (SDWA)\textsuperscript{172} authorizes the four following principal programs: one for enacting and applying national drinking water regulations; a second for regulating the use of underground injection wells; a third for the protection of sole source aquifers; and a fourth, added in 1986, for establishing wellhead protection area plans. Although the Act's name suggests that Congress intended to protect all drinking water sources including groundwater from contamination, the second subsection shows that the statute has fallen far short of solving the groundwater pollution problem. Recent statutory amendments may redress some of the prior deficiencies if vigorously implemented and provide an opportunity for states to enhance protection of public water supplies with federal financial assistance.

1. The SDWA Programs
   a. National drinking water regulations

   In its original form, the SDWA required the EPA to establish recommended maximum contaminant levels (MCLs) for contaminants of public water systems\textsuperscript{173} with a potential adverse effect on public health.\textsuperscript{174} These recommended MCLs were to be set at levels where no known or anticipated adverse effects on public health would occur, allowing an adequate margin of safety.\textsuperscript{175} The EPA was then required to issue MCLs establishing the maximum permissible level of a contaminant in public water supplies.\textsuperscript{176} The MCLs would be


\textsuperscript{173} Public water systems provide water for human consumption through at least 15 service connections or to at least 25 individuals. Id. § 300f(4); see also 40 C.F.R. § 141.2(e) (1985).

\textsuperscript{174} 42 U.S.C. §§ 300g-1, 300f(1) (1982). A contaminant includes "any physical, chemical, biological, or radiological substance or matter in water." Id. § 300f(6).

\textsuperscript{175} Id. § 300g-1(c).

\textsuperscript{176} Id. §§ 300g-1(b)(3), 300f(3).
set as close to the recommended MCLs as technologically and financially feasible.\textsuperscript{177}

The statutory scheme did not work the way Congress intended. The EPA set MCLs "for only a small fraction of the contaminants that are found in public water systems and that may have an adverse effect on human health."\textsuperscript{178} Because the Agency only required public water supply systems to monitor for regulated contaminants, contamination by other potentially hazardous substances often went undetected.\textsuperscript{179} Even when the EPA set MCLs for a particular substance, it failed to update them, so that the regulations required only the use of technology that was available when the SDWA was passed in 1974.\textsuperscript{180}

The result of these regulatory deficiencies was "mounting evidence that our water supplies are contaminated by dangerous chemicals."\textsuperscript{181} The federal Office of Technology Assessment found that "29 percent of the groundwater drinking supplies of the 954 United States cities with populations over 10,000 are contaminated. The EPA reports that forty-five percent of these public water system[s] contain organic chemicals."\textsuperscript{182}

Congress responded by overhauling the SDWA in 1986. To remedy the EPA's failure to regulate most public water supply contaminants, the Act now sets a timetable requiring the Agency to regulate eighty-three named contaminants within three years of the amendments' enactment.\textsuperscript{183} For each of the listed contaminants, the EPA must simultaneously issue maximum contaminant level goals (at which no known or anticipated adverse effects on human health occur and which allow an adequate margin of safety) and enforceable national primary drinking water regulations (which contain MCLs as close to the MCL goals as is feasible).\textsuperscript{184} The primary regulations must reflect the best

\begin{itemize}
  \item \textsuperscript{177} Id. § 300g-1(b)(3).
  \item \textsuperscript{181} Id. at 16.
  \item \textsuperscript{182} Id.
  \item \textsuperscript{183} 42 U.S.C. § 300g-1(b)(1) (1982), amended by Pub. L. No. 99-339, § 101(b), 100 Stat. 642, 643 (1986). The EPA must issue drinking water regulations for nine contaminants within one year, 40 more within two years, and 34 others within three years. Id. The Agency may substitute up to seven contaminants for those on the congressional list if it feels that regulations for these substitutes would provide greater public health protection. Id. § 300g-1(b)(2), amended by Pub. L. No. 99-339, § 101(b), 100 Stat. 642, 643 (1986). The 83 contaminants, which include volatile organic chemicals, microbiology and turbidity, inorganics, organics, and radionuclides, are listed at H.R. Rep. No. 575, 99th Cong., 2d Sess. 30 (1986).
\end{itemize}
technology and treatment techniques available (taking cost into account) and must be at least as effective in controlling synthetic organic chemicals as granular activated carbon.\textsuperscript{185} The EPA must also issue MCL goals and primary regulations for any other contaminant that may have any adverse health effects and is known or anticipated to occur in public water systems.\textsuperscript{186} To remedy the problem of contamination by unregulated substances, the amended Act requires all public water supply systems to monitor for unregulated contaminants at least once every five years.\textsuperscript{187}

Under the SDWA, each state has the opportunity to assume primary responsibility for enforcing the national drinking water regulations\textsuperscript{188} and to adopt regulations more stringent than the federal ones.\textsuperscript{189} A state with primary enforcement responsibility may grant variances or exemptions, but only with EPA approval.\textsuperscript{190}

b. Underground injection wells

The second major component of the SDWA is the program for controlling underground injection.\textsuperscript{191} The Act requires the EPA to

\textsuperscript{185} Id. § 300g-1(b)(5), amended by Pub. L. No. 99-339, § 101(b), 100 Stat. 642, 644-45 (1986).

\textsuperscript{186} Id. § 300g-1(b)(3), amended by Pub. L. No. 99-339, § 101(b), 100 Stat. 642, 643 (1986).

\textsuperscript{187} Id. § 300g-4(a)(2), amended by Pub. L. No. 99-339, § 106, 100 Stat. 642, 650 (1986). The extent of the monitoring required will differ in accordance with the number of persons served by the public water supply system, the source of the supply, and the contaminants likely to be found. Id.

\textsuperscript{188} A state may assume this responsibility if the EPA concludes that the state (1) has adopted drinking water regulations that are no less stringent than the federal regulations; (2) has adopted and is implementing adequate procedures for enforcing the state regulations, including whatever monitoring the EPA requires by regulation; (3) complies with the EPA record-keeping and reporting requirements; (4) permits variances and exemptions from the drinking water regulations only in accordance with the SDWA; and (5) has adopted and can implement an adequate plan for providing safe drinking water under emergency circumstances. 42 U.S.C. § 300g-2(a) (1982), amended by Pub. L. No. 99-339, § 101(e)(2), 100 Stat. 642, 646 (1986). See also 40 C.F.R. § 142.10 (1985). The state’s program must apply to all public water systems other than those specifically exempted by EPA’s regulations. Id. § 142.3.

\textsuperscript{189} 42 U.S.C. § 300g-3(e) (1982).

\textsuperscript{190} Id. §§ 300g-4, -5, amended by Pub. L. No. 99-339, §§ 104, 105(a), 100 Stat. 642, 649-50 (1986). The 1986 amendments provide further safeguards to the quality of public water supplies. They require the EPA to issue regulations requiring disinfection by public water systems, Pub. L. No. 99-339, § 101(b), 100 Stat. 642, 643 (1986) (to be codified at 42 U.S.C. § 300g-1(b)). The use of lead in installation or repair of public water systems or facilities connected to a public water system is also prohibited. Id. § 109, 100 Stat. 642, 651 (1986) (to be codified at 42 U.S.C. § 300g).

issue regulations for state underground injection control (UIC) programs to prevent underground injection that endangers drinking water sources. 192 The EPA may exclude from regulation injection into aquifers that have no real potential to be used as drinking water sources. 193

The EPA has concluded that a UIC program is necessary in every state to assure that underground injection will not endanger drinking water sources. 194 Each state must demonstrate to the EPA that it has adopted and will implement a satisfactory UIC program and will comply with EPA recordkeeping and reporting requirements. 195

If the EPA approves a state UIC program, 196 the state assumes primary enforcement responsibility for underground injection activity. 197 States retain the authority to adopt or enforce regulations concerning underground injection that are more stringent than federal SDWA regulations. 198

Under the EPA’s regulations, a state UIC permit program must regulate underground injection by five classes of wells. 199 The regulations impose different requirements for construction, operation, and

192. 42 U.S.C. § 300h(a)(1), (b)(1) (1982). An underground source of drinking water is an aquifer or a portion thereof

(1) Which supplies any public water system; or (2) which contains a sufficient quantity of ground water to supply a public water system; and (i) currently supplies drinking water for human consumption; or (ii) contains fewer than 10,000 mg/l total dissolved solids.

193. 40 C.F.R. § 144.3 (1985). Underground injection endangers drinking water sources if it may result in the presence in underground water which supplies or can reasonably be expected to supply any public water system of any contaminant, and if the presence of such contaminant may result in such system’s not complying with any national primary drinking water regulation or may otherwise adversely affect the health of persons.

194. 40 C.F.R. §§ 144.1(g), 146.4 (1985).


197. The EPA will approve a state UIC program only if the state prohibits any underground injection not authorized by permit or rule. Id. § 300h(b)(1)(A); 40 C.F.R. §§ 144.1(e), 144.11 (1985). Requirements for state UIC programs are contained in 40 C.F.R. pt. 145. A state may not issue a permit or rule that authorizes any injection that will endanger drinking water sources.

198. 42 U.S.C. § 300h(b)(1)(B). State UIC programs also must require well owners and operators to comply with inspection, monitoring, recordkeeping, and reporting requirements. Id. § 300h(b)(1)(C), amended by Pub. L. No. 99-339, § 201(a), 100 Stat. 642, 653 (1986). If the EPA disapproves a state’s program, in whole or in part, the EPA must administer a program for the state. See id. § 300h-1(c); 40 C.F.R. § 144.1(e) (1985).


201. 40 C.F.R. § 144.1(g) (1985).
monitoring of wells in each class.\textsuperscript{200} Class I wells include those used by hazardous waste generators or management facilities operators to inject waste "beneath the lowermost formation containing, within one-quarter mile of the well bore, an underground source of drinking water."\textsuperscript{201} Under the 1986 amendments, the EPA must issue regulations requiring the operators of Class I wells to monitor for migration of injected substances into or in the direction of a drinking water aquifer.\textsuperscript{202} Class II wells are those that inject fluids in connection with conventional oil and gas production, enhanced oil or natural gas recovery, or storage of liquid hydrocarbons.\textsuperscript{203} Class III wells are those that inject for the extraction of minerals (such as sulfur, uranium, salts, and potash).\textsuperscript{204} Class IV wells include those used to dispose of hazardous or radioactive waste into or above a formation that contains an underground source of drinking water within one-quarter mile of the well.\textsuperscript{205} Injection wells not included in the previous four classes comprise Class V.\textsuperscript{206}

c. Sole source aquifers

The third major SDWA venture is the sole source aquifer program. It applies to aquifers that the EPA finds to be the sole or principal drinking water source for an area and that, if contaminated, would create a significant hazard to public health.\textsuperscript{207} Federal financial assistance must be withheld from any project that the EPA determines may contaminate such an aquifer through a recharge zone and create a significant hazard to public health.\textsuperscript{208}

\begin{itemize}
\item \textsuperscript{200} See id. §§ 146.11-.52; see also id. §§ 144.12-.15.
\item \textsuperscript{201} Id. § 146.5(a)(1). Class I wells also include other industrial and municipal disposal wells that inject fluids beneath such a formation. Id. § 146.5(a)(2).
\item \textsuperscript{203} 40 C.F.R. § 146.5(h) (1985). The UIC program for Class II wells is administered in Kansas by the Kansas Corporation Commission in conjunction with the KDHE, id. § 147.851, unlike the State's programs for the other four classes of wells, which are administered solely by the KDHE.
\item \textsuperscript{204} Id. § 146.5(c).
\item \textsuperscript{205} Id. § 146.5(d). The EPA's regulations required the elimination over a six-month period of operation of Class IV wells that before July 18, 1980 injected hazardous waste directly into an underground source of drinking water. The construction or operation of any new Class IV well is prohibited. Id. §§ 144.1(g), 144.13(a)(1)-3. The 1986 amendments seek to insure that this prohibition is enforced. See Pub. L. No. 99-339, § 202, 100 Stat. 642, 654-57 (1986) (to be codified at 42 U.S.C. § 300h-2); H.R. REP. No. 575, 99th Cong., 2d Sess. 39-40 (1986).
\item \textsuperscript{206} 40 C.F.R. § 146.5(e) (1985).
\item \textsuperscript{207} 42 U.S.C. § 300h-3(e) (1982).
\item \textsuperscript{208} Id. Federal financial assistance is available to plan or design the project to assure that it will not contaminate the aquifer. Id.
\end{itemize}
The 1986 amendments authorize state and local governments to apply for matching federal grants of up to four million dollars per fiscal year to assist in the development and implementation of demonstration programs to protect "critical aquifer protection areas." 209 The EPA is directed to establish criteria by June 1988 for identifying such areas, which must lie within an area designated as a sole source or principal source aquifer. 210 Grant applicants must outline the boundaries of the critical area, include a hydrogeologic assessment of it, designate a planning entity, develop a comprehensive management plan for the area, and establish a schedule for carrying out the plan. 211 The EPA has 120 days from submission of grant applications to approve or disapprove. 212

d. Wellhead protection programs

The 1986 amendments created a new federal grant program for the protection of wellhead areas. States may apply for EPA grants to protect groundwater by establishing, in accordance with guidelines to be issued by the EPA, wellhead protection area plans. 213 The grants would cover from 50 to 90 percent of the plan implementation costs. 214 Because of "the important State role in protecting groundwater," 215 the EPA is to exercise its disapproval authority "judiciously." 216 The Agency may disapprove a state plan that fails to specify: the duties of state and local agencies and public water systems; the wellhead

210. Id. § 203, 100 Stat. at 657 (to be codified at 42 U.S.C. §§ 300h-6(b)(1), (d)). In setting up these criteria, the EPA must consider the vulnerability of the aquifer to contamination; the number of persons using the ground water as a drinking water source; the economic, social, and environmental benefits that would result to the area by preventing degradation; and any similar costs that would result from contamination of the aquifer. Id. § 203, 100 Stat. at 657 (to be codified at 42 U.S.C. § 300h-6(d)).
211. Id. § 203, 100 Stat. at 658 (to be codified at 42 U.S.C. § 300h-6(e)). The amendments also describe the components of the comprehensive management plan. See id. § 203, 100 Stat. at 658-59 (to be codified at 42 U.S.C. § 300h-6(f)). A Clean Water Act § 208 areawide waste treatment management plan can serve as the comprehensive management plan if it has been approved by the EPA. Id. § 203, 100 Stat. at 659 (to be codified at 42 U.S.C. § 300h-6(g)).
212. Id. § 203, 100 Stat. at 659 (to be codified at 42 U.S.C. § 300h-6(h)).
213. Pub. L. No. 99-339, § 205, 100 Stat. 642, 660-61 (1986) (to be codified at 42 U.S.C. § 300h-7(a)). The statute defines a wellhead protection area as the "surface and subsurface area surrounding a water well or wellfield supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield." Id. § 205, 100 Stat. at 662 (to be codified at 42 U.S.C. § 300h-7(c)).
216. Id.
protection area, based on all reasonably available hydrogeologic information; all potential anthropogenic sources (i.e., those resulting directly or indirectly from human activities) of contamination within the area which may have an adverse effect on human health; a description of programs to provide financial assistance, education, training, and necessary source controls; contingency plans for locating and providing alternate sources of drinking water in the event of contamination; and how the implementing agency would consider the potential impact on groundwater quality of anthropogenic sources of contamination within the expected wellhead area in locating a new water well. The only penalty for failing to develop an acceptable wellhead protection plan is ineligibility for federal grants.

The 1986 amendments impose an additional requirement on any state having more than 2,500 active wells which use annular injection as of January 1, 1986. Such a state must certify in its wellhead protection area plan that it is adequately enforcing a program to protect against certain harmful associated contaminants. Failure to submit an acceptable certification results in ineligibility for wellhead area protection grants.

e. Other provisions

The SDWA also grants the EPA authority to issue administrative orders or bring civil suits in federal district court in emergency situations. The Agency may take whatever actions it finds necessary to protect the public health if it believes that a contaminant which is present in or is likely to enter a public water system may present an imminent and substantial endangerment to health. The 1986 amendments for the first time authorize the EPA to take such actions to abate imminent hazards to an underground source of drinking water. The statute also authorizes any person to bring a civil action against any other person who is alleged to be in violation of any requirement

219. Annular injection means "the reinjection of brines associated with the production of oil or gas between the production and surface casings of a conventional or gas producing well." Pub. L. No. 99-339, § 205, 100 Stat. 642, 663 (1986) (to be codified at 42 U.S.C. § 300h-7(i)(2)).
220. Id. § 205, 100 Stat. at 663 (to be codified at 42 U.S.C. § 300h-7(i)(1)).
221. Id. § 205, 100 Stat. at 663 (to be codified at 42 U.S.C. § 300h-7(i)(4)).
222. 42 U.S.C. § 300(a) (1982), amended by Pub. L. No. 99-339, § 204, 100 Stat. 642, 660 (1986). The 1986 amendments authorize the EPA or a state responsible for drinking water programs under the SDWA to order a person responsible for contaminating a public drinking water supply to provide an alternate source of drinking water. Id.
of the SDWA, or against the EPA where the Agency allegedly has failed to perform a duty that the statute requires it to perform.\textsuperscript{223}

2. Assessment of the SDWA

The 1986 amendments to the SDWA may redress some of the major deficiencies that prevented the original statutory program from achieving its intended goals.\textsuperscript{224} If the EPA adheres to the statutory timetable for issuing primary drinking water standards and then follows up with appropriate enforcement efforts against public water systems violating the standards, threats to public health should be reduced. Implementation of the statute's expanded monitoring requirements for unregulated contaminants should also reduce these threats. The two new federal grant programs provide an opportunity for states to develop programs for protection of critical aquifer and wellhead areas with EPA technical and financial assistance.

Even if the amended SDWA is enthusiastically implemented at both the federal and state levels, though, it does not approach a complete solution to overall groundwater pollution. The national drinking water standards are limited in scope; they apply only to public water systems and provide no protection at all to private wells. Moreover, the drinking water regulations may not even afford adequate protection to the users of public water systems. The MCLs contained in the primary regulations purport to be health-based,\textsuperscript{225} yet only the MCL goals are set at a level sufficient to protect the public health with an adequate margin of safety.\textsuperscript{226} The MCLs themselves are only established as close to the goals as is feasible after factoring in cost considerations.\textsuperscript{227} Under the 1974 version of the statute, the EPA promulgated at least one MCL that condoned a risk of one excess cancer death per 10,000 people, a risk level often deemed unacceptable.\textsuperscript{228} Implementation of the amended statute similarly could fall short. Indeed, some European scientists recently concluded that granular activated carbon, the “benchmark” technology in the 1986 amendments, may be only briefly effective (as little as ten weeks) in removing potentially carcinogenic trihalomethanes from drinking water.\textsuperscript{229}

Another possible defect in the drinking water regulations is the

\textsuperscript{223} Id. § 300j-8(a).

\textsuperscript{224} See supra notes 178-82 and accompanying text; see also Henderson, supra note 16, at 37.


\textsuperscript{227} Id.


\textsuperscript{229} See Inside EPA, June 6, 1986, at 1.
absence of any requirement that the EPA issue MCLs for total cumulative organic contamination. The absence of such a requirement would be significant if the synergistic effects of exposure to relatively low levels of multiple organics are greater than the effects of exposure to higher levels of one contaminant. Finally, and perhaps most importantly, the drinking water regulations only prohibit distribution of drinking water with excess levels of contaminants; they do nothing to prevent contamination of public water systems, through source controls or otherwise. After-the-fact cleanup is far more costly than prevention, and cleanup is not always physically possible.

Other components of the SDWA do address source controls, but these programs, even in combination, leave far too many gaps to provide for comprehensive control. The UIC program covers only one category of sources, and the sole source aquifer, critical aquifer protection area, and wellhead protection area programs are all voluntary. States are encouraged to implement the latter programs by the inducement of federal financial support, but are not required to do anything. As one Senator remarked, "the wellhead protection program is like a mouse as compared to an elephant in regard to the scope of the problem that needs to be addressed." The SDWA protects only groundwater used for drinking, not resources devoted to other beneficial purposes. The critical aquifer protection area program is even narrower in scope. The funding provided by the 1986 amendments will probably support only a handful of demonstration programs.

The newly amended SDWA is a marked improvement over the 1974 version. It should result in enhanced protection of groundwater quality at both the federal and state level. But, as a sponsor of the 1986 amendments stated, the amended Act represents only a "small . . . start on ground water protection." Instead of relying on the Act's relatively narrow programs as the sole means for groundwater protection, states and localities should use the authority and assistance provided them by the federal government as the foundation for a more inclusive groundwater pollution strategy.

232. Id. at S6291 (statement of Sen. Baucus).
233. See id. at S6924 (statement of Sen. Bentsen).
234. Cf. id. at S6289 (statement of Sen. Durenberger) (The critical aquifer protection area program is only a demonstration program; it is "not the beginning of a comprehensive, national program to protect our ground water resources," nor is it "the first cycle of some open ended Federal commitment to ground water protection.").
235. Id. (statement of Sen. Durenberger).
236. See, e.g., Groundwater Pollution II, supra note 3, pt. II, § 1 (describing a two-part land use control strategy analogous to an expanded version of the SDWA's wellhead protection area and critical aquifer protection area programs).
D. The Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) was designed in part to reduce threats to the integrity of groundwater posed by solid and hazardous waste.\textsuperscript{237} In particular, Congress found that the open dumping\textsuperscript{238} of solid wastes is "harmful to health [and] contaminates drinking water from underground and surface supplies."\textsuperscript{239} Congress also concluded that because many land disposal facilities are not capable of assuring long-term containment of hazardous wastes, reliance on land disposal should be minimized or eliminated.\textsuperscript{240} The RCRA was intended to prohibit future open dumping of solid wastes, to convert existing open dumps into safer facilities,\textsuperscript{241} and to assure that hazardous waste management practices "are conducted in a manner which protects human health and the environment."\textsuperscript{242}

This section of the article outlines the provisions of the RCRA pertinent to groundwater protection. It concludes that the Act, even as amended, is too limited to be the main basis for a groundwater protection strategy.

I. The Statute

a. Regulation of solid wastes

To insure protection of public health and welfare and of the quality of groundwater, the RCRA requires the EPA to develop solid waste management guidelines describing levels of performance and methods of leachate control.\textsuperscript{243} The EPA does not directly regulate the treatment, storage, or disposal of nonhazardous wastes. Rather, the states are responsible for managing activities related to these wastes under plans they develop and submit for EPA approval.\textsuperscript{244}

\textsuperscript{238} An "open dump" is defined in the RCRA as a "facility or site where solid waste is disposed of which is not a sanitary landfill . . . and which is not a facility for disposal of hazardous waste." 42 U.S.C. § 6903(14) (1982). The EPA is responsible for issuing regulations containing criteria for distinguishing between facilities which are sanitary landfills and those which are open dumps. See id. § 6944(a). The RCRA prohibits the operation of open dumps. See infra pt. III, § E(1).
\textsuperscript{239} 42 U.S.C. § 6901(b)(4) (1982).
\textsuperscript{243} 42 U.S.C. § 6907(a) (1982).
\textsuperscript{244} See 42 U.S.C. §§ 6941-6949 (1982 & Supp. III 1985). The RCRA's provisions concerning state regulation of solid wastes and Kansas legislative and administrative efforts to manage solid waste activities are discussed infra pt. III, § E.
b. Regulation of hazardous wastes

The federal government plays a much more direct and integral role in managing hazardous waste-related activities. The RCRA's hazardous waste regulations apply not only to the generation and disposal of such waste but also to all intervening activities.

The regulations cover all substances specifically listed by the EPA as hazardous wastes and those the EPA identifies as having the characteristics of hazardous waste. The RCRA coverage is only as comprehensive as the number of hazardous substances listed or identified. Because the EPA had not acted quickly or comprehensively enough to include various wastes in the RCRA scheme, Congress in 1984 ordered the EPA, "where appropriate," to list various substances containing dioxin and dibenzofuran as hazardous wastes. The EPA was also to determine by February 1986 whether to list other such wastes. These amendments will expand the scope of the hazardous waste management program.

The RCRA requires the EPA to develop and apply to generators and transporters of listed or identified hazardous wastes whatever standards the Agency finds are necessary to protect human health and the environment. These regulations require generators and transporters to properly label containers used to store and transport hazardous waste and to track the movement of the waste through the use of a manifest system.

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245. Hazardous wastes are solid wastes which, because of their quantity or concentration, or physical or infectious characteristics, may:
(a) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness; or
(b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.


246. The procedures for listing and identifying hazardous wastes are set forth at 42 U.S.C. § 6921 (1982 & Supp. III 1985). The EPA has issued regulations defining a hazardous waste, 40 C.F.R. § 261.3 (1985); excluding certain materials from the definition of a solid (and, therefore, also a hazardous) waste, id. § 261.4; setting criteria for identifying the characteristics of and listing hazardous wastes, id. §§ 261.10-261.11, 261.20-24; and actually listing various wastes as hazardous, id. §§ 261.30-33; see also C.F.R. pt. 261 apps. VII-VIII (1985).


248. Id. § 6921(e)(2).


Before 1984, the EPA exempted generators of small quantities of hazardous wastes (less than 1000 kilograms per month) from many of the regulatory requirements. The 1984 amendments command the EPA to issue standards for generators of between 100 and 1000 kilograms of hazardous waste per month. Although these standards may vary from those applicable to larger quantity generators, they must be "sufficient to protect human health and the environment."

The EPA must also establish performance standards for facilities that treat, store, or dispose of hazardous wastes. These "TSD facilities" must comply with EPA location, design, construction, and operation standards, which are applied to individual facilities through a permit program run by the EPA or an authorized state.

Certain TSD facilities may continue to operate temporarily even though they do not have a permit. Facilities qualifying for "interim status" are treated as if they have a permit between the time they apply for a permit and the time their applications are resolved. The 1984 amendments impose limits on the duration of interim status. The amended statute also authorizes the EPA to require

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nation of their hazardous wastes. That manifest is to accompany the waste during its transportation from the point of generation to the point of disposal, treatment, or storage. 42 U.S.C. § 6903(12) (1982). Discrepancies between the information included on the manifest and the actual wastes shipped or received must be reported to the EPA.


254. Id. § 6921(d)(2). At a minimum, the small quantity generator standards must require that all treatment, storage, or disposal of small quantity generator hazardous wastes take place at a facility that either has a RCRA permit or qualifies for interim status. Id. § 6921(d)(6). In addition, the EPA may regulate generators of 100 kilograms or less to protect human health and the environment. Id. § 6921(d)(4).

255. Id. § 6924(a).


257. To qualify for interim status a person must: (1) own or operate a facility which was in existence on November 19, 1980 or is in existence on the effective date of statutory or regulatory changes first rendering the facility subject to the TSD permit requirements; (2) have properly notified the EPA or a state with an approved RCRA hazardous waste program of the location and general description of the activities engaged in and the hazardous wastes handled by that person; and (3) have applied for a final RCRA permit. Id. §§ 6925(e), 6930(a) (Supp. III 1985).

258. For a land disposal facility granted interim status before the 1984 amendments were enacted, interim status was to terminate on November 8, 1985 unless the owner or operator of the facility was in compliance with groundwater monitoring and financial responsibility requirements. See id. § 6925(e)(2). An estimated two-thirds of the hazardous waste disposal sites in the nation (most of which were facilities generating their own waste on-site) shut down in November 1985 because they were unable to comply with these requirements. See 16 Env't Rep. (BNA) 1619 (Dec. 20, 1985). Interim status for existing surface impoundments expires in November 1988, unless the impoundment (1) has at least one liner (and there is no evidence that the liner is leaking); (2) is located more than one-quarter mile from an underground source of drinking water; and (3) is in compliance with the groundwater monitoring requirements that apply to facilities with final permits. 42 U.S.C. § 6925(j) (Supp. III 1985).
corrective action, suspend or revoke interim status, or seek similar relief in federal district court if it finds that there has been a release of hazardous waste into the environment (including groundwater) from an interim status facility.\textsuperscript{259}

The RCRA regulations for TSD facilities are designed in significant part to prevent contamination of groundwater by hazardous wastes, particularly from spills or leaks.\textsuperscript{260} Each final TSD facility permit must list the hazardous constituents that have been detected in groundwater in the uppermost aquifer underlying that facility and that are reasonably expected to be in or derived from waste contained in the facility.\textsuperscript{261} If hazardous constituents are detected at any designated monitoring compliance points, the owner or operator must conduct a more extensive monitoring program to insure that hazardous constituents entering the groundwater do not exceed concentration limits set by the EPA.\textsuperscript{262} Aside from certain listed constituents for which maximum concentrations have been included in the regulations,\textsuperscript{263} hazardous constituents must not exceed the background levels in the groundwater at the time the facility receives a permit or an alternate concentration set by the EPA.\textsuperscript{264} If they do, the owner or operator must take corrective action by, for example, removing the hazardous waste constituents or treating them in place.\textsuperscript{265}

Additional EPA regulations for specific types of TSD facilities also seek to prevent groundwater contamination. New surface impoundments must have liners designed, constructed, and installed to prevent any migration of wastes to the adjacent subsurface soil or groundwater.\textsuperscript{266} Ponds shall be impounded with "dikes that are designed, constructed, and maintained with sufficient structural integrity to prevent massive failure."\textsuperscript{267} Liners to prevent migration of wastes into

\textsuperscript{259} Id. § 6928(h).

\textsuperscript{260} See 40 C.F.R. pt. 264, subpt. F (1985). The definition of the term "facility," as well as of specific kinds of facilities (surface impoundments, waste piles, land treatment facilities, landfills, and injection wells) subject to the groundwater protection regulations, are all found at id. § 260.10. Certain TSD facilities may be exempt from these regulations. For example, an owner or operator is exempt if the Regional Administrator of the EPA finds that there is no potential for migration of liquid from a regulated unit to the uppermost aquifer. Id. § 264.90(b)(4).

\textsuperscript{261} Id. § 264.93(a).

\textsuperscript{262} Id. §§ 264.91(a)(1), 264.95(a), 264.99(a).

\textsuperscript{263} Id. § 264.94, Table 1. The EPA has announced that it may eliminate groundwater monitoring requirements where it is difficult or impossible to analyze accurately hazardous waste constituents. See 51 Fed. Reg. 5,561 (1986).

\textsuperscript{264} 40 C.F.R. § 264.94(a)(1), (3) (1985).

\textsuperscript{265} See id. §§ 264.94(a)(2), 264.100(b), (c).

\textsuperscript{266} Id. § 264.221(a).

\textsuperscript{267} Id. § 264.221(d).
adjacent groundwater\textsuperscript{268} and leachate collection and removal systems are required for waste piles.\textsuperscript{269} Land treatment units must include run-off management systems,\textsuperscript{270} and landfills must have both liners and run-off management systems to prevent groundwater pollution.\textsuperscript{271}

TSD facilities operating under interim status are subject to less stringent operating and groundwater monitoring requirements than facilities with final RCRA permits.\textsuperscript{272} Since most TSD facilities have not yet received final RCRA permits, the more lenient interim status controls currently apply to more sources than the groundwater protection regulations for facilities with final RCRA permits.

c. Imminent hazard authority

The imminent hazard provisions of the RCRA authorize the EPA to respond to situations threatening pollution of groundwater resources. The Agency can ask a federal district court to restrain any person who has contributed or is contributing to the handling, storage, treatment, transportation, or disposal of hazardous waste if those activities may present an imminent and substantial endangerment to health or the environment.\textsuperscript{273}

The imminent hazard provisions have caused a great deal of controversy and litigation. The courts have disagreed, for example, over whether these provisions are merely jurisdictional. Under one view, proof that an activity presents an imminent and substantial endangerment permits a federal district court to assume jurisdiction over the dispute. To be entitled to an injunctive decree, however, the government must prove a violation of one of the other substantive provisions of the RCRA.\textsuperscript{274} The weight of authority now seems to support the broader view that activities presenting an imminent and substantial endangerment—a term not defined in the RCRA but whose meaning the courts have developed in a series of cases involving many of the federal pollution control statutes\textsuperscript{275}—may be enjoined even if they do not violate other provisions of the RCRA.\textsuperscript{276}

\textsuperscript{268} \textit{Id.} § 264.251(a)(1).
\textsuperscript{269} \textit{Id.} § 264.251(a)(2).
\textsuperscript{270} \textit{Id.} § 264.273(b)-(e).
\textsuperscript{271} \textit{Id.} § 264.301.
\textsuperscript{272} \textit{See id.} pt. 265, subpts. K-N.
\textsuperscript{273} 42 U.S.C. § 6973(a) (Supp. III 1985).
Because the EPA has considerable discretion in deciding whether to initiate imminent hazard suits, this mechanism is necessarily a piecemeal solution to preventing groundwater contamination. The 1984 amendments, however, for the first time authorize private persons to bring imminent hazard suits in federal district court. This change might increase the utility of imminent hazard suits for groundwater pollution prevention.

2. The 1984 Amendments to the RCRA

Apparently not satisfied with the effectiveness of the EPA's existing regulatory program, Congress in the 1984 RCRA amendments took several steps to further minimize threats to human health and groundwater quality. First, the amendments phase in a series of conditional prohibitions on various kinds of hazardous waste disposal. These bans will remain in effect until the EPA determines that land disposal can be undertaken in a manner that protects human health and the environment, issues performance and permitting standards, or determines that land disposal will not present a risk of contamination to any underground source of drinking water. The EPA must review all hazardous wastes listed under the RCRA, but not specifically identified in the 1984 amendments, to determine whether land disposal adequately protects human health and the environment. Unless the EPA does this by a specified date, land disposal of those wastes will be prohibited. In addition, a TSD amendments to the RCRA resolved another controversy. The EPA may seek imminent hazard relief against past as well as present generators, transporters, and facility owners or operators, for past as well as ongoing activities, as long as those past activities may currently present an imminent and substantial endangerment (e.g., because waste disposed of at a dump years ago is currently leaching out of the site toward a groundwater aquifer). 42 U.S.C. § 6973(a) (Supp. III 1985).

278. Id. § 6924.
279. "Land disposal" includes any placement of "hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave." Id. § 6924(k).
280. Id. § 6924(d)(1). To avoid the prohibition on land disposal, the EPA must find that the prohibition is not required to protect human health and the environment. Id. EPA may not conclude that land disposal is sufficiently protective unless it is demonstrated "that there will be no migration of hazardous constituents from the disposal unit or injection zone for as long as the wastes remain hazardous." Id.
281. Id. § 6924(g). The EPA has issued a schedule setting forth the order in which listed hazardous wastes will be prohibited from land disposal unless the EPA can set appropriate standards or grant case-by-case exemptions. See 51 Fed. Reg. 19,300 (1986).
282. Id. § 6924(h).
facility owner or operator may be able to avoid the disposal prohibitions by complying with EPA's pretreatment standards.\textsuperscript{283}

The 1984 amendments also impose more stringent operating requirements on various kinds of TSD facilities. Final RCRA permits for new or expanded landfills and surface impoundments, for example, must require the installation of two or more liners and a leachate collection system, and groundwater monitoring.\textsuperscript{284} These same requirements may apply to existing surface impoundments from which hazardous constituents are likely to migrate into groundwater.\textsuperscript{285} The EPA must also issue regulations requiring new landfill units, surface impoundment units, waste sites, underground tanks, and land treatment units to use approved leak detection systems,\textsuperscript{286} and must specify criteria for the acceptable location of new and existing TSD facilities and for identifying areas of vulnerable hydrogeology.\textsuperscript{287} Future permits must require corrective action for all releases of hazardous wastes from the facilities of the permit applicant, regardless of the time at which the waste was placed in the facility.\textsuperscript{288}

In a third set of provisions, Congress has authorized a new program to regulate underground storage tanks.\textsuperscript{289} The amended RCRA requires the EPA, at a minimum, to develop requirements for maintaining leak detection and inventory control systems; for maintaining monitoring records and reporting releases; for taking corrective action in response to a release; and for closing tanks to prevent future releases.\textsuperscript{290} Congress also directed the EPA to issue performance standards for new storage tanks, including design, construction, installation, release detection, and compatibility standards.\textsuperscript{291} Storage tank owners will have to apply for and comply with permits reflecting the

\textsuperscript{283} Id. § 6924(m).
\textsuperscript{284} Id. § 6924(o)(1)(A). The EPA may exempt certain structures from the groundwater monitoring requirements if a lengthy list of conditions is met. See id. § 6924(p).
\textsuperscript{285} Id. § 6925(j)(7)(B). A facility can avoid the liner and collection system requirements if the EPA finds that alternative design and operating practices, together with location characteristics, will prevent the migration of hazardous constituents from that facility into ground or surface water at least as effectively as the liners and collective systems would. Id. § 6924(o)(2).
\textsuperscript{286} Id. § 6924(o)(4)(A).
\textsuperscript{287} Id. § 6924(o)(7).
\textsuperscript{288} Id. § 6924(u).
\textsuperscript{289} Id. §§ 6991-6991i. An underground tank is defined as: any one or combination of tanks (including underground pipes connected thereto) which is used to contain an accumulation of regulated substances, and the volume of which (including the volume of the underground pipes connected thereto) is 10 per centum or more beneath the surface of the ground.
\textsuperscript{290} Id. § 6991b(c).
\textsuperscript{291} Id. § 6991b(e).
EPA's storage tank regulations. With EPA approval, states may assume primary enforcement responsibilities for state-run programs. State programs can be more but not less stringent than the EPA's corresponding requirements.

To summarize, the RCRA's principal protections against groundwater pollution take the form of EPA regulations applicable through individual permits to underground storage tanks or to facilities engaged in the treatment, storage, or disposal of hazardous waste. The 1984 RCRA amendments ban certain waste disposal activities, at least until the EPA concludes that a ban is not needed to protect health and the environment.

3. Deficiencies in the RCRA as a Means of Controlling Groundwater Pollution

For non-hazardous waste management, the RCRA authorizes only a minimal federal presence. Aside from the prohibition on open dumping, the statute provides no direct regulation of solid waste management activities. Rather, the EPA's role is limited primarily to the establishment of guidelines for state solid waste management plans and the review of those plans. Private citizens, however, may seek enforcement of the EPA's solid waste management criteria as implemented by the states.

The RCRA's mandatory federal program for controlling hazardous waste focuses more directly on the protection of groundwater quality. Before the adoption of the 1984 amendments, the EPA's implementation of the RCRA was criticized as inadequate to prevent pollution of groundwater resources by hazardous waste. The EPA failed to list or identify various substances, including some carcinogens, that some argue should have been regulated. The EPA's exemption of small hazardous waste generators was also criticized as a possible threat to the environment. The 1984 amendments address these and other deficiencies by requiring the EPA to list or consider listing various substances as hazardous wastes, tightening the regulation of small quantity generators, providing for federal enforcement of the prohibition on open dumping as it applies to hazardous household wastes and small quantity generator hazardous wastes, and restrict-

292. See id. § 6924(w).
293. Id. § 6991c(a), (d)(2).
294. Id. §§ 6991c(a), 6991g.
297. See id. at 201-02.
ing the land disposal of hazardous wastes. Many of these provisions, however, are to be phased in over a period of years, and it remains to be seen how effectively the EPA will implement them.

In addition, the 1984 amendments probably did not plug all of the regulatory gaps. The manifest system for tracking hazardous waste as it moves from generation to disposal will fail to alert the EPA to potential problems if generators and TSD facilities do not file reports when discrepancies arise.298 The EPA's regulations apparently permit lengthy delays between the detection of groundwater contamination and the initiation of corrective action.299 Even if these problems do not occur, the RCRA still does not contain a comprehensive mechanism for devising and enforcing precise groundwater quality standards. Finally, the RCRA does not purport to deal with many, if not most, substances and activities that can contribute to groundwater pollution.

E. The Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA300 or Superfund) was enacted to facilitate the federal government's ability to respond to releases or threatened releases of hazardous substances from inactive or abandoned hazard-

298. See id. at 219-20.
299. See id. at 237-38.
300. 42 U.S.C. §§ 9601-9657 (1982). As this article went to press, Congress passed and the President signed the Superfund Amendments and Reauthorization Act of 1986. See Pub. L. No. 99-499, 100 Stat. 1613 (1986). The statute reauthorizes the CERCLA for five years at a level of $8.5 billion, and provides an additional $5 billion for cleaning up leaking underground storage tanks. Of the $8.5 billion, $2.75 billion will be derived from taxes on domestically produced (8.2 cents per barrel) and imported (11.7 cents) crude oil; $1.4 billion will be assessed against producers of chemical feedstocks; a broad-based surtax on corporations subject to the alternative minimum tax under the 1986 tax bill will provide $2.5 billion; $1.25 billion will be extracted from general revenues; $300 million is expected to be earned in interest on the Hazardous Response Trust Fund; and the EPA is expected to recover the final $300 million as reimbursement from responsible parties for costs incurred in cleaning up abandoned waste sites. Substantively, the 1986 reauthorization, among other things, requires the EPA to revise its hazard ranking system for placing sites on the National Priorities List (§ 105); establishes goals and deadlines for the assessment, evaluation, and cleanup of Superfund sites (§ 116); establishes cleanup standards for remedial actions (§ 121); clarifies the right of contribution among potentially responsible parties under §§ 106 and 107 of the CERCLA (§ 113); provides new guidance for the EPA to enter settlement agreements to facilitate response actions under § 104 (§ 122); authorizes citizen suits to enforce the provisions of the CERCLA (§ 206); and establishes a program for cleaning up leaks of petroleum from underground storage tanks (§ 205). In provisions not directly related to the CERCLA, the statute deals with emergency planning and community right-to-know, and authorizes a program for radon gas and indoor air quality research (Titles III and IV).
ous waste disposal and similar sites. Unlike the other federal pollution control statutes discussed in this article, the CERCLA regulatory scheme is not primarily prospective in orientation. Instead, the CERCLA was designed to address current threats to the environment resulting from past hazardous waste disposal activities. This section summarizes the statute and its judicial interpretation, emphasizing relationships between the Superfund law and groundwater quality.

1. The Statute

The CERCLA provides the means by which the federal government can find out about and respond to releases of hazardous substances\(^\text{301}\) posing environmental dangers. The law requires any person in charge of a vessel or facility\(^\text{302}\) with knowledge of a release\(^\text{303}\) of a hazardous substance in excess of certain designated quantities\(^\text{304}\) to notify the National Response Center of the release.\(^\text{305}\)

The EPA is authorized to respond to hazardous substance releases in several ways.\(^\text{306}\) Whenever any hazardous substance is released or there is a substantial threat of a release into the environment, the EPA may take whatever actions are necessary to protect the public health or welfare or the environment.\(^\text{307}\) The EPA also may act whenever a release or substantial threat of a release of any pollutant

\(^{301}\) Hazardous substances under the CERCLA include pollutants regulated under various other federal laws. *Id.* § 9601(14). In addition, the EPA must designate as hazardous "substances which, when released into the environment may present substantial danger to the public health or welfare or the environment." *Id.* § 9602(a). Petroleum and natural gas are not hazardous substances under the CERCLA. *Id.* § 9601(14).

\(^{302}\) A facility is defined broadly to include:

(A) any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, or aircraft, or (B) any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any vessel. *Id.* § 9601(9).

\(^{303}\) A release means "any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment," excluding the normal application of fertilizer. *Id.* § 9601(22). "The environment" includes groundwater. *Id.* § 9601(8)(B).

\(^{304}\) Until the EPA establishes a reportable quantity for a hazardous substance, that quantity is one pound or the reportable quantity, if any, established under the oil spill provisions of the CWA, 33 U.S.C. § 1321(b)(4) (1982). 42 U.S.C. § 9602(b) (1982).

\(^{305}\) 42 U.S.C. § 9603(a) (1982).

\(^{306}\) The statute authorizes the President to undertake response actions, but the President has delegated this authority to the EPA.

may present an imminent and substantial danger to the public health or welfare. 308

EPA responses are divided into two categories: removal actions and remedial actions. 309 Removal actions are temporary actions taken to prevent, minimize, or mitigate damage to the public health or welfare or the environment resulting from a release or threat of a release of a hazardous substance. 310 Remedial actions are long-term or permanent actions taken to prevent or minimize the release of hazardous substances so that they do not migrate, causing substantial future danger. 311

The EPA may pay for its response costs with money in a special Hazardous Substance Response Trust Fund (the Superfund) in the United States Treasury. 312 The Fund collects receipts from taxes on petrochemical feedstocks, crude oil, and imported refined petroleum products. 313 Additional funds are derived from general appropriations. 314

Superfund money can be spent not only to finance the EPA's removal and remedial actions, but also to reimburse certain response costs incurred by private persons. 315 The EPA can use the Fund to remedy injuries to or destruction of natural resources, including groundwater, belonging to, managed by, or held in trust by federal, state, or local governments. 316 Finally, the Superfund may finance various costs associated with response actions or damage to natural resources, such as the costs of assessing injury to natural resources from a hazardous substance release and the costs of identifying and investigating such releases. 317

Congress imposed some limitations on the use of Superfund money. The EPA's response actions must not be inconsistent with the na-

308. Id. A pollutant or contaminant includes any substance which after release into the environment may cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions, or physical deformations. Id. § 9604(a)(2). Petroleum and natural gas are again excluded. Id.
309. Id. § 9601(25).
310. Id. § 9601(23).
311. Id. § 9601(24).
312. Id. §§ 9611(a), 9631(a).
316. Id. §§ 9631(c)(1)(C), 9601(16). Groundwater is defined in the CERCLA as "water in a saturated zone or stratum beneath the surface of land or water." Id. § 9601(12).
317. Id. §§ 9631(c)(1), 9611(a). Other related costs reimbursable from the Fund are described at id. § 9611(c).
tional contingency plan (NCP).\textsuperscript{318} Furthermore, the EPA cannot undertake remedial action unless the state in which the release occurs enters into a contract or cooperative agreement with the EPA, in which the state promises to (1) be responsible for future maintenance of the EPA's removal and remedial actions; (2) assure the availability of a TSD facility with a RCRA permit for any necessary offsite storage, destruction, treatment, or disposal of hazardous substances from the target site; and (3) pay ten percent of the costs of the remedial action (fifty percent or more if the state or one of its political subdivisions owned the site at the time of the disposal of the hazardous substances).\textsuperscript{319} Superfund money cannot be used to pay for injury to natural resources if that injury and the release causing it occurred wholly before December 11, 1980, the date of the CERCLA's enactment.\textsuperscript{320} Finally, it is unclear whether some kinds of sites can be cleaned up with Superfund money. Commentators have questioned, for example, whether groundwater wells contaminated by pesticide runoff from agricultural fields are eligible for EPA remedial actions.\textsuperscript{321}

The CERCLA authorizes the EPA to seek reimbursement for Superfund money\textsuperscript{322} spent on response actions or on remediating injuries to natural resources.\textsuperscript{323} Four categories of persons are liable for these costs and damages: (1) current owners or operators of a facility from which there is a release of hazardous substances; (2) owners or operators of such a facility at the time hazardous substances were disposed of there; (3) persons (including generators) who arranged to have their hazardous substances disposed of, transported to, or treated at a facility from which there is a release; and (4) persons who transported hazardous substances to TSD facilities selected by those persons.\textsuperscript{324}

\begin{flushright}
\begin{itemize}
\item \textsuperscript{318} *Id.* § 9604(a)(1). The NCP is a document which was originally promulgated under the CWA, see 33 U.S.C. § 1321(c)(2) (1982), to deal with the removal of oil and hazardous substances from navigable waters, but which has since been revised and expanded to reflect the EPA's new responsibilities under the CERCLA. 42 U.S.C. § 9605 (1982). The NCP establishes procedures and standards for responding to releases of hazardous substances, pollutants, and contaminants. It includes a national priorities list (NPL) of the facilities with known or suspected releases that demand remedial action on the highest priority basis. *Id.* § 9605(8).
\item \textsuperscript{319} 42 U.S.C. § 9604(c)(3) (1982); see also 40 C.F.R. § 300.62(c-f) (1985).
\item \textsuperscript{320} 42 U.S.C. § 9611(d)(1) (1982).
\item \textsuperscript{322} The liability provisions of the CERCLA also may permit the EPA to be reimbursed for response costs derived from other sources. See 42 U.S.C. §§ 9604(a)(1), 9607(a), 9611(a) (1982).
\item \textsuperscript{323} *Id.* § 9607(a)(1)-(4)(A), (C).
\item \textsuperscript{324} *Id.* § 9607(a)(1)-(4).
\end{itemize}
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2. Interpretation of the Statute

The ambiguity of the liability provisions of the CERCLA has generated considerable controversy and litigation. It is now well established that section 107(a) of the CERCLA imposes strict liability on the categories of persons described above.\textsuperscript{325} Liability is also retroactive; defendants are liable for actions taken (such as the disposal of hazardous waste at a facility) before the CERCLA’s enactment.\textsuperscript{326} The courts have had little difficulty concluding that a court may—but need not—impose joint and several liability under section 107’s response-cost provisions.\textsuperscript{327}

The government’s burden of proof of causation in a section 107 cost recovery action is relatively light. Several courts have concluded that a generator is liable, for example, if it disposed of hazardous substances at a facility which now contains hazardous substances of the same sort (though not necessarily that generator’s own wastes), there is a release or threatened release of that or some other kind of hazardous substance (\textit{i.e.}, \textit{any} hazardous substance, as defined by the CERCLA) from the facility, and the release or threatened release causes the government to incur response costs.\textsuperscript{328}

\begin{footnotes}


\textsuperscript{327} See, e.g., United States v. Conservation Chem. Co., 589 F. Supp. 59, 62-63 (W.D. Mo. 1984); United States v. A & F Materials Co., 578 F. Supp. 1249, 1253-55 (S.D. Ill. 1984); United States v. Chem-Dyne Corp., 572 F. Supp. 802, 808-09 (S.D. Ohio 1983). Joint and several liability is typically imposed where the actions of two or more persons combine to cause harm to the plaintiff, but the plaintiff is unable to demonstrate the extent of the harm attributable to each person. If the persons causing the harm are jointly and severally liable, the plaintiff may sue any one of them for the entire injury. That defendant then may be able to seek reimbursement from other responsible persons for their proportionate shares of the damages awarded to the plaintiff. See \textit{Restatement (Second) of Torts} \textsuperscript{\textcopyright} §§ 875-886B (1977). \textit{See generally} Note, \textit{A Right of Contribution Under CERCLA: The Case for Federal Common Law}, 71 CORNELL L. REV. 668 (1986). For a case apportioning CERCLA response cost liability on the basis of the volume of waste sent to the leaking site, see United States v. Ottati & Goss, Inc., 24 Env’t Rep. Cas. (BNA) 1152 (D.N.H. 1986).

\end{footnotes}
The CERCLA provides the EPA with an alternative means of cleaning up leaking hazardous waste facilities. Instead of responding to a release with Superfund money and then seeking reimbursement in a section 107 cost recovery action against responsible parties, the EPA may bring an abatement action in federal district court under section 106.329 If the EPA finds that there may be an imminent and substantial endangerment because of an actual or threatened release of a hazardous substance from a facility, it can request that the Attorney General seek whatever relief is necessary to abate the danger or threat.330 In such a lawsuit, the government asks the court to order the person responsible for the hazard to end the threat. The same categories of persons listed under section 107 are also proper defendants in a section 106 action.331

The CERCLA does not prevent any state from imposing additional liability or requirements with respect to a release of hazardous substances within that state.332 Prior to 1986, it did, however, preclude states from imposing taxes for the purpose of compensating claims which may be compensated out of the federal fund.333 States could not tax to finance government cleanups of hazardous waste disposal sites or to reimburse third parties for cleanup costs.334 They could impose taxes when the purpose was to compensate third parties for personal injury or property damage resulting from hazardous substance discharges, to pay personnel and equipment costs, to administer the state fund itself, or to conduct research.335

a suggestion that liability might be appropriate even absent proof that a release caused the incurrence of response costs, see New York v. Shore Realty Corp., 759 F.2d 1032, 1044 n.18 (2d Cir. 1985).

An issue that has generated a great deal of litigation is the extent to which private persons can recover the costs they incur in cleaning up hazardous waste sites. Although defendants have argued that the CERCLA does not authorize private cost recovery actions, the courts consistently have rejected this contention. See, e.g., Walls v. Waste Resource Corp., 761 F.2d 311, 317-18 (6th Cir. 1985). It is still not clear, however, exactly what conditions a private plaintiff must meet before it can recover its response costs. See generally Gaba, Recovering Hazardous Waste Cleanup Costs: The Private Cause of Action Under CERCLA, 13 ECOLOGY L.Q. 181 (1986); Mauhs, Judicial Limitations on the CERCLA Private Right of Action, 15 ENVTL. L. 471 (1985).

330. Id. § 9606(a). The EPA may also issue orders to achieve the same objectives. Id.
333. Id. § 9614(c), interpreted in Exxon Corp. v. Hunt, 106 S. Ct. 1103 (1986).
335. Exxon Corp., 106 S. Ct. at 1116.
3. The CERCLA and Groundwater Pollution

The EPA's remedial actions under the CERCLA are intended to prevent or mitigate the migration of hazardous substances into the environment, including groundwater,336 from NPL sites.337 The EPA designates NPL sites through the use of a Hazard Ranking System (HRS).338 One of the important elements of the HRS is the completion of a groundwater route worksheet whenever there is direct evidence of a release from a facility into the groundwater.339 Of the 539 sites on the NPL as of the end of 1984, 410 were selected in part because of groundwater contamination problems.340 The presence of contaminated drinking water is a factor suggesting the need for rapid implementation of remedial action.341 The NCP states that "[g]roundwater pollution is a particularly serious problem because, once an aquifer has been contaminated, the resource cannot usually be cleaned without the expenditure of great time, effort and resources."342 Among the listed techniques for remediating groundwater pollution are impermeable barriers, permeable treatment beds, groundwater pumping, and leachate control.343 The NCP also lists several methods of providing alternative water supplies.344

4. Deficiencies in the CERCLA

The CERCLA's limitations as a means of remediating groundwater contamination problems lie in its implementation, particularly the pace of cleanup activity. Some government officials estimate that the number of hazardous waste sites that will eventually require some kind of cleanup is as high as 19,000,345 but the EPA has included or proposed to include only about 800 sites on the NPL.346 As noted

336. 40 C.F.R. § 300.6 (1985) (definition of environment).
337. Id. § 300.68(a); see supra note 318.
338. See 40 C.F.R. pt. 300, app. A.
341. 40 C.F.R. § 300.68(e)(1)(iii) (1985); see also 50 Fed. Reg. 5,862, 5,905 (1985) (to be codified at 40 C.F.R. § 300.68(c)(2)(iv)) (proposed Feb. 12, 1985) (in determining whether and what type of remedial or removal actions should be chosen, agency should consider hydrogeological factors such as soil permeability, depth to a saturated zone, hydrologic gradients, and proximity to a drinking water aquifer).
343. Id.
344. Id. § 300.70(d).
346. Id.
above, there is some question whether the EPA has the authority to list sites, such as groundwater wells contaminated by pesticide runoff, currently included on the NPL.\textsuperscript{347} Moreover, while cleanups have been commenced at many of the NPL sites, at the end of 1985 they had been completed at only six sites; and the adequacy of the remedies at those sites is in dispute.\textsuperscript{348}

Even if the EPA were willing to move more rapidly in cleaning up sites on the NPL, it may lack the resources to do so. It may cost many millions of dollars to clean up a single leaking hazardous waste site, and yet the Superfund was initially authorized at a level of only $1.6 billion, a figure almost everyone concedes is far from sufficient to clean up even known existing sites. The EPA’s authority to spend the original $1.6 billion expired on September 30, 1985, and reauthorization has been a long and controversial process.\textsuperscript{349} The government’s efforts to seek reimbursement from responsible parties through negotiated settlements and litigation under section 107 have been slow thus far, thereby failing to provide significant outside revenues for additional cleanups.

Finally, some injuries caused by releases of hazardous substances simply are not covered by the CERCLA. The statute provides no monetary remedy for persons suffering personal injury or property damage as a result of these releases. Persons whose health is adversely affected by ingestion of contaminated drinking water therefore have to look to state common law tort actions for compensation.

In sum, the CERCLA cannot serve as the sole or main basis for groundwater pollution prevention. It is retrospective, not prospective, and its provisions cover only limited classes of sources and contaminants.

\textbf{F. The Toxic Substances Control Act}

While the RCRA and the CERCLA are directed at regulating hazardous substances once they are discarded into the waste stream or commercially distributed and used, the Toxic Substances Control Act (TSCA)\textsuperscript{350} is meant to limit the manufacture of hazardous substances before they are widely distributed in commerce and adversely affect the environment.\textsuperscript{351} This goal remains largely unfulfilled.

\textsuperscript{347} See supra note 321 and accompanying text.
\textsuperscript{348} CBO, \textit{Hazardous Waste Management}, supra note 345, at 4.
\textsuperscript{349} The CERCLA was reauthorized in October 1986. See supra note 300.
\textsuperscript{351} See id. §§ 2601(b)(2), 2602(5).
1. The Statute

The TSCA requires manufacturers of potentially harmful chemicals to test them for their health and environmental effects and to submit test data to the EPA for its assessment. Before companies commercially produce new chemical substances or existing chemicals for significant new uses, they must notify the EPA. If the EPA finds a reasonable basis to conclude that the manufacture, processing, distribution in commerce, use, or disposal of a chemical substance presents an unreasonable risk of injury to health or the environment, the EPA must regulate that substance. The EPA may prohibit or limit the manufacturing, processing, or distribution of the chemical; require the use of warning labels; or prohibit or regulate the method of commercial use or disposal of the substance. But the regulation is limited to the least burdensome requirements, which may be imposed only to the extent necessary to protect adequately against that risk. The TSCA authorizes the EPA to request a court order authorizing the seizure of an imminently hazardous chemical substance or mixture.

The TSCA specially authorizes the EPA to regulate polychlorinated biphenyls (PCBs). Unless the EPA grants an exemption, the manufacture, processing, or distribution in commerce of PCBs is prohibited. The EPA has promulgated detailed rules prescribing methods for both the storage and disposal of PCBs. To prevent contamination of groundwater by PCBs, a landfill receiving PCBs must be located in soil with certain characteristics and contain certain synthetic liners. The disposal site must contain monitoring wells and a leachate collection system.

2. Preemption Under the Statute

The EPA's regulation of PCB disposal may limit state authority to regulate these same materials. In *Rollins Environmental Services, Inc. v. Parish of St. James*, the Court of Appeals for the Fifth

352. Id. § 2603.
353. Id. § 2603(b)(3)(A).
354. Id. § 2604(a)(1).
355. Id. § 2605(a).
356. Id.
357. Id. § 2606(a)(1)(A).
358. Id. § 2605(e)(3). The EPA may grant an exemption if it finds that (i) an unreasonable risk of injury to health or environment would not result, and (ii) good faith efforts have been made to develop a safe substitute for PCBs. Id. § 2605(e)(3)(B).
360. Id. § 761.75(b)(1)-(2).
361. Id. § 761.75(b)(3).
362. 775 F.2d 627 (5th Cir. 1985).
Circuit invalidated a Louisiana parish’s ordinance prohibiting the location of any commercial solvent cleaning business in an “area of special environmental concern,” which included areas near subsurface drinking water sources. The court found that the ordinance was a thinly-veiled attempt to prohibit a particular company from establishing a PCB disposal facility in the parish, despite the facility’s compliance with the EPA’s regulations. The court ruled that the ordinance was an obstacle to the accomplishment of congressional purposes and was therefore preempted by the TSCA.363

If the decision in St. James is interpreted broadly, a state strategy to prevent groundwater pollution could be in jeopardy insofar as it covers PCBs.364 Even if St. James is followed, however, the decision does not impose an across-the-board ban on state, county, or municipal laws designed to prohibit the location of potential sources of hazardous waste pollution near groundwater supplies. The EPA regulations which preempted the St. James Parish ordinance applied only to the use and disposal of PCBs. While the EPA has the authority to regulate the use of other substances under the TSCA, it has to date only enacted regulations for a few substances.365

In addition, the TSCA’s provisions concerning state regulatory authority differ from analogous provisions under most of the other federal pollution control laws. Statutes such as the CWA and the RCRA expressly authorize the states to impose regulatory requirements that are more stringent than those contained in federal laws and regulations.366 The RCRA provision is particularly noteworthy. It permits states to adopt requirements, “including those for site selection, which are more stringent than those imposed” by EPA regulations.367 The TSCA, by contrast, leaves the states with much less discretion. If the EPA regulates the use or disposal of a chemical substance (such

363. Id. at 637-38.
364. The attorney for the company that challenged the validity of the St. James ordinance claims that the court’s opinion “far exceed[s] the scope and force of other recent opinions” concerning preemption in the area of hazardous waste disposal. Lewis, Sweeping Pre-emption Ruling Issued in PCB Case, Legal Times, Nov. 11, 1985, at 18, col. 3. He adds that the case “may herald a new realization that greater scrutiny of local hazardous waste regulation is essential, not just for PCBs governed under TSCA, but for the toxic wastes regulated under RCRA as well. The implied pre-emption doctrine thus may have much wider applicability in this area than the courts have heretofore been called upon or willing to give it.” Id. But see Potomac Elec. Power Co. v. Sachs, 639 F. Supp. 856, 860, 863 (D. Md. 1986) (holding that state regulations governing PCB disposal are not preempted by the TSCA and contending that the court in the Parish of St. James case ignored relevant statutory language preserving state and local regulatory authority).
as PCBs) under the TSCA, that Act prohibits any state or political subdivision from enacting any requirement applicable to that substance unless the state requirement (1) is identical to the EPA’s rule; (2) is authorized by another federal law; or (3) prohibits the use of the substance in the state or political subdivision. Although St. James Parish did not contend that its ordinance was justified by any of these three exceptions, the second exception permits state regulations authorized by other federal laws. The RCRA expressly permits states to enact site selection requirements for hazardous waste disposal facilities that are more stringent than those contained in the EPA’s regulations.

In short, the implications of the Parish of St. James decision are not yet clear. If the opinion is incorrect or is given a narrow reading by the courts and the EPA, the TSCA will probably not present a major hurdle to the implementation of most parts of a state groundwater protection program.

3. The Statute and Groundwater Pollution

Although the TSCA holds out the promise of regulating hazardous materials that fall mostly outside the scope of the RCRA and the CERCLA—commercial products that are or contain toxic materials and may contaminate groundwater through normal usage—this promise has not yet been kept. The EPA has restricted the use of very few substances under the TSCA. This limited exercise of TSCA authority may reflect the Agency’s difficulty in meeting its burden of proving that a substance’s manufacture or use presents an “unreasonable risk.” It may also reflect a lack of information. The Office of Technology Assessment has criticized the EPA’s implementation of the testing and premanufacture notification provisions of the TSCA as inadequate. Consequently, the TSCA does not now

369. 42 U.S.C. § 6929 (1982). For a discussion of the second exception, see SED, Inc. v. Dayton, 519 F. Supp. 979, 986 (S.D. Ohio 1981). Even if the statutory exceptions to preemption are read restrictively, however, states seeking to prevent groundwater contamination may be able to avoid the preemptive effect of EPA’s TSCA regulations by applying for an exemption. See 15 U.S.C. § 2617(b) (1982). Because the parish did not apply for an exemption from the PCB disposal regulations, though, neither the EPA nor the court had occasion to address the propriety of a statutory exemption. 775 F.2d at 633-34.
371. Congress declared in the TSCA that “authority over chemical substances and mixtures should be exercised in such a manner as not to impede unduly or create unnecessary economic barriers to technological innovation while fulfilling the primary purpose” of preventing an unreasonable risk of injury to health or the environment. 15 U.S.C. § 2601(b)(3) (1982).
372. OTA REPORT, supra note 2, at 227. Federal information gathering efforts related to groundwater pollution control have generally been criticized as inadequate. See NRC REPORT, supra note 14, at 10.
provide significant protection against groundwater pollution by toxic chemical products.\textsuperscript{373}

G. \textit{The Federal Insecticide, Fungicide, and Rodenticide Act}

Pesticides are a significant potential source of groundwater pollution in any state whose economy is heavily dependent on agriculture.\textsuperscript{374} This section explains why the federal pesticide laws do not adequately prevent groundwater contamination by agricultural sources.

1. The Structure and Provisions of the Act

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)\textsuperscript{375} generally prohibits the distribution, sale, shipment, or receipt of pesticides\textsuperscript{376} not registered with the EPA\textsuperscript{377} and of adulterated or misbranded pesticides.\textsuperscript{378} Companies seeking a pesticide registration must submit detailed information on the toxicity of the chemical.\textsuperscript{379} The EPA may register a pesticide if it determines not only that its composition warrants the manufacturer’s proposed claims as to its usefulness, but also that it is properly labeled, will perform its intended function without unreasonable adverse effects on the environment, and, when used in accordance with widespread and commonly recognized practices, will not generally cause such adverse effects.\textsuperscript{380}

The EPA may register a pesticide for either general or restricted use.\textsuperscript{381} A pesticide should be classified for general use only if it will not generally cause unreasonable adverse effects on the environment

\textsuperscript{373} The EPA has announced tentative plans for increasing the use of TSCA regulatory authority to prevent groundwater pollution. The EPA’s Office of Toxic Substances drafted a strategy in December 1985 which recommends use of the TSCA’s provisions to identify current groundwater contamination problems, determine health effects, improve groundwater quality assessment methods, and adopt appropriate controls (such as limitations on the use of septic system additivies). The plan concentrates on preventing contamination by volatile organic chemicals and fertilizer constituents. See 16 Env’t Rep. (BNA) 1794-95 (Jan. 24, 1986).

\textsuperscript{374} See Henderson, \textit{supra} note 16, at 15-16.


\textsuperscript{376} The FIFRA defines a pesticide as “(1) any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, and (2) any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant.” Id. § 136(u).

\textsuperscript{377} Id. § 136a(a); see also id. § 136(f)(1)(A); 40 C.F.R. § 162.5(a) (1985).


\textsuperscript{379} The FIFRA is not the only statute giving the EPA the power to regulate pesticides. The EPA has the authority under the Federal Food, Drug, and Cosmetic Act to set tolerances for pesticides in or on raw agricultural commodities. If these tolerances are exceeded, the commodities are adulterated and their sale is prohibited. See 21 U.S.C. §§ 342(a)(2)(B), 346a (1982); see also 40 C.F.R. pt. 180 (1985).

\textsuperscript{380} 7 U.S.C. § 136a(c); 40 C.F.R. § 162.8(b).

\textsuperscript{381} Id. § 136a(d)(1)(A).
when properly used. \textsuperscript{382} Pesticides that may generally cause such effects must be restricted \textsuperscript{383} and can be applied only by or under the direct supervision of applicators certified by the EPA. \textsuperscript{384} The FIFRA prohibits the use of any restricted use pesticide in a manner inconsistent with the applicable restrictions or with its labeling. \textsuperscript{385}

In addition to imposing civil and criminal penalties on those violating the statute, \textsuperscript{386} the FIFRA authorizes the EPA to issue an order stopping or limiting the sale or use of a pesticide when the EPA has reason to believe there is or will be a statutory violation. \textsuperscript{387} In addition, the EPA may seek seizure of the pesticides in federal court. \textsuperscript{388}

The FIFRA requires that the EPA issue regulations for the disposal or storage of pesticide packages, containers, and excess amounts. \textsuperscript{389} The EPA has issued these regulations, \textsuperscript{390} but they are mandatory only for the EPA itself in carrying out its own pesticide and container disposal operations. \textsuperscript{391} For anyone else storing or disposing of these materials, the regulations are only hortatory. \textsuperscript{392}

2. Deficiencies in Federal Pesticide Laws

Although the FIFRA aims at avoiding the distribution of potentially dangerous or environmentally disruptive pesticides, most pesticides currently in use have not been comprehensively tested and reviewed by the EPA. In particular, many pesticides containing toxic chemicals remain untested for carcinogenic, mutagenic, and teratogenic effects. A congressional subcommittee staff report published in 1982 found that 79 to 84 percent of pesticides lacked adequate carcinogenicity testing, 90 to 93 percent lacked adequate mutagenicity testing, and 60 to 70 percent lacked adequate teratogenicity testing. \textsuperscript{393} The National Academy of Sciences concluded in 1984 that "complete health hazards assessments for pesticides and inert ingredients of pesticide

\textsuperscript{382} Id. § 136a(d)(1)(B).
\textsuperscript{383} Id. § 136a(d)(1)(C).
\textsuperscript{384} Id. § 136a(d)(1)(C)(i)-(ii); id. § 136j(a)(2)(F). Standards for applicator certification are published at 40 C.F.R. pt. 171 (1985).
\textsuperscript{385} 7 U.S.C. § 136j(a)(2)(F), (G) (1982). The statute contains several exemptions which may apply to these prohibitions. See id. §§ 136j(b), 136j(a)(1)(A), 136(q).
\textsuperscript{386} Id. § 136l.
\textsuperscript{387} Id. § 136(k)(a).
\textsuperscript{388} Id. § 136(k)(b).
\textsuperscript{389} Id. § 136(q)(a).
\textsuperscript{391} Id. § 165.2(c).
\textsuperscript{392} See id. Transporters of pesticides may be subject to the mandatory regulations of the Department of Transportation or the Interstate Commerce Commission. See id. § 165.2(f)(2).
formulations are possible for only 10 percent of pesticides in use." In particular, most pesticides have been inadequately evaluated with regard to their potential for contaminating groundwater and their long-term health effects. A 1986 report by the General Accounting Office claims that few of the 50,000 pesticide products licensed for use under the FIFRA have been fully evaluated for chronic health effects and that the EPA has not completed a final reassessment on any of the 600 active ingredients in pesticides. These deficiencies pose a problem for groundwater protection because, once in the groundwater, pesticides may persist for long periods.

In addition, the EPA's decisions concerning the need for and method of regulation may be suspect in some instances due to the Agency's reliance on pesticide manufacturers for toxicity information. The EPA lacks access to some necessary information due to the FIFRA's protections of trade secrets. Even where information is available, some "independent" laboratories have falsified toxicity tests, placing in doubt the validity of information upon which some pesticides have been registered. Legal procedures available to the EPA for cancelling and removing previously registered pesticides from the market are cumbersome. Cancellation of a registered pesticide later found to be an unacceptable hazard to public health and the environment can take years.

Thus, current regulatory programs for the registration and use of pesticides provide a less than comprehensive mechanism for preventing groundwater contamination by these substances. This may account for the EPA's detection of groundwater contamination by pesticides in 23 states.

H. Other Federal Laws

Because most human activities can cause groundwater contamination in some circumstances, any law that regulates any activity could affect groundwater pollution, if only tangentially. Federal securities laws requiring corporations to disclose potential liability for pollution...
tion penalties, for example, might serve as an indirect deterrent to polluting activities. The United States Code fills dozens of volumes; obviously, this article cannot seek out and evaluate every possible connection between federal statutes and activities that might contribute to pollution. This section is therefore limited to a cursory description of several federal laws that could be relevant to groundwater protection in some situations.

1. The Surface Mining Control and Reclamation Act

In states with an active coal mining industry, the Surface Mining Control and Reclamation Act (SMCRA), 400 if rigorously implemented, should prevent, in new coal mines, much of the groundwater (and surface water) pollution so prevalent in old mines. 401 Enhancement of water quality was a prime congressional purpose behind passage of the Act, 402 and many of its sections are specifically directed at avoiding surface and groundwater contamination. The SMCRA covers underground as well as surface strip mines, both active and abandoned, but does not reach problems cause by the extraction of minerals other than coal. 403

In essence, the SMCRA regulation is based on a nondegradation standard: miners must leave the land in nearly as good condition as they found it, avoiding "spillover" effects during mining to the maximum extent possible. The Act imposes even more drastic conditions on mining of prime farmland, 404 alluvial valley floors, 405 and steep slopes. 406 Some areas are to be designated as wholly unsuitable for mining. 407

Under the SMCRA, coal mining operations require a permit from the Office of Surface Mining or an authorized state agency. The applicant must submit a description of existing or proposed operations, and "a determination of the probable hydrologic consequences of the mining and reclamation operations . . . in surface and ground

402. Id. at 627-28.
404. Id. § 1260(d).
405. Id. § 1260(b)(5).
406. Id. § 1265(d).
407. Id. § 1281. The regulations are codified at 30 C.F.R. pt. 700 (1985). Most of these were upheld in litigation brought by both the coal industry and environmentalists. See In re Surface Mining Regulation Litig., 452 F. Supp. 327 (D.D.C. 1978), aff'd in part, rev'd in part, 627 F.2d 1346 (D.C. Cir. 1980).
Among the many criteria for permit issuance, the permitting authority must find that the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area. The Act includes twenty-five performance standards for mining operations, several of which relate directly to groundwater quality protection. The operator must, at a minimum, stabilize spoil piles "to effectively control erosion and attendant air and water pollution," minimize the disturbances to the prevailing hydrologic balance at the minesite and in associated offsite areas and to the quality and quantity of water in surface and ground water systems" by several specified means, including restoration of recharge capacity in the mined area to approximate premining conditions; and insure that acid-forming or toxic materials are disposed of in a manner designed to prevent groundwater pollution. The Act expressly requires groundwater monitoring by coal mine operators.

In states with relatively little coal, the SMCRA is a small piece in the overall groundwater quality control puzzle and is confined primarily to the clean up of abandoned problem sites. In more active coal-mining states, the SMCRA should insure that groundwater supplies will receive more adequate protection, if its provisions are effectively implemented. Given the confusion in the federal program, however, effective implementation is problematic.

2. The National Environmental Policy Act of 1969

The National Environmental Policy Act of 1969 (NEPA) generally requires all federal agencies to consider environmental values when making virtually any decision. The law specifically requires each

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408. 30 U.S.C. §§ 1257(b)(7), (11) (1982). If protection of water quality cannot be assured, the miner must provide alternative sources of water. Id. § 1258(a)(13)(C).

409. Id. § 1260(b)(3). Beyond the 100th meridian, the permit authority must also certify that the operation will "not materially damage the quantity or quality of water in surface or underground water systems that supply [alluvial] valley floors." Id. § 1260(b)(5)(B).

410. Id. § 1265(b)(4).

411. Id. § 1265(b)(10).

412. Id. § 1265(b)(10)(D).

413. Id. § 1265(b)(14). The Secretary's promulgation of numerical effluent standards for discharges was upheld as a reasonable means of protecting the hydrologic balance and water quality. See In re Surface Mining Regulation Litig., 627 F.2d 1346, 1366-69 (D.C. Cir. 1980).

414. 30 U.S.C. § 1267(b) (1982). The SMCRA also creates an Abandoned Mine Reclamation Fund to be used for, among other things, "prevention, abatement, treatment, and control of water pollution created by coal mine drainage" in abandoned coal mines. Id. § 1231(a)-(c).

415. Generally the articles and reports on OSM deficiencies running on an almost weekly basis since 1982 in Inside Energy With Federal Lands.


417. Generally F. Anderson, NEPA in the Courts (1973); W. Rodgers, Environmental Law ch. 7 (1977); Liroff, NEPA Litigation in the 1970's: A Deluge or a Dribble?, 21
agency to prepare an environmental impact statement (EIS) whenever it proposes a major federal action that could significantly affect the quality of the human environment.418

The scope and effectiveness of the NEPA in preventing groundwater contamination are limited in several pertinent ways. First, the NEPA provides an avenue to procedural protection only when the project threatening groundwater is federal.419 Federal projects include federally approved private projects, such as those receiving federal permits or financing.420 Second, the NEPA applies only to a project or activity that may have significant environmental effects.421 Thus, where the federal government has not formally decided to do something, or has decided not to interfere with an otherwise lawful activity, the NEPA does not apply.422 Third, even when the statute does apply, the Supreme Court has decided that the NEPA is primarily, if not purely, a procedural statute.423 This means that the federal agency must only consider the environmental consequences of its pro-

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NAT. RESOURCES J. 315 (1981). The Council on Environmental Quality (CEQ) promulgated extensive regulations for the implementation of the law by all federal agencies, 40 C.F.R. pt. 1500 (1985), but the regulations are often treated by reviewing courts as advisory opinions to which some deference is due rather than as governing legal requirements.

418. 42 U.S.C. § 4332(2)(C) (1982). The NEPA dictates consideration of environmental effects for all federal decisionmaking, but its procedural requirements vary, depending on the magnitude of the proposal. For projects that are not major and significant, the agency may simply do a cursory environmental analysis and issue a Finding of No Significant Impact (FONSI), or “mini-EIS.” See, e.g., Township of Lower Alloways Creek v. Public Serv. Elec. & Gas Co., 687 F.2d 732 (3d Cir. 1982). For projects that are major and have significant effects, the agency must follow certain procedures and discuss in some detail several specified topics in the EIS. 42 U.S.C. § 4332(2)(C) (1982).

419. About half of the states have similar laws for state or local projects, see Yost, Streamlining NEPA—An Environmental Success Story, 9 B.C. ENVTL. AFF. L. REV. 507 (1981). Kansas is not among them.

The NEPA review process has already succeeded in halting a proposed project in Kansas in at least one notable instance. In the early 1970's, the Atomic Energy Commission tried to locate a nuclear waste repository near Lyons, Kansas. The studies necessary for an EIS disclosed adverse geohydrological information. After political opposition arose, the AEC abandoned the repository proposal.


423. Stryker's Bay Neighborhood Council, Inc. v. Karlen, 444 U.S. 223, 227 (1980). The NEPA recites a series of environmental goals as national policy, 42 U.S.C. §§ 4321, 4331 (1982), including “beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences.” Id. § 4331(b)(3). Maintenance of groundwater quality certainly is within that policy. But in spite of the command that all federal laws and policies “shall be interpreted and administered in accordance with [these] policies,” id. § 4332(1), the policies are treated as nonbinding generalities, interesting but not controlling. The policies are, in any event, so general and ambiguous that they would furnish little guidance even if binding.
posed action; the NEPA does not require that the decision to proceed be environmentally sound.

As a practical matter, then, the NEPA has had and will have relatively little direct effect on groundwater quality. NEPA compliance is not an integral part of any overall federal groundwater protection strategy, and the NEPA process makes the state merely another commentator, not a decisionmaker.

3. Transportation of Hazardous Substances

A group of closely related federal laws, all administered by the Department of Transportation (DOT), regulates transportation of hazardous substances. In each case, the federal law is directed at interstate commerce, and states are free to promulgate additional or more stringent standards for intrastate pipelines and other forms of transportation if compatible with federal minimum requirements. None of these laws is specifically directed at prevention of groundwater pollution.

The Natural Gas Pipeline Safety Act of 1968 (NGPSA),\(^{424}\) as amended in 1976 and 1979, instructs the Secretary of the DOT to set minimum safety standards for natural gas pipelines and liquified natural gas facilities.\(^{425}\) Groundwater protection is not among the criteria used in setting the standards.\(^{426}\) The Hazardous Liquid Pipeline Safety Act of 1979 (HLPSA)\(^ {427}\) is a mirror image of the NGPSA covering transportation of all hazardous liquids, including petroleum products, through pipelines.\(^ {428}\) Again, except to the extent that groundwater protection "will contribute to public safety,"\(^ {429}\) it is not a standard-setting criterion.

These two statutes are too limited in coverage and implementation to form an adequate safeguard against groundwater pollution caused by pipeline activities. Most of the provisions of the implementing regulations do not apply to existing pipelines, to oil production and refinery facilities, to certain terminal facilities, or to storage areas associated with new pipeline activities. Groundwater monitoring requirements are virtually nonexistent and the requirements for corrective actions to address spills are vague.\(^ {430}\)


\(^{425}\) Id. §§ 1672(a)(1), 1674(a). Facilities existing at the time of regulation promulgation are exempt from design and construction standards. Id. § 1672(a)(1).

\(^{426}\) Id.

\(^{427}\) Id. §§ 2001-2014.

\(^{428}\) Id. §§ 2001(2). The states may regulate intrastate facilities for transportation of hazardous liquids. Id. § 2004.

\(^{429}\) Id. § 2002(b)(4).

\(^{430}\) See NEBRASKA DEPT' OF ENVT'L CONTROL, WATER AND WASTE MANAGEMENT DIV., PROGRAM PLANS SECTION, NEBRASKA GROUND WATER QUALITY PROTECTION STRATEGY: FINAL
The Hazardous Materials Transportation Act of 1975 (HMTA)\textsuperscript{431} is broader in scope than the NGPSA or the HLPSA, although its provisions exclude from coverage matters regulated under those statutes.\textsuperscript{432} The HMTA applies to all hazardous materials,\textsuperscript{433} which include more than 1200 items and substances.\textsuperscript{434} The Secretary may issue regulations governing any "safety aspect" of hazardous materials transportation, including manufacture of containers.\textsuperscript{435}

Studies have found DOT's HMTA program seriously deficient in various respects; noncompliance is said to be widespread, and regulated entities are bewildered as to their regulatory obligations.\textsuperscript{436} Like the provisions of the NGPSA and HLPSA implementing regulations, those of the HMTA appear to be primarily surface oriented.\textsuperscript{437}

These and other similar laws\textsuperscript{438} are safety laws, not pollution laws. Their main function is protecting human health and safety from catastrophes such as explosions or chemical poisoning caused by accidents. Insofar as they prevent spills of hydrocarbons and other substances that could leach into groundwater tables, however, they contribute to prevention of groundwater contamination.

4. Nuclear Waste Legislation

Radioactive waste from nuclear power generating plants and defense installations poses an especial hazard to groundwater quality. Nuclear energy utilization produces various kinds of wastes with varying degrees of toxicity. Disposal of low-level wastes is governed in part by the Low-Level Radioactive Waste Policy Act of 1980\textsuperscript{439} and inter-state compacts concluded thereunder.\textsuperscript{440} Groundwater pollution from uranium mining is regulated in part by the Uranium Mill Tailings Radiation Control Act of 1978.\textsuperscript{441} Safe disposal of high-level nuclear

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432. Id. § 1811(c).
433. Id. § 1803.
436. Marten, Regulation of the Transportation of Hazardous Materials: A Critique and A Proposal, 5 Harv. Envtl. L. Rev. 345, 356-58 (1981). The regulations have been described as "fine print an inch and a half thick, requiring a Ph.D. chemist and a Philadelphia lawyer to read." Id. at 358.
437. Nebraska Report, supra note 430, at 22.
438. Marten, supra note 436, at 350-56, summarizes various other federal statutes that affect transportation of hazardous materials.
wastes is a more acute problem. The Nuclear Waste Policy Act of 1982 requires the Department of Energy to recommend three potential permanent waste repository sites to the President, who in turn is to choose one by 1987. Future events and requirements in this area are simply too speculative to warrant further comment. Certainly high-level waste poses a threat to groundwater quality if not safety quarantined from the environment. It will have to be stored at each generating plant site until a permanent, federally operated repository is completed. That will probably not happen until well into the 1990's.

In sum, the foregoing federal laws and others like them conceivably could affect some aspects of groundwater quality in some situations. They do not merit detailed discussion in this article, however, because of their narrow scope of applicability.

I. Summary of Federal Law

As the preceding sections of this part indicate, Congress has enacted a long list of statutes that empower several federal administrative agencies (primarily the EPA) to regulate activities that can contribute to groundwater contamination. These laws address a great many of the aspects necessary for a comprehensive program to prevent and abate groundwater pollution.

Many of the laws require the federal government to sponsor or conduct information gathering efforts to improve knowledge of the nature, source, extent, and effect of groundwater pollution. The statutes envision groundwater monitoring by federal and state governments and operators of contamination sources so that existing and potential problem areas are identified. Some of the statutory provisions, such as the imminent hazard sections of the CWA, the SDWA, the RCRA, the CERCLA, and the TSCA, authorize the EPA to institute administrative or judicial proceedings to correct existing problems. Some laws, such as the CERCLA and the SMCRA, set up programs to finance governmentally supervised cleanup efforts. Finally, all of the laws except the NEPA authorize the government to impose...

442. *Id.* §§ 10101-10226.


regulatory requirements, in the form of location, design, operating, or other performance standards, on potential pollution sources to prevent future contamination.

Despite the plethora of federal laws with some application to groundwater pollution and of associated state laws enacted in response to and under the authority of the federal statutes, the Office of Technology Assessment concluded recently that "[t]here is no explicit, comprehensive national legislative mandate to protect groundwater from contamination." Federal efforts to protect groundwater quality are fragmented among a number of federal agencies: "there is no single agency or organization responsible for all groundwater programs and activities." Even within the EPA, numerous divisions are responsible for different groundwater-related activities." While specialization has virtues, the component parts have not been integrated into a larger whole.

The fragmentation of federal law in this area has had another unfortunate consequence. Most of the statutes described in this part seek to protect the public health or the environment in general. Rarely do the statutes focus on the protection of groundwater per se." Furthermore, even where the statutes seek to achieve the same goal—protection of the public health—the extent to which the agency responsible for implementing congressional policy may consider economic or technological feasibility often differs from statute to statute or even from program to program within the same law. As a result, the government may set different discharge limitations or maximum concentration levels for the same substance if that substance is regulated under more than one statute. Finally, the extent of degradation permitted under one statute (such as the RCRA) may conflict with the amount authorized under another (such as the SDWA).

As the OTA points out, significant gaps in federal regulatory coverage remain. Some known groundwater contaminants are not regulated adequately or at all under the federal laws. The EPA has established MCLs for only a handful of substances, although recent amendments to the SDWA require the Agency to regulate many more substances in the next few years. The number of chemicals covered by regulations under the TSCA and the FIFRA is even more limited.

445. OTA REPORT, supra note 2, at 63; see also NRC REPORT, supra note 14, at 2.
446. OTA REPORT, supra note 2, at 63 (emphasis in original).
447. Id. at 81.
448. See id. at 74; see also Tripp & Jaffe, Preventing Groundwater Pollution: Toward a Coordinated Strategy to Protect Critical Recharge Zones, 3 HARV. ENVTL. L. REV. 1, 24-25 (1979).
449. See OTA REPORT, supra note 2, at 222.
450. See supra notes 183-86.
Further, not all bodies of groundwater are protected. Certain aquifers, for example, may be exempt from UIC programs under the SDWA, leaving underground injection into those aquifers uncontrolled.\textsuperscript{451} Some known contamination sources are not covered at all by federal law. The OTA cites as examples surface impoundments, waste piles, materials stockpiles, tanks and pipelines used to contain or store nonhazardous waste, and noncoal mining activities on private lands.\textsuperscript{452}

Even where regulatory coverage exists, it is sometimes minimal or inadequate. Not all sources of groundwater contamination are regulated to the same extent. Perhaps they should not be, but, according to the OTA, the differences in regulatory treatment "often have little relation to the potential for a source to cause contamination."\textsuperscript{453} Thus, point sources generally are subject to much more extensive and stringent controls than are nonpoint sources (e.g., under the CWA), even though such nonpoint sources as pesticide runoff from agricultural activities are significant contributors to groundwater pollution. Several sources are not required to engage in groundwater monitoring under any federal law. The OTA concluded that federal monitoring requirements are "generally limited relative to [known and suspected] sources of contamination."\textsuperscript{454} Sources not subject to monitoring requirements include irrigation, fertilizer application, pipelines, and activities causing salt water intrusion or brackish water upconing.\textsuperscript{455} These same sources, as well as others such as material transfer operations, urban runoff, production and other nonwaste wells, and construction excavation are not subject to explicit corrective action provisions; federal agency experience with such activities is limited.\textsuperscript{456} Even when statutes such as the CERCLA set up federally funded remedial action programs, they do not always provide standards for the adequacy of the cleanup (the so-called "how clean is clean?" problem).\textsuperscript{457} Finally, mandatory preventive mechanisms such as design and operating requirements have not been established for all groundwater pollution sources.\textsuperscript{458}

Funding problems also detract from the efficacy of federal law affecting groundwater quality. During the last several years, in part

\begin{itemize}
\item \textsuperscript{451} See OTA Report, supra note 2, at 222.
\item \textsuperscript{452} Id. at 77. According to the OTA, percolation of atmospheric pollutants, graveyards, animal burial grounds, de-icing salts, and household disposal have also slipped through the federal regulatory net, although the OTA does not feel that these sources are major contributors to groundwater contamination nationwide. See id. at 77 n.14.
\item \textsuperscript{453} Id. at 63.
\item \textsuperscript{454} Id. at 145.
\item \textsuperscript{455} Id. at 76, 155.
\item \textsuperscript{456} Id. at 76, 197, 200.
\item \textsuperscript{457} Id. at 200.
\item \textsuperscript{458} Id. at 223.
\end{itemize}
because of rising federal deficits and related national economic difficulties, funds requested for, appropriated for, and spent on many of the federal programs related to the protection of groundwater quality have been reduced significantly. 459 These budgetary changes almost certainly detract from the federal agencies' ability to implement their statutory mandates. The current Administration has also sought to shift some of the responsibilities for protecting the environment from the federal to the state level. 460 At the same time, it has cut, in some cases drastically, federal financial assistance to state programs created under the federal statutes. Funding for the CWA section 208 areawide waste management program and the RCRA program for nonhazardous solid waste management, for example, has been totally eliminated at various times between 1981 and 1985. 461 These funding reductions cannot help but negatively affect state as well as federal regulatory efforts.

Although it has not enacted a comprehensive groundwater protection law, Congress has not ignored the groundwater pollution problem. Indeed, the number of statutes that bear in one way or another on groundwater resource quality is little short of astonishing, especially since the vast bulk of this body of law is of very recent vintage. But this part shows that the federal effort to protect groundwater quality is far from all-encompassing. The states cannot rely on federal regulatory programs to insure that future generations will have safe and ample groundwater resources.

The federal laws are good starting points for state groundwater protection initiatives. States should take full advantage of the information generated by the federal government and of the authority provided to supervise or participate in many of the programs created under federal law. A state's groundwater protection program, however, should extend beyond the confines of current federal programs and the minimum requirements imposed by those programs, so long as the state program is consistent with federal law. The state should pay particular attention to those aspects of the groundwater pollution problem that have been overlooked or downplayed by Congress and the EPA. Finally, states should not rely upon a continuing flow of federal dollars to assist them in their groundwater protection initiatives.

459. See, e.g., 16 Env't Rep. (BNA) 8-9 (May 2, 1986).
460. See OTA REPORT, supra note 2, at 66, 69; see also NEBRASKA REPORT, supra note 430, at 34.
461. See NRC REPORT, supra note 14, at 10 ("All groundwater protection programs reviewed . . . indicated a lack of adequate funding, which constrained the development and implementation of a comprehensive groundwater protection program.").
III. Kansas Law-Governing Groundwater Pollution

This part describes the present Kansas law that directly bears on prevention of groundwater pollution. The deficiencies identified in the attempt by Kansas to ensure groundwater quality protection are probably representative of similar efforts in most other states. The first section briefly summarizes the responsibilities of the State administrative agencies currently entrusted with some role in groundwater management or protection. The second section outlines Kansas law creating and regulating property rights in groundwater. Subsequent sections discuss the various existing laws and regulations intended to combat groundwater contamination. The final section concludes that a groundwater pollution prevention strategy cannot be premised on these laws and regulations alone because they are too scattered, diffuse, and problematic.

A. The Kansas Administrative Structure

The administrative structure in Kansas for regulating, managing, conserving, and protecting natural resources in general, and groundwater in particular, is more a product of history than of logical design. Many states have consolidated related administrative functions under the umbrella of a department of natural resources or its equivalent. Kansas has not. Instead, many departments and agencies, each with differing statutes, interests, procedures, missions, and constituencies, govern various aspects of groundwater use and abuse.

The Kansas Department of Health and Environment (KDHE), a product of earlier mergers, is the central state agency in the realm of general pollution control. The KDHE operates nearly all of the State's conventional pollution abatement programs. It is the designated organ of the State for implementing most of the federal pollution laws, including the CAA, the CWA, the SDWA, the RCRA, and the CERCLA. In addition, the Kansas Legislature has given the KDHE full or partial jurisdiction over related areas such as water wells and septic fields, pesticides, and oil and gas drilling.

The present internal organization of the KDHE is inadequate to implement a comprehensive groundwater protection strategy. No single division or section of the KDHE, as currently constituted, has sole or primary responsibility for preventing or abating groundwater contamination. Instead, ad hoc task forces, with personnel drawn from other divisions, are put together to deal with pollution incidents in response to complaints. A sui generis approach may have been suf-

462. Interview, supra note 62; cf. NRC REPORT, supra note 14, at 156 (Kansas groundwater quality protection efforts lacked "an adequate number of professionally trained staff to carry out the program requirements")
sufficient when the protection of groundwater quality was a relatively low priority, but it is an increasingly ineffective method for dealing with a serious, growing, statewide problem. Without a single entity that is clearly responsible for implementing a defined program, necessary research is not undertaken, coordination and consistency are at best difficult, and regulatory efficiency is questionable.\footnote{463}

The KDHE’s basic mission is shared with or diluted by other agencies.\footnote{464} The Kansas State Board of Agriculture (KSBA) and the Livestock Commission have primary or exclusive jurisdiction over agricultural activities that affect environmental quality; the Division of Water Resources of the KSBA has a special regulatory role.\footnote{465} The Kansas Corporation Commission (KCC) has authority to participate in environmental regulation of several source categories, including, notably, oil and gas drilling.\footnote{466} The Mined-Land Conservation and Reclamation Board (MLC&RB) governs mining operations in Kansas.\footnote{467} The division of authority over the creation and administration of water rights further fragments efforts to prevent groundwater pollution. The State Water Office, the Chief Engineer, and Groundwater Management Districts are all involved in allocating water rights and each of these agencies necessarily will interact with any groundwater protection strategy. This summary does not exhaust the list of administrative entities with relationships to groundwater pollution sources, but it does illustrate the historical fragmentation of administrative effort.

For a long time, Kansas lacked a general administrative procedure statute. The State has recently enacted such a law,\footnote{468} but its scope is too limited to clear up the confusion over procedure in the pollution control area. The new Act applies “only to the extent that other statutes expressly provide” that it governs procedures under those statutes.\footnote{469} The statutes that grant regulatory authority to many of the State’s agencies, including the KDHE, do not refer to the new Kansas administrative procedure act. Therefore, each such agency must follow the procedures spelled out (or hinted at) in its governing

\footnotetext[1]{463}{For those reasons, the strategy set forth in Groundwater Pollution II, supra note 3, recommends that a Division of Groundwater Quality be created in the KDHE. See id. pt. II, § A.}
\footnotetext[2]{464}{See generally M. Fund, supra note 42, at pt. three.}
\footnotetext[4]{466}{See id. §§ 66-101 to -1,238 (1985); id. §§ 55-1 to -164, 55-1001 to -1007 (1983 & Supp. 1985).}
\footnotetext[5]{467}{Id. §§ 49-405 to -406 (1983 & Supp. 1985).}
\footnotetext[7]{469}{Id. § 77-503(a). Governor Carlin vetoed another bill (S.B. 479, § 2) that would have made the State administrative procedure act applicable to all State agencies not expressly providing other procedures. See Kansas Sen. J. 1550 (Apr. 23, 1986) (veto message).}
legislation. In the absence of any statutory procedures, the agency is guided only by the requirement that regulated entities and other affected persons be afforded elementary due process of law.\textsuperscript{470} Unless and until the new act is extended to all agencies, considerable uncertainty will continue to surround administrative procedure in Kansas.

These shortcomings in administrative structure and procedure are not necessarily representative of situations in other states. Still, fragmentation of agency responsibilities and uncertainty of administrative approach are cited as prime reasons why programs in other jurisdictions have failed.\textsuperscript{471}

\subsection*{B. \textit{The Kansas Law of Water Rights in Groundwater}}\textsuperscript{472}

Kansas originally adhered to the so-called "English Rule" for diffused percolating groundwater.\textsuperscript{473} This rule, also called the "absolute ownership doctrine," assumed that a property owner's rights in water underlying his land were virtually unlimited; a landowner could use underlying water regardless of the effect on his neighbor's use of water from the same underground reservoir.\textsuperscript{474} Kansas, like other jurisdictions,\textsuperscript{475} repudiated the absolute ownership rule for groundwater in the Kansas Water Appropriation Act of 1945.\textsuperscript{476} It significantly limited property rights in Kansas groundwater. Most dramatically, the statute declares that "[a]ll water within the state of Kansas

\begin{itemize}
\item \textsuperscript{470} \textit{See generally} Ainsworth \& Shapiro, \textit{Rethinking Kansas Administrative Procedure}, 28 \textit{Kan. L. Rev.} 419 (1980).
\item \textsuperscript{471} \textit{See}, \textit{e.g.}, Getches, \textit{supra} note 131, at 644-45.
\item \textsuperscript{472} This section is based upon a paper prepared by Professor John C. Peck, Professor of Law at the University of Kansas. The paper, which analyzed the Kansas law of groundwater rights and water rights administration, is found at Appendix II to the \textit{Strategy Report}, \textit{supra} note 6.
\item \textsuperscript{473} \textit{See} Williams \textit{v.} Wichita, 190 Kan. 317, 326, 374 P.2d 578, 585-86 (1962), \textit{cert. denied}, 375 U.S. 7 (1963). There have been two legal subclassifications of groundwater—"waters flowing in defined subterranean channels" and "diffused percolating water." W. Hutchins, \textit{Selected Problems in the Law of Water Rights in the West I} (U.S. Dep't of Agric. Misc. Pub. No. 418, 1942). The former refers to underground rivers like those found in the Missouri Ozarks but rarely in Kansas. The discussion of water rights in this section deals with the latter type of groundwater, that found in the interstices of sands and gravels.
\item \textsuperscript{474} \textit{See} Acton \textit{v.} Blundell, 12 M. \& W. 324, 349, 152 Eng. Rep. 1223, 1233 (1843).
\item \textsuperscript{475} The "reasonable use" or "American rule" adopted in some states, for example, modified the English rule. Under the reasonable use doctrine, a user of groundwater is required to use the water on his land in an amount necessary for some useful or beneficial purpose; within these guidelines, the use can still result in a draining of a neighbor's groundwater supply. Under this rule, however, the owner cannot carry the water away for use elsewhere.
\end{itemize}
is hereby dedicated to the use of the people of the state, subject to the control and regulation of the state.\cite{477} The 1945 Act, which still governs private rights in Kansas groundwater,\cite{478} authorizes private persons to "appropriate" water rights in groundwater or surface waters by obtaining a permit from the Chief Engineer of the Division of Water Resources of the Board of Agriculture.\cite{479} With certain exceptions,\cite{480} it is a misdemeanor to appropriate water without a permit.\cite{481} Water rights are defined as "real property right[s] appurtenant to and severable from the land on or in connection with which the water is used."\cite{482}

If two or more persons claim rights in the same groundwater, the 1945 Act resolves the conflict by applying a "first in time, first in right" principle: the recipient of an earlier permit (the senior appropriator) takes priority over the holder of a later permit (the junior appropriator).\cite{483} Junior appropriators may not impair the water rights of senior appropriators. Impairment is defined in terms of both quantitative and qualitative impact. It includes either an "unreasonable lowering of the static water level" or the unreasonable deterioration of the water quality at the senior user's point of diversion beyond a reasonable economic limit.\cite{484} Accordingly, a senior user may shut down a junior appropriator who causes an unreasonable deterioration in water quality.\cite{485}

The 1945 Act allows the Chief Engineer to reject an application to appropriate fresh water where other waters are available and the

\begin{footnotesize}
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\item[481.] Id. § 82a-728;
\item[482.] Id. § 82a-701(g); These rights may be forfeited by non-use. See id. § 82a-718.
\item[483.] Id. § 82a-707; The Appropriation Act recognized water rights existing before 1945 in persons making a beneficial use of water (so-call "vested rights"), but cut off existing riparian or groundwater rights not being used. See id. §§ 82a-701(d), -704a, -716, -717a;
\item[484.] Id. § 82a-711; Under this definition, junior appropriators are allowed to deplete the supply until there is an "unreasonable" effect, so the senior users have to accommodate junior users to that extent.
\item[485.] Id. § 82a-717a. The Act itself provides no monetary recovery; although it does not limit the right of a senior user to recover damages under other legal theories for any injury to land or appurtenant water rights. Id. § 82a-721a. Neither a junior user nor a non-holder of a water right may sue a senior user for water quality impairment under the Act; but they are apparently not precluded from other forms of relief found outside the Act. Domestic water rights can exist without a permit, and these non-recorded domestic rights, having a status equal to other water rights, can be the basis of a suit for water quality impairment if they are senior to the impairing right. See id. §§ 82a-701, -705, -705a, -707, -728.
\end{itemize}
\end{footnotesize}
use of those waters is technologically and economically feasible.\footnote{486}{Id. § 82a-711 (1984).} It also might require permits in some seemingly unlikely situations involving water quality. If a State agency, for example, were to combat the intrusion of subsurface saltwater into surface water by undertaking a saltwater interception and deep well injection project, as the 1985 State Water Plan recommended,\footnote{487}{Kansas Water Office, Kansas Water Plan: Quality Section, Mineral Intrusion Subsection 4 (1985).} a water right would arguably be required to intercept, remove, and inject the saltwater.

Kansas statutes enacted after 1945 continued to restrict private property rights in groundwater to protect water quality. The purpose of the 1972 act authorizing the creation of groundwater management districts (GMDs)\footnote{488}{1972 Kan. Sess. Laws ch. 386 (codified as amended at Kan. Stat. Ann. §§ 82a-1020 to -1040 (1984)).} was to achieve "the proper management of the groundwater resources of the state; [to] conserv[e] . . . groundwater resources; [and to] prevent[] . . . economic deterioration. . . ."\footnote{489}{Kan. Stat. Ann. § 82a-1020 (1984). The GMD Act sets out a rigid procedure for establishing a GMD. Id. §§ 82a-1022 to -1025. Once established, the GMD has certain enumerated powers, including the power to sue or be sued and to own land and water rights. Id. § 82a-1028. To date five GMDs have been created. The western GMDs (#1, #3, and #4) overlie the Ogallala Aquifer in a region where soil conditions and relatively little rainfall prevent much aquifer recharge. The two central Kansas GMDs (#2 and #5) lie in an area where the soil is sandy, transmissibility is high, and rainfall is more abundant, leading to more recharge potential.} GMDs are authorized to adopt and enforce standards and policies relating to conservation and management of groundwater within their boundaries.\footnote{490}{Id. § 82a-1028(n).} Most GMD standards, policies, and management programs are subject to approval by the Chief Engineer.\footnote{491}{Id. §§ 82a-1028(o).}

Although the act authorizing the creation of GMDs was primarily intended to achieve water quantity, rather than quality, objectives, some of the GMD regulations approved by the Chief Engineer are

\footnote{486}{Id. § 82a-711 (1984).}
\footnote{487}{Kansas Water Office, Kansas Water Plan: Quality Section, Mineral Intrusion Subsection 4 (1985).}
\footnote{489}{Kan. Stat. Ann. § 82a-1020 (1984). The GMD Act sets out a rigid procedure for establishing a GMD. Id. §§ 82a-1022 to -1025. Once established, the GMD has certain enumerated powers, including the power to sue or be sued and to own land and water rights. Id. § 82a-1028. To date five GMDs have been created. The western GMDs (#1, #3, and #4) overlie the Ogallala Aquifer in a region where soil conditions and relatively little rainfall prevent much aquifer recharge. The two central Kansas GMDs (#2 and #5) lie in an area where the soil is sandy, transmissibility is high, and rainfall is more abundant, leading to more recharge potential.}
\footnote{490}{Id. § 82a-1028(n).}
\footnote{491}{Id. §§ 82a-1028(o), -1029. Although enhancement of local decision-making authority is the paramount purpose of the GMD Act, the Act is subject to existing water laws and policies of the State. Id. § 82a-1020. The Chief Engineer's Division of Water Resources therefore remains the primary water rights agency in the State. Id. § 82a-1039. The Chief Engineer continues to be responsible for handling water rights applications throughout the State, even within the boundaries of the GMDs. The GMDs may give opinions on whether to grant a permit, but the Chief Engineer retains the power to make the ultimate decision. The GMD Act requires each GMD to establish a management program describing the characteristics of the GMD and the nature and methods of dealing with groundwater supply problems, subject to the Chief's approval. Id. GMDs may recommend rules and regulations for the district, but they have the force and effect of law only when approved by the Chief Engineer. Id. § 82a-1028(o). The GMD Act gives GMDs the power to adopt and enforce standards and policies not inconsistent with the Water Appropriation Act. These need not be approved by the Chief Engineer, but must be otherwise consistent with State law. Id. § 82a-1028(n).}
directed to water quality protection. For example, all GMDs prohibit "waste of water," which includes "any act or omission causing the unreasonable deterioration of the quality of water in any source of supply, thereby causing impairment of a person's right to use water." Under this authority, GMD #2 has joined forces with the Kansas Corporation Commission and the KDHE to prevent water pollution from oil and gas operations.

Certain other GMD powers and activities seek to protect groundwater quantity and quality through land use control mechanisms. The two central Kansas GMDs, for example, have devised safe yield formulas for use in considering new well permit applications. If the quantity of water to be pumped by the applicant, when added to existing withdrawals within a two-mile radius of the proposed new well, would cause groundwater mining, the GMD will recommend to the Chief Engineer that the permit be denied.

The GMD Act also gives the Chief Engineer the power to designate within a GMD an "intensive groundwater use control area." Such an area may be established when (1) groundwater levels have declined excessively; (2) groundwater mining exists; (3) preventable waste is occurring; or (4) water quality is being unreasonably deteriorated. Once an intensive use control area is designated, the Chief Engineer may close the area to further appropriation, require a system of rotation within the area, apportion the water among right holders based on priority of appropriation, or impose such other requirements "as are necessary to protect the public interest." Pursuant to this authority, the Chief Engineer has designated a control area in GMD #2 to

494. See the June 1985 newsletter of the Equus Beds GMD #2. The regulations of Southwest GMD #3 and Big Bend GMD #5 also provide that abandoned wells must be closed or plugged according to KDHE regulations, Kan. Admin. Regs. §§ 5-23-8, -25-2(d) (1983), and owners must cap open or uncovered wells. Id. § 5-23-9. Northwest GMD #4 has established well-construction criteria that prevent mixing of cretaceous aquifer water with quaternary, tertiary, or other cretaceous water. Id. § 5-24-7(b). Big Bend GMD #5 also gives its board the power to require all water users to obtain water quality analyses and to submit results to the board. Id. § 5-25-7.
495. See Kan. Admin. Regs. §§ 5-22-7, -25-4 (1983). Southwestern Kansas GMD #3, because of its inherent problem of little recharge, has opted for a depletion formula rather than a safe yield formula. Id. § 5-23-4. To have the latter would effectively shut down further withdrawals of groundwater in that region. It too uses a circle with a two-mile radius to test whether the proposed well, when added to existing wells within the circle, would create a withdrawal that would exhaust 40% or more of the water in the aquifer within the next 25 years. If so, the GMD recommends denial of the permit.
497. Id.
498. Id. § 82a-1038.
deal with deteriorating water quality near Burrton, Kansas. The Chief Engineer (1) required flow metering of wells; (2) established deep aquifer monitoring wells and a continuous monitoring program in the control area; (3) conducted investigations to determine the sources of pollution; and (4) implemented additional water well construction standards.\footnote{500. More particularly, the Chief Engineer appointed a task force whose recommendations included conducting detailed lease investigations to ascertain who might be potential water pollution contributors; investigating the integrity of plugs in wells suspected of leaking; conducting mechanical integrity tests on all injection or disposal wells in the control area; conducting soil samples of several abandoned saltwater ponds; establishing deeper aquifer monitoring wells; and implementing additional water well construction standards.} It is not known whether this venture has succeeded or will succeed.

Various other laws place limits on groundwater extraction. The Kansas Groundwater Exploration and Protection Act,\footnote{501. \textit{Id.} § 82a-1201. The Act is also meant "to protect the health . . . of the citizens of this state; to protect groundwater resources from . . . potential pollution . . . ; and to provide . . . water quality tests." \textit{Id.}} for example, provides for "the exploration and protection of groundwater through the licensing and regulation of water well contractors."\footnote{502. \textit{Id.} §§ 82a-1202, -1205, -1206, -1212, -1213.} The Act requires licensing of water well contractors by the KDHE, authorizes the establishment of standards for well construction, treatment, and plugging, and requires well drillers to submit data and water quality samples.\footnote{503. Various statutes and regulations apply to the use of water in initial drilling operations, as a by-product in oil and gas productions, and in secondary or enhanced oil and gas operations. \textit{See} Neufeld, \textit{The Kansas Water Appropriation Statutes and Their Effects Upon the Oil and Gas Industry in Kansas}, 50 \textit{J. Kan.} B.A. 43 (1981).} Water use by the oil and gas industry is regulated under other statutes, including the Kansas Water Appropriation Act of 1945.\footnote{504. \textit{See} Groundwater Pollution \textit{II}, supra note 3, at pt. II.} The law of water rights in Kansas has undergone a dramatic change in the last forty years. The 1945 Water Appropriation Act ended any notion that the owner of land has an unqualified property right in groundwater underlying that land. The 1945 Act and subsequent statutes have imposed a series of restrictions on private water rights to achieve various public purposes, including the protection of groundwater quality. The water rights laws of other states undoubtedly differ markedly both in general approach and detail from those in Kansas. Nevertheless, to the extent a state's existing laws provide restrictions on property rights in groundwater to achieve water quality protection objectives, these laws provide precedent for imposing further restrictions necessary for a more comprehensive groundwater quality strategy.
C. Kansas Water Pollution Law

Kansas water pollution law, while extensive in theoretical coverage, is scattered, primitive in places, and largely directed at pollution of surface waters. Unlike federal law, Kansas law clearly covers contamination of groundwater. It offers a starting place for a strategy to prevent and abate groundwater pollution, but, by itself, is not adequate for that purpose. This section discusses Kansas law applicable to various sources, including public sewage treatment systems, and points out some of the ways in which the present State laws are deficient in combatting groundwater pollution.

1. State Regulation of Potential Water Pollution Sources

The federal CWA authorizes state participation in the Act’s programs by permitting states to administer NPDES permit programs.\textsuperscript{505} The CWA mandates development and application of state water quality standards\textsuperscript{506} and allows state enforcement actions against violators of state-issued permits.\textsuperscript{507} The states are free to adopt controls that are more stringent than those promulgated by the EPA.\textsuperscript{508}

Kansas, with its antiquated water pollution laws,\textsuperscript{509} has taken advantage of the regulatory opportunities provided to it by the CWA. The Legislature has authorized the KDHE to prevent surface and subsurface water pollution detrimental to public health or to the plant, animal, and aquatic life of the State, to protect beneficial uses of the waters of the State, and to require the treatment of sewage.\textsuperscript{510} To achieve these goals, the KDHE must issue whatever regulations it deems necessary to protect the waters of the State from pollution\textsuperscript{511} by oil, gas, salt water injection wells, or underground storage reservoirs. The KDHE must also control the discharge\textsuperscript{512} or escape of sewage (broadly defined)\textsuperscript{513} into waters of the State.\textsuperscript{514}

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\textsuperscript{505} See 33 U.S.C. § 1342(b) (1982). States that do not have an approved permit program still may affect the outcome of NPDES permit proceedings. The EPA cannot issue a permit if the state refuses to certify that a permit applicant’s discharges will comply with federal or state water pollution control standards issued under the CWA. See id. § 1341(a)(1).

\textsuperscript{506} See id. § 1313.

\textsuperscript{507} Id. § 1319(a)(1).

\textsuperscript{508} Id. § 1370.


\textsuperscript{511} Pollution is defined at id. § 65-171d(c).

\textsuperscript{512} Id. § 65-161(b).

\textsuperscript{513} Sewage means “any substance that contains any of the waste products or excrementitious or other discharges from the bodies of human beings or animals, or chemical or other wastes from domestic, manufacturing or other forms of industry.” Id. § 65-164. The wording indicates the age of the law.

\textsuperscript{514} Id. § 65-171d(a).
statutory terms and standards seldom precisely track the federal law, because they were originated generations ago, and the resulting topsy-turvy system has never been overhauled, simplified, or made congruent with federal law.\footnote{515} To carry out the State's obligations under the CWA, the KDHE must establish water quality standards to protect beneficial uses of the waters of the State.\footnote{516} Unlike the CWA, Kansas statutes unquestionably apply to groundwater pollution. The statute defines "waters of the state" to include "all streams and springs, and all bodies of surface and subsurface waters within the boundaries of the state."\footnote{517} Other than this reference and a few specific provisions, however, the Legislature has provided no real guidance on the preferred means of applying the general water pollution laws to groundwater pollution sources.

The Kansas Legislature has also authorized a permit program to operate in lieu of the EPA's NPDES program. State statutes prohibit any person from placing or discharging sewage or permitting sewage to flow into the waters of the State without a permit.\footnote{518} The KDHE may not permit any direct sewage discharge that pollutes the waters of the State in a manner prejudicial to the public health.\footnote{519} Dischargers must meet all applicable State water quality standards and all federal water quality and effluent standards issued under the CWA.\footnote{520} In addition, indirect dischargers (nondomestic sources that introduce pollutants into a publicly owned treatment works (POTW))\footnote{521} must comply with pretreatment and water quality standards.\footnote{522} These provisions were evidently meant to apply primarily to sources of surface water pollution, because the Legislature omitted any specific provision covering "dischargers" into subsurface waters.

To implement these statutes, the KDHE has promulgated regulations requiring a permit for any person discharging or having a potential to discharge pollutants into waters of the State.\footnote{523} All owners and operators of sewage systems, industrial facilities, commercial

\footnote{515} See Coggins, supra note 509, at 27.
\footnote{517} Id. § 65-161(a); see also Kan. Admin. Regs. § 28-16-58(1) (1983).
\footnote{519} Id. § 65-164. Conversely, the KDHE may issue a discharge permit when it concludes that the general interests of the public health would be served thereby or that the discharge would not detract from the quality of the waters of the State for domestic or public water supply, agricultural needs, industrial needs, recreational needs, or other beneficial uses. Id. § 65-165. Obviously, Kansas law is not precisely congruent with the federal CWA.
\footnote{520} Id. § 65-165.
\footnote{521} Id. § 65-161(c).
\footnote{522} Id. § 65-165.
establishments, or agricultural activities discharging sewage must have approved water pollution control facilities. The KDHE must ensure that these facilities conform to minimum design, construction, and maintenance standards. The KDHE apparently limits the application of these regulations to surface water discharges because it does not require many classes of groundwater polluters to obtain permits.

The KDHE's regulations also prohibit the construction, maintenance, or use of a privy, seepage bed, or similar device into which a water closet, lavatory, kitchen sink, or similar plumbing fixture is drained within fifty feet of any well, spring, or other source of water used for drinking or cooking. A privy that, because of its location, makes pollution of a domestic water supply probable is a public health nuisance, which may be abated by the KDHE. Domestic wastes must be discharged into a community sewer system approved by the KDHE, a private sewer system with a KDHE permit, or a septic tank located, designed, and operated in accordance with KDHE standards. The regulations also govern septic tank discharges into soil absorption fields, sewage treatment facilities, or seepage pits. These regulations are intended to prevent groundwater pollution, but they govern only limited classes of pollution sources and then only in a somewhat limited manner.

The Kansas Legislature also has prohibited the storage or disposal of salt water, oil, or refuse in surface ponds without a KDHE permit. If the KDHE finds "that the waters of the state are not being protected from pollution by oil, gas, salt water injection wells, or underground storage reservoirs, or that storage or disposal of salt water, oil, or refuse in a surface pond is causing or is likely to cause pollution of soil or waters of the state," the KDHE must issue an order prohibiting the operation of the activity causing the problem.

2. Statutory Penalties and Remedies

The statutes authorize both civil and criminal penalties for violators of the water pollution laws. Any person who violates statutes, regulations, or orders and kills or injures fish, animals, vegetation, or other

524. Id. § 28-16-621(A).
525. Id. § 28-5-2.
526. Id. § 28-5-4(1). So is a domestic animal pen that pollutes a domestic water supply, an underground water-bearing formation, or a stream in a manner hazardous to human health. Id. § 28-5-4(3).
527. Id. § 28-5-6.
528. Id. § 28-5-7.
530. Id. § 65-171d(e)(1).
531. Id. §§ 65-170d(a)-(b).
resources of the State, or who otherwise causes a reduction in the quality of the State's waters below KDHE standards, is liable to the State for damages. 532

The KDHE has the authority to abate or clean up pollution in emergency situations by ordering the cessation of pollution within a reasonable time or requiring whatever treatment or disposal that the KDHE finds is necessary to prevent future pollution. 533 In addition, the Legislature has established a $50,000 special fund in the State treasury to finance cleanup of water or soil pollutant discharges, if the discharger is unknown or refuses to clean up the pollutant. 534 Fund expenditures are recoverable from persons responsible for the discharge. 535 These regulatory tools apparently are not often used to clean up pollution of groundwater.

3. Regulation of Public Sewage Systems

The State's statutes and regulations contain a series of provisions governing the construction and operation of public sewage and other similar systems. The KDHE has the power to enact minimum standards for the design, construction, and maintenance of sanitary water and sewage systems. 536 Municipalities may enact regulations prohibiting the discharge into their sewer systems of matter deleterious to the proper operation of the treatment plant. 537 The KDHE has issued regulations to ensure that POTWs receiving federal financial assistance are properly designed, constructed, and operated. 538 The emphasis of the statutes and regulations are again on surface water pollution. Finally, the Legislature has authorized the KDHE to issue standards and procedures for the development of countywide wastewater management plans under section 208 of the CWA. 539 The KDHE’s regulations describe the required components of each plan, 540 and require permits for the operation of sewage facilities to be consistent with the plan. 541

532. The State may recover amounts necessary to restock waters, replace resources, and otherwise restore the water source to its condition prior to the injury. Id. § 65-171u. These damages do not include injuries to private property rights or personal injuries. Id.

533. Id. § 65-164.

534. Id. § 65-171w.

535. Id. § 65-171v.

536. Id. § 65-171h.

537. Id. § 12-3105 (1982).

538. See KAN. ADMIN. REGS. §§ 28-16-50 to -55 (1983); see also id. § 28-16-29 (requirements for certification of operators of water supply systems and wastewater treatment facilities).


540. KAN. ADMIN. REGS. § 28-16-80 (1983).

541. Id. § 28-16-81(b).
4. Deficiencies in State Regulation

The Kansas water pollution statutes, in spite of their ancient origins, authorize controls on subsurface pollution as extensive as those on surface pollution. Nevertheless, and perhaps because the State’s program is integrated with the EPA’s implementation of the federal statute, relatively little attention appears to have been paid to groundwater problems in the program’s implementation.542 Furthermore, the present statutes do not provide guidelines for preventing groundwater pollution, and the implementing regulations are similarly lacking. The theory of water pollution regulation in Kansas is helpful to a groundwater strategy, but the practice offers relatively few valuable pointers.

D. Kansas Drinking Water, Well, and Reservoir Regulation

The general water pollution laws discussed in the preceding section are supplemented in Kansas by a patchwork of other statutes dealing with specific sources of pollution. While some of these laws are fairly new, and some are directly relevant to groundwater pollution, these statutes do not form an adequate foundation for even a rudimentary prevention strategy.

1. Drinking Water Standards and Similar Programs

Kansas laws and regulations implement two of the principal programs under the federal SDWA, the program for drinking water standards and the program for underground injection control. Kansas, like most states, has not designated any sole source aquifers.

The first of the two Kansas programs establishes drinking water standards for public water supply systems.543 The KDHE may adopt regulations setting primary drinking water standards which identify contaminants that may have an adverse effect on the public health, and specify for each identified contaminant a maximum contaminant level (MCL) that is acceptable in water for human consumption.544 It also may establish monitoring, recordkeeping, and report-

542. See, e.g., id. § 28-16-28 (listing water quality criteria for surface waters only).
ing requirements to insure compliance with the MCLs or treatment techniques and to insure proper operation and maintenance of public water supply systems.\(^{545}\) All drinking water supplied to the public from a public water supply system must be disinfected.\(^{546}\) The KDHE's regulations also include requirements covering the frequency and methods for monitoring public water supplies.\(^{547}\) The Legislature has prohibited any person from operating a public water supply system within the State without a permit from the KDHE.\(^{548}\) New or expanded facilities for public water supply systems cannot be constructed at sites determined by the KDHE to be unsuitable, including sites adjacent to a major source of pollution that the KDHE determines has a potentially adverse influence on the water supply.\(^{549}\)

All community water supply systems\(^{550}\) and any high-risk non-community water systems\(^{551}\) designated by the KDHE must notify the KDHE and responsible local officials of any situation that may present an imminent and substantial endangerment to health.\(^{552}\) Community water systems also must prepare and submit for KDHE approval an emergency operations plan to safeguard the water supply if natural or man-made disasters occur.\(^{553}\)

Any person who operates a public water supply system without a permit, in violation of permit conditions, or in violation of primary drinking water standards is subject to civil penalties.\(^{554}\) The KDHE may request that the Attorney General bring a civil suit to prevent or enjoin a violation of regulations relating to the operation of a public water supply system.\(^{555}\)

2. Underground Injection Control

The second SDWA-related program in Kansas controls groundwater pollution by underground injection activities. The KDHE may adopt regulations, including the registration of potential sources of pollution, to protect the waters of the State from pollution by oil,

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547. Id. § 28-15-14.
550. Community water supply systems are those with at least ten service connections used by year-round residents or that regularly serve twenty-five year-round residents. Id. § 28-15-11(b).
551. A non-community water supply system is a public water supply system which is not a community water supply system. Id. § 28-15-11(c).
552. Id. § 28-15-18(d).
555. Id. § 65-171t.
gas, or salt water injection wells, or by underground storage reservoirs.\textsuperscript{556} If the KDHE finds that water resources are not being protected from pollution by any of these activities, it must issue an order prohibiting the operation or use of the well or reservoir.\textsuperscript{557}

Using this authority, the KDHE has adopted an underground injection control ("UIC") program that incorporates verbatim virtually all of the provisions of the EPA's program, including the EPA's system for classifying injection wells,\textsuperscript{558} its procedures and standards for issuing injection well permits,\textsuperscript{559} and its provisions for the construction, operation, monitoring, plugging and abandonment of injection wells.\textsuperscript{560}

3. Other Well and Reservoir Regulation

Aside from the two programs directly related to the SDWA, the KDHE has adopted several other mechanisms to protect drinking water supplies and groundwater resources from contamination resulting from the use of wells or from other industrial activities. In the aggregate, these programs constitute a morass incomprehensible to the outsider. They are merely summarized here.

The KDHE regulates the construction, operation, and abandonment of salt solution mining wells and hydrocarbon storage wells. The regulations require permits for persons seeking to construct and use solution mining wells for the production of brine from subsurface formations by hydraulic methods.\textsuperscript{561}

Under another set of regulations, the KDHE controls the construction and use of underground storage reservoirs\textsuperscript{562} and of disposal

\textsuperscript{556} Id. § 65-171d(a)(1).
\textsuperscript{557} Id. § 65-171d(c)(1).
\textsuperscript{559} See id. §§ 28-46-5 to -9, 28-46-11 to -22.
\textsuperscript{560} See id. §§ 28-46-29 to -30, 28-46-34; see also id. § 28-46-1(a). The KDHE's regulations prohibit the injection of hazardous or radioactive wastes into or above an underground source of drinking water; the Agency may issue any orders or take other appropriate action necessary to enforce that prohibition. Id. § 28-46-4. The KDHE may, subject to EPA approval, exempt certain underground sources of drinking water from protection under the UIC program. Aquifers that may be exempted include those containing water with more than 10,000 milligrams per liter of total dissolved solids; those that produce minerals, hydrocarbons, or geothermal energy; and those situated at a depth which makes the recovery of water economically impractical. Id. § 28-46-40.
\textsuperscript{561} Id. § 28-43-3. Similarly, the regulations prohibit the construction and use of new wells for the storage of hydrocarbons in cavities developed in subsurface formations by solution or other mining methods without a permit. Id. § 28-43-3. Both sets of regulations restrict the location and the method of construction of new wells. Id. §§ 28-43-5, -45-5. Both programs specify procedures for abandoning and plugging wells to prevent leakage into groundwater. Id. §§ 28-43-8, -45-8. Both require monitoring and reporting. Id. §§ 28-43-7, -45-7.
\textsuperscript{562} An underground storage reservoir is "any naturally occurring or artificially produced
wells for the confinement, storage, and disposal of industrial fluids such as brines. The regulations prohibit the use of any disposal well without a KDHE permit. Plans and specifications for the storage of petroleum products, acids, radioactive materials, or other fluid or gaseous products in underground reservoirs must be approved by the Chief Engineer before construction or development of the reservoir.

The KDHE also regulates the activities of those who supply drinking water from wells and reservoirs. Public water supply wells and wells located in reservoir sanitation zones must be located, constructed, and operated in accordance with KDHE standards. Other water wells must be located in a way that will minimize the potential for contamination of the delivered groundwater and of the aquifer. Well locations must be approved by municipal and county governments to insure conformance with local zoning and other regulations, although the KDHE mandates that wells be located certain minimum distances from potential sources of pollution. Abandoned water wells must be plugged to prevent threats of contamination of supplies.

The Kansas Groundwater Exploration and Protection Act is intended to protect groundwater through the licensing and regulation of water well contractors in Kansas; it seeks to prevent waste and pollution of groundwater resources by requiring proper location, drilling, well construction, and plugging of abandoned water wells and test holes. To achieve these objectives, the Act requires water well contractors to be examined and licensed by the KDHE before they can engage in the business of constructing, reconstructing, or treating water wells.

subsurface cavity in which petroleum products, acids, radioactive materials, or fluid or gaseous products are stored.’’ Id. § 28-13-2(A).

A disposal well is ‘‘any well which receives industrial waste waters, both organic and inorganic, salt water or other highly mineralized waters for disposal into underground formations.’’ Id. § 28-13-2(C).

Id. § 28-13-10.

Id. § 28-13-3.

These wells are defined at id. § 28-30-2(i).

Id. §§ 28-30-5, -10-100(b). The reservoir sanitation zones are described at id. §§ 28-10-15 to -41 (1983 & Supp. 1985).

Id. § 28-30-6(a) (1983).

Id. § 28-30-8(a). Drilled and driven wells used as a source of water supply for single family dwellings are subject to special provisions specifying minimum distances from sources of contamination and from the property line of the well owner. Id. § 28-10-101(a), (b); see also id. § 28-30-6(a).

Id. § 28-30-7(a)-(c).


Id. § 82a-1202.

Id. §§ 82a-1206 to -1207; see also KAN. ADMIN. REGS. § 28-30-3 (1983).
Kansas statutes and regulations also restrict activities located near reservoirs that have the potential to pollute water in the impoundments. The KDHE may fix minimum standards for the control of sewage and refuse disposal on property located in reservoir sanitation zones. The statute requires preparation of a sanitation plan prior to the subdivision of land within a reservoir sanitation zone. If the sanitation plan contains plans for a sewage system or water supply to serve two or more lots, the local reservoir sanitation officer must submit the plan for KDHE approval.

The KDHE’s regulations provide further protection to water supply systems. Every city, water district, improvement district, or other public agency that provides a water supply system to serve two or more single family dwellings or to any establishment open to the general public located in a sanitation zone must obtain a water supply permit from the KDHE before constructing the system. Private individuals or companies providing a similar water supply system in a sanitation zone must obtain both a KDHE permit and a certificate of convenience from the KCC. Water supply storage tanks for single family dwellings must be designed in accordance with KDHE specifications. Septic tank location, construction, and operation are also regulated.

4. Deficiencies in State Regulation

The UIC and similar Kansas well injection programs have the potential to protect against groundwater contamination by some classes of activities. The Kansas programs, however, reflect the same shortcomings as their federal parents. The seemingly endless parade of Kansas public water supply, well, and reservoir regulations appears to be a fragmented, disconnected group of apparently overlapping programs, with regulatory responsibilities divided among various State and local officials. The statutes and regulations cover, sporadically, a variety of potential pollution sources but are often notably lacking in clear guidelines. At the very
least, these programs probably create regulatory duplication, inefficiently, and confusion. They may also create unintended regulatory gaps. But, in the end, the Kansas law in this area is simply unintelligible.

E. Kansas Solid and Hazardous Waste Law

Facilities and activities involving solid and hazardous wastes are prominent sources of groundwater contamination. Spurred by changes in federal law, Kansas has erected in recent years a theoretically formidable regulatory edifice to control pollution from these sources. As a practical matter, however, regulatory coverage and implementation remain far from complete.

1. Regulation of Solid Waste

The RCRA creates a minimal federal presence in the management of solid, nonhazardous waste, with relatively few mandatory state obligations. States seeking federal financial assistance in solid waste management must submit a management plan for EPA approval. A state plan will not be approved unless it prohibits the establishment of new open dumps and contains requirements that all nonhazardous solid waste be either used for resource recovery (the recovery of material or energy from solid waste) or disposed of in sanitary landfills (or in another environmentally sound manner). In addition, the state plan must provide for the closing or upgrading of existing open dumps within the state. The 1984 amendments to

584. Id. § 6903(22).
585. A sanitary landfill is a facility for the disposal of solid waste that meets criteria published by the EPA. Id. § 6903(26). At a minimum, a sanitary landfill must insure that the disposal of solid waste presents no reasonable probability of adverse effects on health or environment. Id. § 6944(a). Solid waste disposal facilities or sites not qualifying as sanitary landfills are open dumps. Id. § 6903(14).
586. Id. §§ 6947(a)(1), 6943(a)(2).
the RCRA refined the minimum criteria for federal and state regulation.\textsuperscript{588}

The Kansas procedures for adopting RCRA solid waste management plans are contained in the Kansas Solid Waste Management Act.\textsuperscript{589} This statute requires each county in the State to adopt a solid waste management plan and submit it for KDHE approval.\textsuperscript{590} The KDHE, in addition to issuing regulations setting forth standards for solid waste management to protect public health and the environment,\textsuperscript{591} is responsible for developing a statewide solid waste management plan,\textsuperscript{592} issuing permits, establishing criteria for the location of solid waste processing facilities and disposal areas, and regulating the closing, termination, and long-term care of solid waste disposal sites.\textsuperscript{593} It is unlawful to construct, alter, or operate a solid waste processing facility or disposal area without a KDHE permit.\textsuperscript{594} Open dumping, which is defined as the disposal of solid waste at an unpermitted solid waste disposal area or facility or in a manner contrary to KDHE regulations,\textsuperscript{595} is prohibited.\textsuperscript{596} Cities or counties may enact more stringent ordinances for control of solid waste management practices.\textsuperscript{597}

\textsuperscript{588} The amendments permit federal enforcement of those parts of a state management plan governing disposal of hazardous household wastes and hazardous wastes produced by small quantity generators. See 42 U.S.C. § 6921(d)(1) (Supp. III 1985). The KDHE’s regulations already prohibit the disposal of hazardous wastes in sanitary landfills, but the regulations exclude from the definition of hazardous waste both household wastes and hazardous wastes produced by small quantity generators (those producing less than 50 kilograms per month; effective July 1, 1986, those producing less than 25 kilograms per month). See Kan. Admin. Regs. § 28-29-23(l) (1983); id. § 28-31-3(a) (Supp. 1985); 40 C.F.R. § 261.5(b), (g) (1985).

As a result, the KDHE’s regulations do not currently prohibit the disposal in sanitary landfills of those hazardous household and small generator wastes that are the subject of the 1984 amendments to the RCRA. Following the EPA’s issuance of revised criteria for solid waste management facilities required by those amendments, see 42 U.S.C. § 6921(d)(1) (Supp. III 1985), the KDHE will probably have to revise its regulations.


\textsuperscript{590} Id. § 65-3405. The State has delegated control over local solid waste flow to the cities and counties, subject to State oversight through approval of individual resource recovery facilities and local solid waste plans by the KDHE. See id. § 65-3422(f).

\textsuperscript{591} Id. § 65-3406(a).

\textsuperscript{592} Id. § 65-3406(e).

\textsuperscript{593} Id. § 65-3406(i), (k), (o).

\textsuperscript{594} Id. §§ 65-3407(a), -3409(a)(2); see also Kan. Admin. Regs. §§ 28-29-6, -9(a), -10(a) (1983). Disposal area owners can be forced to execute restrictive covenants for preserving and protecting all environmental monitoring stations installed at the disposal area, id. § 28-29-20(a)(4), and to give easements permitting KDHE agents or contractors to enter the premises for monitoring. Id. § 28-29-20(b)(3).


\textsuperscript{596} Id. § 65-3409(a)(1).

KDHE regulations require owners or occupants of any premises, business establishment, or industrial plant to provide sanitary storage for all nonhazardous solid waste. All such storage must be consistent with the county or city solid waste management plan and must not create a health or safety hazard. The location of all solid waste disposal areas and processing facilities must conform to county or city zoning regulations.

2. Regulation of Hazardous Waste

The RCRA, like most of the other federal pollution control statutes, gives states the opportunity to administer, in lieu of the EPA, significant parts of the regulatory program. Before the EPA issued its technical permitting standards for TSD facilities, it authorized state hazardous waste programs on an interim basis. Kansas received Phase I interim authorization in 1981 and final authorization in 1985.

Under the Kansas hazardous waste management program, the KDHE must develop a statewide hazardous waste management plan, issue permits, and regulate the design, location, construction, and operation of hazardous waste TSD facilities. Anyone who wants to construct, modify, or operate an off-site hazardous waste disposal facility must apply for a permit. In reviewing permit applications, the KDHE must consider, among other things, the hydrogeology of the proposed site and the facility’s impact on water quality.

598. Id. § 28-29-21(a).
604. KAN. STAT. ANN. § 65-3431(a), (e), (i), (t) (1985). The KDHE’s other powers are enumerated in the remaining provisions of § 65-3431.
605. Id. §§ 65-3439(a), -3437(a), -3441(a)(2).
606. Id. § 65-3433(b)(2). If the KDHE approves a permit application, its decision is reviewed by the State’s hazardous waste disposal facility approval board. Id. § 65-3432(a). The board must consider whether the proposed facility is consistent with local planning and the potential relationship of “local ordinances, permits or other requirements” to the proposed facility. Id. § 65-3434(g)(4). To the fullest extent possible, the board must integrate the provisions of local ordinances, permits, or requirements. Id. § 65-3434(h). In addition, the board must consider the risk and impact of contamination of ground and surface water by leaching and runoff from the proposed facility. Id. § 65-3434(g)(2); see also id. §§ 65-3434(g)(5)(D), -3439(c).
The KDHE has broad general authority to order the modification of hazardous waste generation, accumulation, management, or disposal activities if it finds that these activities are causing or threaten to cause water pollution or a hazard to public health and safety.\textsuperscript{607} The Agency must establish standards for underground injection, land treatment, mound landfill, and above ground storage of hazardous waste.\textsuperscript{608} During the 1985 session, the Legislature followed the lead of the 1984 Congress by restricting waste disposal activities that pose a particular threat of groundwater contamination. Specifically, it prohibited the underground burial of most hazardous waste absent KDHE approval.\textsuperscript{609} Any existing hazardous waste disposal facility that uses underground burial must stop doing so and, with the KDHE's approval, implement closure and post-closure plans for all units of the facility in which hazardous wastes have been disposed of underground. The KDHE may grant an exception to the prohibition of underground burial only if it finds that no economically reasonable or technologically feasible methodology exists for the disposal of a particular hazardous waste.\textsuperscript{610}

It is unlawful for any person to dump or deposit, or permit the dumping or depositing of hazardous waste into a facility that does not comply with statutory or regulatory standards.\textsuperscript{611} Transportation of hazardous waste to a facility not authorized to operate under the federal or State RCRA hazardous waste program is prohibited, as is transportation in a manner contrary to KDHE orders or regulations.\textsuperscript{612} Statutory violations may give rise to both criminal and civil liability.\textsuperscript{613} The Kansas statute also has a provision analogous to the RCRA's imminent hazard provision.\textsuperscript{614}

In 1984, the Kansas Legislature created the hazardous waste cleanup fund.\textsuperscript{615} The KDHE is authorized to determine whether cleanup of

\textsuperscript{607} Id. § 65-3443(a).
\textsuperscript{608} Id. § 65-3443(b).
\textsuperscript{609} Id. § 65-3458(a). This prohibition applies to persons who generate 2.2 pounds or more of acutely hazardous waste in any month. Id. § 65-3451(a). Beginning July 1, 1986, all persons generating 55 pounds or more of other hazardous wastes were subject to the new law. Id. § 65-3451(b). The statute does not affect mound landfill, aboveground storage, land treatment, or underground injection of hazardous waste. Id. § 65-3458(a).
\textsuperscript{610} Id. § 65-3458(b).
\textsuperscript{611} Id. § 65-3441(a)(1). The statute does not prohibit the use of hazardous wastes in normal farming operations or in the processing or manufacturing of other products in a manner that will not adversely affect the public health or environment. Id. § 65-3441(a)(1)(A).
\textsuperscript{612} Id. § 65-3441(a)(9), (11).
\textsuperscript{613} Id. §§ 65-3441(b)-(c), -3444(a).
\textsuperscript{614} Id. § 65-3445(a).
\textsuperscript{615} See id. § 65-3452. The cleanup fund, which is currently authorized at a level of $200,000, may be used to pay contractors for cleanup work; for cleanup planning, design, and review;
a hazardous waste site is necessary to protect the public health, public safety, or the environment; to use fund money and enter into contracts to clean up a hazardous waste site; and to issue cleanup orders to persons responsible for the health or environmental hazards.\textsuperscript{616} Persons responsible for the discharge, abandonment, or disposal of hazardous waste that the KDHE determines must be cleaned up are liable for costs of both investigation and remedial action.\textsuperscript{617}

The KDHE’s regulations for petroleum products storage tanks apply to the installation, operation, leak detection monitoring, and abandonment of both aboveground and underground tanks used to store liquid petroleum products.\textsuperscript{618} New or replacement tank systems must be installed to prevent leakage and must include a monitoring system to facilitate early detection of leaks.\textsuperscript{619} All plans for new and replacement underground tank systems must be submitted for KDHE approval before installation begins.\textsuperscript{620}

3. Assessment

Because Kansas’ programs for controlling solid and hazardous waste are tied closely to the provisions of the RCRA, these programs may reflect some of the same weaknesses that characterize the EPA’s RCRA implementation.\textsuperscript{621} In addition, some of the Kansas programs fail to address current problems created by years of neglect and inadequate regulatory controls. The underground tank regulations, for example, apply for the most part only to new or replacement tanks, and not to existing tanks that are already leaking or in danger of doing so. It is not known whether and to what extent the provisions for State and local coordination have been effective. Enforcement, particularly with respect to public and private landfills, is problematic. When the solid and hazardous waste programs are fully implemented to mitigate adverse environmental impacts; to finance either emergency or long-term cleanup activities; to pay legal costs incurred in recouping fund expenditures from responsible persons; and to provide matching moneys for funds available from the federal government under the CERCLA. \textit{Id.} § 65-3454.

\textsuperscript{616} Id. § 65-3453. The KDHE’s hazardous waste management regulations incorporate by reference most of the EPA’s regulations, including those providing for groundwater protection and monitoring in connection with TSD facilities. See \textit{Kan. Admin. Regs.} § 28-31-8 (Supp. 1985).


\textsuperscript{619} \textit{Id.} § 28-44-3.

\textsuperscript{620} \textit{Id.} § 28-44-9. The regulations also include recordkeeping, leak reporting, and leak testing requirements, \textit{id.} §§ 28-44-4 to -44-6, and procedures for abandoning or removing tanks. \textit{Id.} §§ 28-44-7 to -44-8.

\textsuperscript{621} See supra pt. II, § D.
and effective, however, they can serve as models for a broader strategy
to control all major sources of groundwater pollution.\footnote{622}

F. Kansas Pesticide and Herbicide Law

Much of Kansas pesticide law and regulation is derived from author-
ity granted to the State under federal pesticide statutes. The FIFRA
authorizes the states to devise and submit plans to the EPA for cer-
tification of pesticide applicators.\footnote{622} States may regulate the sale or
use of any federally registered pesticide, but only if the regulation
does not permit any sale or use prohibited by federal law.\footnote{624}

The Kansas Legislature has enacted a series of laws that regulate
the sale and use of pesticides, herbicides, and other agricultural
chemicals. The Kansas Agricultural Chemical Act of 1947\footnote{625} prohibits
the distribution, sale, or transportation in intrastate commerce of
agricultural chemicals\footnote{626} that are not registered with the Secretary of
the Board of Agriculture, that differ in composition from the com-
position represented to the Secretary in connection with registration,\footnote{627}
that are not in appropriately labeled containers,\footnote{628} or that are
adulterated or misbranded.\footnote{629} Persons violating the statutory prohibi-
tions are guilty of a criminal misdemeanor.\footnote{630}

The Kansas Pesticide Law\footnote{631} prohibits any unlicensed pesticide
business from applying pesticides to another person's property.\footnote{632} With
certain exceptions, it is also unlawful to use any restricted use pesticide
without a commercial applicator's license.\footnote{633} The storage or disposal

\footnote{622. See, e.g., the proposed requirement that all point sources apply for permits from
the KDHE, described in pt. II. § G of Groundwater Pollution II, supra note 3.}

\footnote{623. 7 U.S.C. § 136b(a)(2) (1982); see also 40 C.F.R. § 171.8 (1985).}

\footnote{624. 7 U.S.C. § 136v(a) (1982).}

\footnote{625. KAN. STAT. ANN. §§ 2-2201 to -2216 (1982).}

\footnote{626. This term is defined at id. § 2-2202(a).}

\footnote{627. Pesticides classified as restricted use pesticides under the FIFRA also must be registered
for restricted use in Kansas. KAN. ADMIN. REGS. § 4-13-1 (1983). The Secretary may cancel
a registration "[i]n order to protect the public." KAN. STAT. ANN. § 2-2204(f) (1982).}

\footnote{628. KAN. STAT. ANN. § 2-2203(a)(1), (3), (4) (1982).}

\footnote{629. Id. § 2-2203(a).}

\footnote{630. Id. § 2-2208.}


\footnote{632. KAN. STAT. ANN. § 2-2440(a)(1) (1982). Licenses are issued by the Board of Agriculture.
Id. § 2-2440(b).}

\footnote{633. Id. § 2-2441a. Applicants must be knowledgeable concerning the potential damage
to the environment, including water, from use and misuse of pesticides (as influenced by fac-
tors such as type of terrain, soil and other substrata, and drainage patterns). Id. § 2-2443a(b);
KAN. ADMIN. REGS. § 4-13-13(a)(1)(C) (Supp. 1985). They must also understand the relation-
ship of pesticide placement to proper use, unnecessary pesticide use and misuse, and preven-
tion of pesticide loss into the environment. KAN. ADMIN. REGS. § 4-13-13(a)(1)(G) (Supp. 1985);
see also id. § 4-13-14(4) (1983).}
of pesticides or pesticide containers in a manner that causes injury to people or waterways is a Class A misdemeanor.634

The State Board of Agriculture is authorized to adopt and apply methods for the control and eradication of noxious weeds.635 The Board’s regulations require the use of approved chemicals in controlling noxious weeds636 and describe the chemicals approved for use and the proper method of application for a variety of weeds.637 The increasing number of instances in which pesticides have contaminated groundwater indicates that the current regulatory scheme does not go nearly far enough. Registration procedures have been faulty, sometimes grossly so, and registration alone has little effect on practices in the field. It may be that state agriculture agencies are not inclined to burden farmers by requiring strict adherence to regulatory schemes imposing additional costs of operation.

G. Kansas Oil and Gas Drilling Regulation

The Kansas Legislature, prompted by the fear that groundwater pollution from oil and gas operations was increasing,638 extensively revised the statutes regulating oil and gas drilling in 1982. The 1982 amendments both imposed new and more detailed substantive standards and gave the KDHE a large share of the regulatory duties formerly implemented by the Kansas Corporation Commission (KCC).639 In 1986, the Legislature again rearranged the administrative furniture, ceding back to the KCC primary jurisdiction over virtually all aspects of oil and gas operations while retaining in reshuffled form most of the substantive provisions from the 1982 amendments.640 This section describes the statutes and regulations governing new well drilling, abandoned wells, and brine disposal.

1. General Operator Duties and Liabilities

An old Kansas statute prohibits any operator, agent, or contractor from allowing salt water, oil, or “refuse” to escape from a well “by

635. See id. §§ 2-1314 to -1332.
overflow, seepage or otherwise," unless the escape was beyond his control and could not have been guarded against. The law was amended and renumbered in 1986. The Kansas Supreme Court, for more than 60 years, has used both the statute and the common law doctrine of strict liability from *Fletcher v. Rylands* to impose liability on drillers who caused damage to surface and subsurface resources. In spite of these clear rulings that drillers must pay for the damage they cause to groundwater, however, such incidents remain common.

2. New Producing, Injecting, Sampling, and Disposal Wells

The substantive provisions of the 1982 legislation (carried over in 1986) are directed at protecting surface and groundwater from various types of wells used in the production of oil and gas. The basic intent of the new Act is to "protect all usable waters," which include those with up to 10,000 milligrams of suspended solids per liter. Unless the KDHE has found that the well will do this, no permit to drill can be granted. It is not clear from the statutory language whether, by the use of the word "protect," the Legislature

645. See supra pt. I, § C(2).
646. The New Act (untitled) in Kan. Sess. Laws, ch. 201, is at first blush, extremely confusing. The repealer purports to repeal the sections earlier amended in the same legislation. *Id.* § 41. The substantive provisions in former Kan. Stat. Ann. §§ 55-121 through 55-142 are reenacted with slight changes in *id.* §§ 24-38 without indication of their origin or history. Except for provisions concerning fees, however, most of the changes involve deleting references to the KDHE Secretary in sections authorizing administrative actions.
649. See *id.* § 55-150(c), (i).
650. *Id.* § 55-151(a).
intended to impose a strict nondegradation standard or something less stringent. The regulations do not directly address this question. It is clear, however, that drillers must avoid damage to "usable" as well as "fresh" aquifers. The provision that requires licenses for operators and contractors of new wells does not spell out standards for granting or denying those permits, except that usable water must be protected.

The statutory requirements for drillers are somewhat more specific. Failure to plug an abandoned well in accordance with KCC regulations is a felony. The KCC regulations that implement the statute also impose reasonably specific requirements governing the drilling of new production and injection wells, although they are apparently not as extensive as the law seems to contemplate. The regulations provide minimum standards for cementing in new wells and pipes, and specify plugging requirements for temporarily and permanently abandoned wells. In general, drillers are under a duty to seal off all formations to prevent migration of oil, gas, or water. The KCC may investigate violations and bring administrative proceedings against violators.

The regulations governing secondary recovery operations are less specific. The operator must submit considerable information when he applies for KCC approval of an injection well. Approval will be given only if the formations to be used are separated from fresh and usable water formations by impervious beds to give adequate protection to the fresh and usable water formations. Particular guidelines within this general standard are conspicuously absent. In-

651. Fresh water aquifers are those containing suspended solid concentrations not exceeding one thousand miligrams per liter. Id. § 55-150(c).
652. Id. § 55-155.
653. Applicants need not demonstrate the ability to avoid groundwater pollution, although the KCC is authorized generally to impose whatever requirements it deems "appropriate." Id. § 55-151(a).
654. Id. § 55-156. Violations of most other sections are only misdemeanors. Id. §§ 55-158 to -159.
657. Id. § 82-3-111 (Supp. 1985).
659. Id. § 82-3-104 (1985).
660. The KCC has the power to enter a broad range of orders, after administrative hearings, and it can take immediate remedial action if damage may result in the interim. KAN. STAT. ANN. § 55-162(a), (b) (1983). The Commission can also impose civil penalties. Id. § 55-164(a), (c). All such penalties are credited to the Conservation Fund described infra, pt. III, § G(3). KAN. STAT. ANN. § 55-164(d) (1983).
661. See KAN. ADMIN. REGS. § 82-3-401 (Supp. 1985).
662. Id. § 82-3-400(a) (1985).
jection and disposal wells must be operated and equipped in a manner that "will prevent pollution of fresh and usable water. . . ." 663

The Legislature evidently expanded the KDHE regulatory role in 1982 because prior KCC oversight did not adequately protect groundwater. The reasons for its abrupt retreat in 1986 are not so clear. The main thrust of the 1986 amendments was to strip the KDHE of all except vestigial authority over oil and gas drilling operations. 664 The Secretary of the KDHE may now promulgate regulations in this area only to "[c]lean up pollution resulting from oil and gas activities regulated by the [KCC]; protect the soil and waters of the state from pollution resulting from (A) oil and gas activities not regulated by the [KCC] or (B) underground storage reservoirs of hydrocarbons, natural gas and liquid petroleum . . . ." 665 Statutory responsibility is also shared by the "advisory committee on regulation of oil and gas activities," which is mainly composed of oil and gas industry appointees and representatives of five State administrative agencies. 666 The advisory committee has vague power to review proposed regulations, but the Commission need not follow the committee's recommendations. 667 The retrocession of primary jurisdiction to the KCC may avoid confusion in the short run, but the fragmentation of responsibility for groundwater pollution it embodies could retard the effort to prevent such pollution in the long run. 668

3. Abandoned Oil and Gas Wells

The KCC has broad regulatory and financial powers to investigate and remedy complaints that lack of plugging (or improper plugging) is causing or is likely to cause pollution of "usable water strata." 669 As amended in 1982, these sections in effect create a mini-Superfund for abandoned oil and gas wells. Fees, or portions of fees, imposed on oil and gas operators, are deposited in a Conservation Fund for use by the agencies in plugging abandoned wells, among other things. 670

The KCC must ascertain whether any "legally responsible" person can be found to remedy contamination threats from improperly

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663. Id. § 82-3-405(a)(1) (Supp. 1985). Apparently, however, injection and disposal wells drilled before 1982 are subject only to preexisting requirements. See id. § 82-3-409 (1985).
664. Except for shared authority over the "cleanup of pollution from oil and gas activities," the KCC is given "exclusive jurisdiction and authority to regulate oil and gas activities." 1986 Kan. Sess. Laws ch. 201, § 1(a), (b).
667. Id. § 55-152(a).
668. See Groundwater Pollution II, supra note 2, at pt. II, § A.
670. Id. § 55-143.
plugged or abandoned wells. If those persons cannot respond, the Agency may itself plug, replug, or repair the well, using money from the Conservation Fund to pay for the work. If a legally responsible person is available and solvent, the Agency may, after a hearing, order the person to remedy the violation or take other appropriate action.

4. Salt Water and Brine Disposal

For no readily apparent reason, Kansas has enacted two statutes to control the disposal of salt water, brine, and mineralized waters produced from oil and gas operations. All salt water disposal requires KCC permission. Disposal of salt water, brine, and mineralized waters is governed by the requirement that the KCC “determine that the proposed method is a feasible method to be employed in protecting the water resources of the state from preventable pollution.” The statute also forbids injection at pressures higher than authorized, or at a depth less than that required by regulation.

The KDHE underground injection control regulations specifically exclude secondary recovery operations by the oil and gas industry. Brine disposal is covered by the KDHE regulations governing oil field brine disposal (now to be administered by the KCC), which are

671. Id. § 55-140(a). Legally responsible persons include secondary recovery operators causing the problem, the operator who plugged or abandoned the well, and the current or last lease holder. Id. § 55-140(a)(2).

672. Id. The KCC is required to investigate abandoned wells, and, based on actual or potential pollution problems, select abandoned wells to be drilled out in order to test the integrity of the plugs. The Agency can pay for this testing from the Conservation Fund. Id. § 55-161. The KCC can enter lands to investigate and plug or repair abandoned well. Id. § 55-141. When the KCC plugs or repairs a well, it has a cause of action against any responsible parties for the reasonable cost incurred; until that claim is satisfied, the Commission has a lien on the interests of the party in the property affected. Id. § 55-140(a)(c).

673. Id. §§ 55-140(b), -162(a).

674. “Salt water” is defined as water containing more than 5000 milligrams of chlorides per liter, KAN. STAT. ANN. § 55-904(b) (1983), amended by 1986 Kan. Sess. Laws ch. 201, but neither “brines” nor “mineralized waters” are defined in the statute.

675. Id. §§ 55-901 to -904, 55-1003 to -1007.

676. Id. § 55-904(a). A driller has the right to return the salt water to the horizon where produced (with KCC approval), id. § 55-901(a), but otherwise disposal shall be according to the rules and regulations of the Commission. Id. § 55-904(a).

677. Id. § 55-1003.

678. Id. § 55-1004.

679. Id. § 55-1005.


682. Id. §§ 28-41-1 to -9 (Supp. 1985).

683. Regulations promulgated by the KDHE and in effect at the time of the 1986 amendments are to remain effective as KCC regulations. 1986 Kan. Sess. Laws ch. 201, § 1(e).
less comprehensive than they could be. All operators proposing to store brine, oil, or "other refuse" in surface ponds must apply for a permit,\textsuperscript{684} except for certain temporary and emergency storage situations in which the operator is entitled to an "automatic temporary permit."\textsuperscript{685} The general standard for permit grant or denial is whether the appropriate KCC bureau "finds that a proposed surface pond is not likely to cause pollution of soil or of surface or subsurface waters" and that the pond will not "be detrimental to public health" or living organisms.\textsuperscript{686} Such a standard is notable for its breadth and lack of guidance.

The regulations do not spell out how the KCC intends to carry out its statutory responsibilities for preventing groundwater pollution in ways other than regulating new well drilling. It has not published regulations indicating the water quality criteria by which it will make the crucial determination to grant or deny drilling permits for new wells. It has also neglected to specify procedures and priorities for use of the Conservation Fee Fund and to outline its program of inspecting and replugging already abandoned wells. The program begun in 1982 for preventing groundwater contamination from oil and gas operations is a vast improvement over its predecessor, but significant problems and gaps remain. The Legislature's 1986 separation of the State's main pollution control agency from this form of pollution control bodes ill for a comprehensive, coordinated prevention program.

\textbf{H. Kansas Zoning Law}

Most recent federal and state efforts to prevent pollution focus on centrally administered statutes and regulations limiting emissions of potential contaminants. Local governments, too, have a role in minimizing the adverse effects of pollution.\textsuperscript{687} This section considers whether present zoning authority allows municipalities and counties to prevent groundwater contamination, focusing on environmental performance zoning, a relatively innovative land use technique. The section begins with a brief summary of the principal Kansas zoning statutes. The section concludes by analyzing a series of potential legal

\textsuperscript{685} \textit{Id.} § 28-41-7.
\textsuperscript{686} \textit{Id.} § 28-41-3. The KCC may require artificial sealing of ponds if it "determines that an unsealed condition will present a pollution threat to . . . groundwater or to soil through seepage." \textit{Id.} § 28-41-4(d). If a pond is abandoned, the Agency may require groundwater monitoring. \textit{Id.} § 28-41-5(b).
\textsuperscript{687} See generally \textit{Groundwater Pollution II}, supra note 3, at pt. II.
challenges to several hypothetical zoning ordinances designed to prevent groundwater pollution.

1. Kansas Zoning Statutes

The Kansas Legislature has delegated planning and zoning authority to officials at both the municipal and county levels. The governing body of any city is authorized to adopt ordinances dividing the city into zones or districts and to regulate and restrict the location and use of buildings and land within each district or zone. Similarly, the county commissioners of each Kansas county may adopt zoning resolutions applicable to all lands within any township in the county that lie outside the limits of any incorporated city. County zoning resolutions may divide the territory outside incorporated cities into districts according to the use of land and buildings and the intensity of that use.

Both city and county zoning laws contain certain exceptions. City zoning ordinances may not apply to uses of buildings or land existing at the time the ordinance is adopted, but may apply to alterations of buildings when there is a change in use. The county zoning statute has a similar exemption for nonconforming uses. In addition, county zoning ordinances cannot apply to land or buildings used for agricultural purposes.

2. Possible Legal Challenges to Groundwater Pollution Zoning Laws

a. Scope of judicial review

Kansas statutes require all zoning ordinances to be reasonable. Any person having an interest in affected property may bring an action to determine the reasonableness of any ordinance.


689. Id. § 12-707 (1982). Cities may adopt zoning regulations affecting all or any portion of the land located outside of but within three miles of the city under certain conditions. See id. §§ 12-715b to -715d (Supp. 1985).

690. Id. § 19-2901(a) (1981); see also id. § 19-2906; id. § 19-2919(a) (Supp. 1985). The statutes contain a separate grant of zoning authority for counties with cities of the first, second, or third class. Id. §§ 19-2927 to -2937 (1981). Wabaunsee County and Johnson County also receive separate grants of zoning authority. See id. §§ 19-2950 to -2966 (Supp. 1985).

691. Id. § 19-2901(a) (1981).

692. Id. § 12-709 (1982).

693. Id. § 19-2908 (1981).


sas courts presume that the zoning authority acted reasonably, however, and the burden of proving otherwise is on the landowner challenging the ordinance. A court may not substitute its judgment for that of the zoning body and will not declare the ordinance unreasonable unless clearly compelled to do so by the evidence. A zoning decision is unreasonable when it is so arbitrary that it appears that it was taken without regard to the benefit or harm involved to the community at large and was so wide of the mark that its unreasonableness lies outside the realm of fair debate.

b. Constitutional claims

The fifth amendment to the United States Constitution, applicable to the states under the fourteenth amendment due process clause, provides that "private property [shall not] be taken for public use, without just compensation." The United States Supreme Court recently stated that "[t]he application of a general zoning law to particular property effects a taking if the ordinance does not substantially advance legitimate state interests . . . or denies an owner economically viable use of his land."

A state has the authority to regulate private property through zon-

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698. Id.
700. U.S. CONST., amend. V.
701. Agins v. City of Tiburon, 447 U.S. 255, 260 (1980) (citing Penn Central Transp. Co. v. New York City, 438 U.S. 104, 138 n.36 (1978); Nectow v. Cambridge, 227 U.S. 183, 188 (1918)). See also United States v. Riverside Bayview Homes, Inc., 106 S. Ct. 455 (1985). The latter part of this statement is derived from Pennsylvania Coal Co. v. Mahon, 260 U.S. 393 (1922), in which the Court stated that one fact for consideration in determining the limits of the state's power to regulate private property for the public good is the extent of the diminution in value of the property caused by the regulation. "When it reaches a certain magnitude, in most if not all cases there must be an exercise of eminent domain and compensation to sustain the act." Id. at 413. The difficulty, obviously, is determining how much regulation is too much.

The Kansas Supreme Court has focused on essentially the same factors as the federal courts in resolving constitutional challenges to zoning laws. Under Kansas takings jurisprudence, a zoning ordinance that diminishes the value of property is not necessarily invalid. See Houston v. Board of City Comm'rs, 218 Kan. 323, 332-33, 543 P.2d 1010, 1019 (1975). Among the other factors the court will consider are (1) the existing uses and zoning of nearby property, (2) the extent to which the destruction of the owner's property values promotes the health, safety, morals, or general welfare of the public, (3) the relative gain to the public as compared to the hardship imposed upon the individual property owner, and (4) the suitability of the property for the zoned purposes. Golden v. City of Overland Park, 224 Kan. 591, 598-99, 584 P.2d 130, 136 (1978) (quoting La Salle Nat'l Bank v. City of Evanston, 12 Ill. 2d 40, 46-48, 145 N.E.2d 65, 69 (1957)).
ing as part of its inherent police power. This power may be exercised to further the public health, safety, morals or the general welfare.\textsuperscript{702} A zoning law therefore must reasonably seek to promote one of these objectives. There is little question that a zoning ordinance enacted to protect groundwater quality would fall within the permissible scope of the police power.\textsuperscript{703} The Kansas Supreme Court held in 1929 that a statute regulating disposal of oil and gas well wastes to prevent water pollution was within the scope of the State Legislature’s authority because it was aimed at protecting the public health.\textsuperscript{704} In 1962, the court had little trouble concluding that the 1945 Water Appropriation Act\textsuperscript{705} was a valid exercise of the police power.\textsuperscript{706} It relied upon the federal courts’ earlier recognition that “[a]dequate water supply is a necessity” and that an attempt to use water beneficially and without waste “is well within the competency of the legislature.”\textsuperscript{707} A zoning law aimed at preventing groundwater pollution would be a regulation of groundwater use, and would seek to ensure the continued availability of adequate drinkable and usable water in the state. The court recently repeated that “water use regulation is an appropriate exercise of the state’s police power.”\textsuperscript{708}

A zoning ordinance adopted for an appropriate purpose nevertheless violates the due process clause if its application to a particular piece of property denies the owner economically viable use of the land. That a zoning law prevents the most profitable use of the land does not of itself make the law unconstitutional.\textsuperscript{709} The courts will focus

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\textsuperscript{703} Cf. Huron Portland Cement Co. v. City of Detroit, 362 U.S. 440, 442 (1960) (“Legislation designed to free from pollution the very air that people breathe clearly falls within the exercise of even the most traditional concept of what is compendiously known as the police power.”).


\textsuperscript{707} Id. at 338, 374 P.2d at 593 (quoting Baumann v. Smrha, 145 F. Supp. 617, 625 (D. Kan.), aff’d, 352 U.S. 863 (1956)).


\textsuperscript{709} See Andrus v. Allard, 444 U.S. 51, 66 (1979). The Court stated that when it reviews a regulation, “reduction in the value of property is not necessarily equated with a taking.” Id.
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on what the owner can do with the regulated property, not on what has been taken away. If the owner can make a reasonable return on its investment in the property, i.e. the owner's primary investment-backed expectations have not been upset, the courts will not find a taking.

Deciding whether the application of a zoning ordinance constitutes a taking also requires "a weighing of private and public interests." A court engaged in such a balancing process would give considerable weight to a determination by public zoning officials that an ordinance is necessary to prevent groundwater pollution, especially if it was "expected to produce a widespread public benefit and [was] applicable to all similarly situated property." In upholding the constitutionality of the 1945 Water Appropriation Act, the Kansas Supreme Court stated that legislation limiting the right to use water is no more objectionable than legislation forbidding the use of property for certain purposes. The court long ago upheld a State statute regulating the disposal of salt water and oil resulting from oil and gas production against a claim that it violated the fourteenth amendment—a situation closely analogous to the use of zoning for groundwater protection purposes.

The results in "taking" cases are too dependent on the specific impact of a regulatory measure on individual property to confidently predict that any zoning ordinance enacted to protect groundwater

711. See id. "[L]oss of future profits—unaccompanied by any physical property restriction—provides a slender reed upon which to rest a takings claim." Andrus, 444 U.S. at 66.
713. In the Agins case, the Court upheld an ordinance intended to protect city residents against the ill effects of urbanization, including "water pollution, . . . disturbance of the ecology and environment, [and] hazards to geology." Id. at 261 n.3 (quoting TIBURON, CAL. ORDINANCE No. 124 § 1(c)). The Court stated that "[s]uch governmental purposes long have been recognized as legitimate" for purposes of fourteenth amendment analysis. Id.
714. Penn Central, 438 U.S. at 133-34 n.30.
715. KAN. STAT. ANN. §§ 82a-701 to -731 (1984). This Act is discussed supra pt. III, § B.
717. State v. Lebow, 128 Kan. 715, 720, 280 P. 773, 776 (1929). The court noted that the aim of the statute was to protect the purity of streams, wells and lakes from pollution by such salt water, oil and refuse for the preservation of the life and health of the people as well as animal life, by preventing these products of oil and gas wells from flowing over the land or percolating through it. Id. at 720, 280 P. at 776. It then held that the law was a reasonable means of protecting the public, despite its impact on owners of oil and gas producing properties. Id. at 719-21, 280 P. at 775-76.
quality will withstand all attacks on its constitutionality.\textsuperscript{718} A recent Florida case, however, represents the discernable trend of recent "taking" cases in both the federal and state courts.\textsuperscript{719} In that case, a Florida appellate court stated that "[a] zoning ordinance is confiscatory if it deprives an owner of the beneficial use of his property by precluding all uses to which the property might be put or the only use to which it is reasonably adaptable."\textsuperscript{720} Because the rezoning of the property owner's land to prevent pollution of the county's only source of groundwater did not so restrict the plaintiff's use of his property, the court found no taking.\textsuperscript{721}

\textsuperscript{718} Cf. Keystone Bituminous Coal Ass'n v. Duncan, 771 F.2d 707, 713 (3d Cir. 1985), cert. granted, 106 S. Ct. 1456 (1986) (discussing cases where courts have upheld and struck down regulations as constituting a taking).

\textsuperscript{719} See Moviematic Indus. Corp. v. Board of County Comm'rs, 349 So. 2d 667 (Fla. Dist. Ct. App. 1977). The zoning authorities of Dade County, Florida rezoned the plaintiff's property, which overlay the Biscayne Aquifer (the primary source of drinking water in the county), from heavy industrial to residential. The officials based this rezoning on their fear that industrial use of the property would pollute the aquifer. See id. at 670.

\textsuperscript{720} Id. at 671 (emphasis added).

\textsuperscript{721} Id. But cf. Florida Rock Indus., Inc. v. United States, 22 Env't Rep. Cas. (BNA) 1943 (Ct. Cl. 1985), aff'd in part and vacated in part, 791 F.2d 893 (Fed. Cir. 1986), in which the U.S. Army Corp of Engineers denied a property owner's request for a dredge and fill permit under the CWA. See 33 U.S.C. § 1344 (1982). The district court held that this action constituted a taking of property, rejecting the Corps' justification that the plaintiff's mining operation would contaminate the Biscayne Aquifer. The court found that by denying the permit, the Corps had made it impossible to profitably mine rock on plaintiff's property and that there were no other economically viable uses to which the property could be put. 22 Env't Rep. Cas. (BNA) at 1945. The court stated:

(1t) is conceivable that government could prohibit all viable economic uses of property without paying compensation if all such uses, in fact, cause pollution. However, simple invocation of the term pollution cannot foreclose a plaintiff's right to compensation under the [taking clause]. To avoid [a taking], the government must show that the prohibited activity in fact causes such harm.

Id. at 1951. The Corps failed to produce such evidence. \textit{Id.} at 1955. In an interesting aside, the court denigrated the Corps' activity as "a deliberate, but unannounced policy of 'zoning' the area . . . as undisturbed wetlands where no significant development would be permitted." \textit{Id.} at 1957 n.23. The \textit{Florida Rock Industries} decision was subsequently vacated in part and remanded to the trial court, which improperly ignored factual findings by administrative officials and applied an erroneous test for assessing the severity of the regulation's economic impact on the property owner. \textit{See} 791 F.2d 893 (Fed. Cir. 1986). In a recent decision by the Supreme Court, \textit{United States v. Riverside Bayview Homes, Inc.,} 106 S. Ct. 455 (1985), the Court again made it clear in a case with facts somewhat similar to those in \textit{Florida Rock Industries} that governmental land use regulation will amount to a taking only in "extreme circumstances." \textit{Id.} at 456.

One way to minimize the risk that the application of a groundwater protection zoning ordinance would constitute a taking even in an extreme case is for the state legislature to authorize county and city zoning authorities to issue transferable development rights (TDRs) to the owner of regulated property. Under this technique, the zoning authorities provide compensation to the owner of the restricted property by permitting him to develop other property to an extent otherwise not permitted by the zoning and other laws applicable to that property. See generally
c. Statutory arguments

Whether the present Kansas zoning laws authorize zoning to prevent groundwater pollution is a somewhat more difficult question.\(^\text{722}\) Statutory authority exists if a zoning measure designed to protect groundwater quality seeks to achieve an appropriate purpose and entails a reasonable means of achieving that purpose. Because the Kansas statutes authorize counties and cities to zone to achieve any of the police power objectives,\(^\text{723}\) groundwater quality zoning would satisfy the first of these two requirements.\(^\text{724}\)

To determine whether zoning to preserve groundwater quality would

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\(^\text{722}\) If they do not, then a city or county enacting such an ordinance would be exceeding the scope of zoning authority delegated to it by the State.

\(^\text{723}\) The county zoning law provides that the county commissioners shall zone “[f]or the purpose of promoting the public health, safety, . . . comfort, [and] general welfare.” KAN. STAT. ANN. § 19-2901(a) (1981). Groundwater protection zoning presumably would be intended to protect the public health and safety and the general welfare. Id. § 12-704 (1982); id. § 19-2916a (1981). More specifically, these statutes require that the comprehensive plan make recommendations for the development of land, including “[u]tilization and conservation of natural resources.” Id. § 12-704 (1982). See also id. § 19-2916a (1981).

\(^\text{724}\) In a 1985 decision, the Kansas Supreme Court upheld a county’s refusal to rezone a tract of land from agricultural to residential due to concern that the area contained an insufficient water supply to support both the existing residential uses of neighboring land and a proposed new mobile home development. See Dings v. Phillips, 237 Kan. 551, 701 P.2d 961 (1985). The court stated:

Without hesitation we conclude the availability of water, both to the subject property and other area properties, is a proper consideration of a zoning body hearing a request for a zoning change. Indeed, refusal to consider water availability would usually constitute arbitrary action by a zoning body in determining a requested zoning change. Id. at 553, 701 P.2d at 964. This case strongly supports the argument that zoning for purposes of groundwater quality protection is appropriate under current statutes. If the availability of water is a proper basis for refusing to rezone, then the same factor should also support a decision to rezone, for example, by creating new groundwater protection districts around drinking water wells. Although the court’s 1985 decision dealt with water quantity, the degradation of the quality of groundwater supplies reduces the quantity of drinkable and usable water and thus directly affects groundwater quantity. See also KAN. STAT. ANN. § 12-725 (1982) (planned unit developments can be established “to provide for well located, clean, safe, pleasant industrial sites involving a minimum strain on . . . community facilities . . . .”); id. § 19-2930 (1981) (county zoning regulations shall “facilitate the adequate provisions of . . . water . . . [and encourage] the most appropriate use of land . . . .”).
involve a reasonable means of promoting the statutory objectives, it is necessary to consider separately three hypothetical zoning ordinances, the impact of these ordinances on both new and existing uses, and the specific problem of agricultural land use.

(1) New land use activities

A city or county seeking to protect groundwater quality through zoning might consider at least three different kinds of ordinances to achieve its goals. The first kind, a traditional Euclidean\(^{725}\) zoning ordinance, typically divides a city or county into districts and indicates what kinds of uses (industrial, commercial, or residential) may be located within each district. These use designations are often cumulative; higher uses are permitted in districts zoned for lower uses, but not vice versa. Single family residential use is usually deemed to be the highest use and heavy industry the lowest. In addition to these district-by-district use designations, traditional zoning ordinances frequently specify minimum lot sizes, minimum building floor sizes, and maximum building heights.\(^{726}\)

This kind of ordinance is the easiest to justify under the current statutes. It appears to fall squarely within the terms of both the city and county laws that authorize zoning officials to "regulate and restrict the location and use of buildings and the uses of land within each district,"\(^{727}\) and to "restrict and regulate the area within which trade, industries and recreations may be conducted, and the location and use of buildings."\(^{728}\)

A landowner might argue that the absolute prohibition of certain uses within a specified distance from water wells exceeds the authority granted in the Kansas statutes. Such a contention, however, is unlikely to succeed. A property owner regulated under a similar Pennsylvania municipal ordinance contended that the ordinance could restrict, but not absolutely prohibit, any particular industrial use. The court disagreed, stressing the generality and flexibility of the powers granted by statute.\(^{729}\) The Kansas statutes seem just as expansive in their delegation. The zoning law for cities authorizes the creation of zones or districts "for other purposes deemed necessary."\(^{730}\)

\(^{725}\) Euclidean zoning is named for the United States Supreme Court decision upholding zoning as a permissible land use control technique. Euclid v. Ambler Realty Co., 272 U.S. 365 (1926).


\(^{728}\) Id. § 19-2906 (1981). See also id. §§ 19-2901, 19-2929.


county law permits zoning officials "to prohibit uses, buildings, or structures, incompatible with the character of [the] district." A traditional Euclidean ordinance clearly would be valid under current law.

Some jurisdictions have begun to enact more innovative zoning ordinances containing more flexible land use control techniques such as conditional zoning and special use permits. Conditional (or "contract") zoning permits a developer's proposed land use in exchange for the developer's promise to do or refrain from doing certain acts on the land. Special use permits have essentially the same effect. Such a permit authorizes a landowner to use his property in a manner that would normally conflict with the permissible uses for the zoning district, provided the landowner proves that his or her use will comply with certain standards specifying maximum amounts of such things as noise, vibration, smoke, glare, heat, odors, and emissions into the air or water. To combat groundwater pollution, a town might enact an ordinance permitting industrial uses within a certain distance of a drinking water well, but only if those industries install and operate the best designated pollution control technology for the particular industry. Thus, an ordinance of this second type would not only specify the uses that are appropriate in each district, but also authorize zoning officials to condition the right to operate certain new uses on the property owner's use of specified technologies or management practices.

The current Kansas zoning laws do not expressly authorize zoning officials to regulate the manner of operation of industrial or other facilities. Arguably, however, such a power is encompassed within the delegation of the right to "regulate the . . . use of buildings, and other structures designed for any specified industry." Recent Kansas Supreme Court cases upholding the validity of special use permits support this analysis. In a 1986 case, the court stated that

731. Id. § 19-2906 (1981).
733. Id. at 257 n.7.
736. In Cities Service Oil Co. v. City of Marysville, 117 Kan. 514, 231 P. 1031 (1925), error dismissed, 270 U.S. 665 (1926), the Kansas Supreme Court addressed a challenge to the validity and reasonableness of a municipal ordinance that forbade storage of gasoline or other combustible materials within the town except in tanks, barrels, or other containers buried at least three feet underground. Id. at 514, 231 P. at 1031. The court concluded that the ordinance was not invalid in its face and represented an appropriate exercise of the police power.
in general, "there is no question a City has the lawful authority to issue special use permits." The court also held that the city in that case, in granting a special use permit to a sanitary landfill, had not exercised this power unreasonably. In order to prevent groundwater contamination, the permit required that, before beginning construction of the landfill, the applicant submit to the planning commission a leachate control plan; a plan for controlling illegal dumping around the entrance to the landfill during nonoperational periods; and a detailed survey of all undermined areas extending beyond the boundaries of the site. As a condition of operation, the landfill operator was required to exclude all hazardous waste and prevent the degradation of "the naturally occurring groundwater quality beyond the disposal site boundary." In a 1985 case, the court upheld the validity of a special use permit issued to another sanitary landfill. The permit required that the landfill operate "in accord with the criteria for evaluating sanitary landfill sites and operations" formulated by the city's consulting engineers. These cases support the validity of a zoning ordinance authorizing certain uses in areas within specified distances of a water well, but only if these uses meet conditions for operation that are included either in the ordinance itself or in a special use permit issued on a case-by-case basis by city or county zoning authorities.

The principal statutory authorities relied on by the court were two general grants of authority to municipalities, both of which in essence allowed each city "to enact . . . any and all ordinances not repugnant to the constitution and laws of this state, and such as it shall deem expedient for the good government of the city." Id. at 515, 231 P. at 1032. A Kansas court might be willing to construe the zoning laws in a similarly expansive manner, although the situations are distinguishable. The statutes in Cities Services on their face provided virtually unqualified authority to enact ordinances. The current zoning laws, on the other hand, specify certain permissible methods of current zoning regulation—e.g., regulation of "location and use." A court might conclude that had the Legislature intended to grant the authority to use other methods of regulation, such as use, design, or operating restrictions, it would have done so expressly. Ironically, the kind of underground storage tanks encouraged by the ordinance in Cities Services is a principal source of groundwater pollution today. See supra pt. I, §§ B, C. K-S Center Co. v. City of Kansas City, 238 Kan. 482, 499, 712 P.2d 1186, 1198 (1986).


See also Kimberlin v. City of Topeka, 238 Kan. 299, 302-04, 710 P.2d 682, 685-87 (1985) (rejecting challenge to an airport hazard zoning ordinance that imposed different height limitations on buildings within a series of concentric circles surrounding the site of the airport. The court held that the ordinance was not too vague, did not exceed the scope of the police power, and was not a taking of nearby property owners' land).

A third way to protect groundwater quality involves a technique known as environmental performance zoning (EPZ) or impact zoning. While performance zoning may involve the use of one or more other innovative techniques, it replaces the traditional use specifications characteristic of Euclidean zoning ordinances with a set of standards (either descriptive or numerical) specifying the maximum allowable levels of undesirable by-products generated by use of that land, such as potential groundwater contaminants.

Performance zoning relies on a planning technique called carrying capacity analysis, which assumes that the environment has a finite capacity for absorbing new development and that this capacity should not be exceeded. To set environmental performance standards, the zoning body must inventory the environmental characteristics of the locality, analyze the capability of the environment to absorb additional impacts without causing unacceptable levels of deterioration in environmental quality, and set impact standards to ensure that new development will not produce impacts in excess of the land’s surplus carrying capacity. The performance standards can be expressed in broad, descriptive terms, such as a prohibition on “obnoxious noise, smoke, [and] vibrations.” Many planners suggest instead specifying acceptable numerical levels for performance based on available scientific data wherever possible. In short, environmental performance standards, whether descriptive or numerical, are meant to ensure that any development of the affected land will not disrupt

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743. A challenge to the validity of an Overland Park zoning ordinance prohibiting the use of searchlights without a special use permit. The ordinance authorized the zoning officials to write into the permit “[c]onditions of operation . . . and other reasonable safeguards” to insure that the use of the searchlights would not seriously injure the uses of neighboring properties. Id. at 635, 657 P.2d at 1123. The court held that the regulations were a reasonable exercise of the police power. Id. at 643, 657 P.2d at 1128. In an earlier case, the court rejected the argument by landowners located near the recipient of a special use permit that this mechanism constitutes arbitrary and discriminatory “spot zoning.” See Duggins v. Board of Comm’rs, 179 Kan. 101, 107-09, 293 P.2d 258, 263-64 (1956).

744. McDougal, supra note 732, at 259. A zoning ordinance that required a developer to apply for a permit before commencing construction and to prove in the permit proceeding that it will meet the applicable performance standards would combine EPZ with special use permit mechanism. A similar combination of EPZ with conditional zoning is also possible.


746. See Fredland, supra note 726, at 681-82.

747. See McDougal, supra note 732, at 260.

748. See, e.g., McDougal, supra note 732, at 260; C. THUROW, W. TONER & D. ERLEY, PERFORMANCE CONTROLS FOR SENSITIVE LANDS 96 (Am. Soc’y of Plan. Officials, Plan. Advisory Serv. Rep. No. 307/308 (1975)). For example, a Texas ordinance tried to minimize urban runoff by specifying the slope of impervious substances, the amount of preconstruction clearing (so as not to affect natural ground cover), and the depth of fill material allowed. See City of Austin v. Jamal, 662 S.W.2d 779, 780 n.2 (Tex. Ct. App. 1983).
the ability of the land to absorb adverse environmental impacts. As long as natural processes continue to function in an acceptable manner, the developer may choose whatever means it wants to meet the environmental performance standards.\footnote{750}

The legality of an EPZ ordinance under current Kansas statutes is difficult to assess. The statutory language is inconclusive. The statutes for cities and counties do not expressly permit the use of performance standards, so their validity may depend on how broad an interpretation the Kansas courts give to regulate the use of land and buildings\footnote{751} and, in the case of counties, to "prohibit uses, buildings, or structures incompatible with the character of [the] district."\footnote{752}

The cases that provide the most support for the use of EPZ are the two recent decisions that uphold the authority of cities to issue special use permits for the operation of sanitary landfills.\footnote{753} In both cases, the Kansas Supreme Court rejected surrounding property owners' allegations that the granting of the permit was unreasonable.\footnote{754}

Several provisions of the permits are significant. In the earlier case, the permit provided:

in deference to the City's water supply, the naturally occurring groundwater quality beyond the disposal site boundary (the area of actual waste disposal) shall not be degraded or if it is currently of adequate quality for drinking water supply, it shall not be degraded to a point where additional treatment would be required for use.\footnote{755}

The permit in the later case included an almost identical provision.\footnote{756}

The permit upheld in the earlier decision also required that "[a]ir and water pollution . . . be avoided," based on the study of the City's consulting engineer; that "[t]here will be no destruction of an irreplaceable natural resource"; and that "[c]onstruction and maintenance of this operation will not cause excessive erosion but will in fact control and remedy an existing soil erosion problem."\footnote{757}

All of these permit conditions are performance standards because


\footnote{752} Id. § 19-2906 (1981).

\footnote{753} K-S Center Co. v. City of Kansas City, 238 Kan. 482, 712 P.2d 1186 (1986); Daniels v. Board of Comm'rs, 236 Kan. 578, 693 P.2d 1170 (1985).

\footnote{754} 238 Kan. at 495-99, 712 P.2d at 1196-98; 236 Kan. at 585-87, 693 P.2d at 1178.

\footnote{755} 236 Kan. at 583-84, 693 P.2d at 1176.

\footnote{756} 238 Kan. at 490, 712 P.2d at 1192.

\footnote{757} 236 Kan. at 584, 693 P.2d at 1177.
they specify an end result but do not dictate any particular means of achieving it.

The courts of other jurisdictions have addressed the validity of performance standard zoning more directly. Although the courts are not of one mind, the trend of these decisions is to uphold the use of EPZ.\footnote{A relatively early Florida case dealt with an ordinance that provided that no industrial operation "shall be carried on which is injurious to the operating personnel of the business or to other properties, or to occupants thereof by reason of the objectionable emission of cinders, dust, fumes, gas, odor, noise, refuse matter, smoke, vapor, vibration, or similar substances or conditions." Phillips Petroleum Co. v. Anderson, 74 So. 2d 544, 545 (Fla. 1954). The court invalidated the ordinance as an unconstitutional delegation of legislative power to local zoning officials responsible for issuing building permits and because the ordinance was too vague. The ordinance lacked "an intelligible principle to be laid down for the guidance of an administrative official in the performance of his duties." \textit{Id.} at 547. An Alabama case decided at about the same time came to a different conclusion. See Walls v. City of Guntersville, 235 Ala. 480, 45 So. 2d 468 (1950). The ordinance involved was similar to the Florida ordinance quoted above. A property owner charged that the ordinance, by authorizing zoning officials to prohibit "offensive" uses, vested those officials uncontrolled and arbitrary discretion, in violation of the fourteenth amendment. 45 So. 2d at 470-71. The court rejected this claim, stating: ordinances need not always prescribe a specific rule of action and . . . some situations require the placing of some discretion in municipal officials, as in cases where it is difficult or impracticable to lay down a definite or comprehensive rule for guidance, or where the discretion relates to the administration of a police regulation and is essential to the protection of the public morals, health, safety, welfare, etc. 45 So. 2d at 472 (quoting 37 Am. Jor. \textit{Zoning} § 160). A Virginia case reached the same result shortly thereafter, adding that if the zoning officials did act arbitrarily in carrying out the ordinance, an aggrieved person could seek review in administrative and judicial appeals, and that the ordinance was therefore consistent with due process. See \textit{Ours Properties, Inc. v. Ley}, 198 Va. 848, 853, 96 S.E.2d 754, 758 (1957).}\footnote{See Treme v. St. Louis County, 609 S.W.2d 706 (Mo. App. 1980).} The trend of these decisions is to uphold the use of EPZ.\footnote{City of Austin v. Jamail, 662 S.W.2d 779 (Tex. Ct. App. 1983).} Within the last few years, courts in Missouri,\footnote{DeCoals, Inc. v. Board of Zoning Appeals, 284 S.E.2d 856 (W. Va. 1981).} Texas,\footnote{\textit{Id.} at 860. The ordinance prohibited dust of any kind from escaping beyond the limits of property used by industrial operations. It also prohibited noise above 70 decibels, measured at the property line. \textit{Id.} at 858.} and West Virginia\footnote{\textit{Id.} at 859. The court quoted from a land use planning expert to support its conclusion: The most important current trend in industrial zoning is the gradual movement towards zoning by performance standards. Since a primary purpose of industrial zoning is the} have upheld the validity of zoning ordinances containing performance standards. Of these decisions, the West Virginia case contains the most extensive discussion of performance zoning. That court rejected a claim that the ordinance violated the due process clause.\footnote{\textit{Id.} at 860. The ordinance prohibited dust of any kind from escaping beyond the limits of property used by industrial operations. It also prohibited noise above 70 decibels, measured at the property line. \textit{Id.} at 858.} It stated that because the objective—protecting neighbors from pollution—was legitimate, the only issue was whether the means chosen were substantially related to that end. The court concluded that they were, holding flatly that "[z]oning by pollution performance standards is reasonable."\footnote{\textit{Id.} at 859. The court quoted from a land use planning expert to support its conclusion: The most important current trend in industrial zoning is the gradual movement towards zoning by performance standards. Since a primary purpose of industrial zoning is}
Kansas statutes. If the statutory language is construed broadly, this mechanism could be allowed. The 1985 and 1986 Kansas cases upholding special use permits for sanitary landfills support such a broad interpretation. To overcome any remaining doubts, the legislature could amend the city and county zoning laws to expressly permit the use of EPZ.\textsuperscript{764} The more precise the standards set forth in an EPZ ordinance are, and the more firmly they are tied to scientific evidence as to the impact of industrial or other operations on the environment, the less likely it is that those standards will be invalidated.\textsuperscript{765}

(2) Existing land use activities

A special problem arises in connection with any attempt to apply ordinances such as the three described above to existing uses of property. The city and the county zoning laws prohibit the application of zoning regulations to existing uses.\textsuperscript{766} Unless these provisions are amended, no zoning ordinance aimed at protecting groundwater quality could be applied to uses already in existence at the time the ordinance was enacted.

The Kansas Legislature has already permitted the application of zoning regulations to existing, or "nonconforming" uses in one statute. The Legislature has provided a separate grant of zoning authority\textsuperscript{767} to counties having first, second, or third class cities with respect to the unincorporated territory lying within three miles of any such city, provided the city has established a planning commission and has adopted a zoning ordinance under the city zoning statutes.\textsuperscript{768} Counties acting under this zoning law may adopt "reasonable regulations . . . for the gradual elimination of nonconforming uses."\textsuperscript{769} The same authority could be granted to all other counties and to city zoning authorities.

\textsuperscript{764} See McDougall, supra note 732, at 268 ("specific enabling legislation authorizing . . . performance standards . . . is preferable"). Even then, there is some question as to whether such a delegation of authority would be constitutional. Property owners could claim that EPZ involves an excessive delegation of legislative authority to local zoning officials, that the standards involved are void for vagueness, or that EPZ is not a reasonable means of achieving legitimate police power objectives. The judicial precedents in other states provide reason to believe that the Kansas courts would reject such arguments. See supra notes 758-63 and accompanying text.

\textsuperscript{765} See McDougal, supra note 732, at 272-73.


\textsuperscript{767} Id. §§ 19-2927 to -2937 (1981).

\textsuperscript{768} Id. §§ 12-701, 12-707 to -715 (1982).

\textsuperscript{769} Id. § 19-2930 (1982).
Property owners required to phase out nonconforming uses have attacked the ordinances authorizing such phase-outs as a taking of property. In several states, the courts have agreed and have invalidated the ordinances.\textsuperscript{770} In a 1957 decision, however, the Kansas Supreme Court held that the county phase-out provision does not violate the fourteenth amendment and is a proper exercise of the police power.\textsuperscript{771}

(3) Agricultural land use activities

The county zoning laws do not permit the application of zoning regulations to land used for agricultural purposes.\textsuperscript{772} Because agricultural activities are a significant source of potential groundwater contamination in Kansas,\textsuperscript{773} this exemption must be repealed if zoning for groundwater protection purposes is to be applied to agricultural polluters.

3. Conclusion

Zoning for groundwater protection purposes is not likely to present constitutional difficulties except in rare cases where the application of a zoning ordinance to a particular property deprives the owner of all beneficial use of that property. Zoning for groundwater quality protection is also within the scope of the State's police power. The present Kansas zoning laws may even authorize the use of a variety of techniques for achieving this purpose, although a statutory amendment expressly authorizing the use of EPZ is desirable. Yet, the present Kansas city and county zoning laws do not provide local zoning officials with sufficient authority to implement a comprehensive system of land use control to prevent groundwater pollution. The principal obstacles are the exemptions for agricultural uses and existing activities.

\textsuperscript{770} See, e.g., Ebel v. City of Corona, 767 F.2d 635, 639 (9th Cir. 1985); Hoffman v. Kinealy, 389 S.W.2d 745, 754-55 (Mo. 1965); City of Akron v. Chapman, 160 Ohio St. 382, 388-89, 116 N.E.2d 697, 700 (1953).

\textsuperscript{771} See Spurgeon v. Board of Comm'rs, 181 Kan. 1008, 317 P.2d 798 (1957). The courts in a variety of other jurisdictions have also held that ordinances containing a reasonable amortization period conform to constitutional requirements. See, e.g., Lachapelle v. Town of Goffs-town, 107 N.H. 485, 225 A.2d 624 (1967); City of Seattle v. Martin, 54 Wash. 2d 541, 342 P.2d 602 (1959); Chico Corp. v. Delaware-Muncie Bd. of Zoning Appeals, 466 N.E.2d 472 (Ind. App. 1984); City of Los Angeles v. Gage, 127 Cal. App. 2d 442, 274 P.2d 34 (1954). One of these cases even involved an ordinance which phased in what it called "performance standards," although the ordinance's minimum lot size and setback requirements hardly seem to merit that designation. See Chico Corp. v. Delaware-Muncie Bd. of Zoning Appeals, 466 N.E.2d 472, 479 (Ind. App. 1984).


\textsuperscript{773} See supra pt. I, § C.
I. Kansas Nuisance Law

Potential groundwater contamination sources are restricted not only by a variety of federal and state regulatory programs; they also can become defendants in common law tort actions if other persons in the vicinity believe they have been harmed by the defendants' activities.\(^{774}\) Such lawsuits could be based on several causes of action, including trespass, negligence, strict liability, or nuisance.

1. Trespass, Negligence, and Strict Liability

A trespass action is based on the defendant's physical invasion of the plaintiff's land and his interference with the plaintiff's exclusive right to possess that land.\(^{775}\) If a pollution source causes something tangible to be projected onto the surface of the plaintiff's land, the defendant normally has committed a trespass.\(^{776}\) It is less certain whether a defendant who causes a subsurface invasion of liquids into groundwater underneath the plaintiff's property will be liable in trespass,\(^{777}\) although it is difficult to understand why some courts draw this distinction.\(^{778}\)

A person who causes groundwater contamination also may be liable in a negligence action. The injured plaintiff must show that the defendant had a duty to conform to a certain standard of conduct, a breach of that duty, a causal connection between the conduct and the resulting injury, and actual loss or damage.\(^{779}\)

Strict liability is imposed even if the defendant did not knowingly or purposely interfere with a legally protected interest or was not

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\(^{775}\) See W. Prosser & W. Keeton, The Law of Torts § 13, at 70 (5th ed. 1984); Restatement (Second) of Torts § 158 (1977).

\(^{776}\) See id.; supra note 775, § 158(a) & comment c; see also Riddle Quarries, Inc. v. Thompson, 177 Kan. 307, 311, 279 P.2d 266, 269 (1955).

\(^{777}\) See W. Prosser & W. Keeton, supra note 775, § 13, at 72.

\(^{778}\) See, e.g., supra note 775, § 158 comment g ("A trespass on land may be committed by an intrusion . . . beneath . . . the surface.").

\(^{779}\) W. Prosser & W. Keeton, supra note 775, § 30, at 164-65.
2. Nuisance

Nuisance is the most commonly invoked common law cause of action in cases involving injury caused by pollution, although not all nuisance law is judge-created. The Kansas Criminal Code makes maintaining or permitting a public nuisance a class C misdemeanor. The governing body of any city may remove or abate a nuisance from any land within the city whenever the local board of health declares the nuisance to be dangerous to the public health, or when the activity is maintained in violation of zoning laws. The KDHE has the power to order the removal of any nuisance that may be injurious to the public health. The statute imposes fines of up to $100 for each day that the nuisance continues in violation of a KDHE order.

Aside from these legislatively declared nuisance remedies, the courts can require the owner or operator of a nuisance to compensate those injured by the nuisance-creating activity, or enjoin the continued operation of the activity, or both. Common law nuisance standards are the source of considerable confusion because they encompass two fields of tort liability, public and private nuisance, each of which involves the invasion of a different kind of interest. For years the Kansas courts blurred or ignored the distinction between these two separate fields of civil tort liability.

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780. Id. § 78, at 554. The defendant is liable because its behavior exposed others to an abnormal risk of harm. Id. § 75, at 536-38. The defendant is permitted to engage in the conduct creating the undue risk of harm but is forced to bear the loss caused by its conduct because it can bear that loss more easily than the injured individual. Id. at 537.


782. See Restatement, supra note 775, § 519.


784. KAN. STAT. ANN. § 21-4106 (1981). The management of hazardous waste in a manner that creates a public nuisance is a class A misdemeanor. Id. § 65-3409(a)(5), (c) (1985).

785. Id. § 12-1617(e) (1982). See also id. § 65-159 (Supp. 1985).

786. See id. § 12-710 (1982).


a. Public nuisance

A public nuisance is a substantial and unreasonable interference with a right common to the general public. An intentional interference is unreasonable if the gravity of the harm caused by the defendant’s conduct outweighs the utility of that conduct. Public nuisance liability also can be based on negligent or reckless conduct or on an abnormally dangerous activity. In assessing the reasonableness of the interference, a court will give weight to whether the defendant’s conduct violated a statute, ordinance, or administrative regulation, and whether the conduct is of a continuing nature or has produced a permanent or long lasting effect upon the public right. A significant interference with the public health, safety, peace, comfort, or convenience may create a public nuisance. The Kansas courts frequently have held that pollution may constitute a public nuisance.

Because a public nuisance action is based upon an interference with rights common to the general public, such an action may be brought by a public official representing the state or one of its political subdivisions. A private person also may sue, provided he can show that he has suffered injury distinguishable both in kind and degree from that suffered by other members of the general public.

789. Restatement, supra note 775, § 821B(1). See also Miller v. Cudahy Co., 592 F. Supp. 976, 1004 (D. Kan. 1984); Culwell, 211 Kan. at 365, 506 P.2d at 1195 (“Stated in another way, a public nuisance is one which annoys a substantial portion of the community.”).
790. Restatement, supra note 775, § 826 & comment a. An intentional interference also may be unreasonable if the harm caused by the conduct is serious and the financial burden of compensating for this and similar harm to others would not make continuation of the conduct infeasible. Id. § 826 & comment a.
791. If the court finds that the defendant acted negligently or recklessly or that the defendant’s activity was abnormally dangerous, it has implicitly concluded that the defendant’s conduct or activity was in some way unreasonable. Id. § 821B comment e.
792. Id. § 821B(2)(b)-(c).
793. See Culwell, 211 Kan. at 363, 506 P.2d at 1195; Restatement, supra note 775, § 821B(2)(a).
794. See, e.g., Lehmkuhl v. City of Junction City, 179 Kan. 389, 392-93, 295 P.2d 621, 624-25 (1956) and cases cited therein. In a recent case, a federal district court held that contamination of an underground aquifer by salt water constituted a public as well as a private nuisance because the defendant salt company had “wrought substantial damage to a precious natural resource and thereby infringed the public interest in maintaining the state’s water resources in a pure and unpolluted condition.” Miller v. Cudahy Co., 592 F. Supp. 976, 1004 (D. Kan. 1984). The court assessed actual damages of more than $3 million and contingent punitive damages of $10 million and required the salt company to assess the alternatives for cleaning up the contamination. Id. at 1008-09. The court held the punitive damage award in abeyance pending evaluation and assessment of the potential clean-up alternatives. Id. at 1009.
795. See Restatement, supra note 775, § 821C(2)(b).
796. See Culwell, 211 Kan. at 363, 506 P.2d at 1196. An individual who has suffered personal injuries or harm to health, see, e.g., id. at 364, 506 P.2d at 1196; Sly v. Board of Educ., 213 Kan. 415, 419, 516 P.2d 895, 899 (1973), or whose ability to use and enjoy his property has been interfered with as a result of the defendant’s activities, see Culwell, 211 Kan. at 364,
b. Private nuisance

A private nuisance action involves the invasion of an individual's interest in the private use and enjoyment of his land resulting from the defendant's use of his land. The plaintiff's interest in the use and enjoyment of land can be interfered with through physical harm to the land itself or to tangible things (such as crops) on the land. A private nuisance action also can be based on a disturbance of the occupant's comfort, convenience, health, and perhaps even peace of mind in using the land.

To prevail in a private nuisance action, the plaintiff must demonstrate that the interference with his protected property interest is substantial. The interference also must be unreasonable, which normally means that the gravity of the harm suffered by the plaintiff outweighs the utility of the defendant's conduct.

If a court finds that the defendant's interference with the plaintiff's interest is unreasonable, it can award damages to compensate the plaintiff for the harm that has already occurred. In such a case, the plaintiff may recover in subsequent suits for injury suffered after the first lawsuit. Alternatively, the court can award permanent damages, compensating the plaintiff in one lawsuit both for harm

506 P.2d at 1196; Berry v. Shell Petroleum Co., 140 Kan. 94, 100, 33 P.2d 953, 957 (1934), probably will be able to satisfy this "special injury" requirement. An interference with the plaintiff's business may also suffice. See cases cited in W. PROSSER & W. KEETON, supra note 775, § 90, at 650 n.78.


798. See W. PROSSER & W. KEETON, supra note 775, § 87, at 619. If, for example, materials from a hazardous waste disposal site leak from the dump, through the soil, and then contaminate groundwater under a neighbor's land, the latter's interest in the use and enjoyment of his land has been invaded. Cf. Miller, 592 F. Supp. at 1004.


801. See W. PROSSER & W. KEETON, supra note 775, § 87, at 620 & nn.17-19.


803. See, e.g., McMullen v. Jennings, 141 Kan. 420, 425, 41 P.2d 753, 755 (1935); Berry v. Shell Petroleum Co., 140 Kan. 94, 102, 33 P.2d 953, 958 (1934). For an alternative basis for a finding of unreasonableness, see RESTATEMENT, supra note 775, § 826(b); see also supra note 790.
that has already occurred and for harm that will occur in the future. A plaintiff who receives such a permanent damage award cannot obtain any further relief against the polluter in subsequent lawsuits. When the court believes that the defendant’s activity is a socially desirable one and should be permitted to continue, the court will limit the plaintiff to damages. Because the defendant has caused harm to the plaintiff, however, the defendant will be permitted to continue its polluting activity only if it compensates the plaintiff for that harm.804

A third option is to grant damages for past harm and enjoin the defendant from causing further harm to the plaintiff. An injunction, by its own terms or its practical effect, may require the defendant’s industrial operation to shut down. The grant of injunctive relief reflects the court’s belief that the defendant should not be permitted to continue harming the plaintiff, even if the defendant is able to compensate the plaintiff for that harm.805

The courts have broad discretion in determining whether injunctive relief is appropriate. After the court weighs the gravity of the harm to the plaintiff against the utility of the defendant’s conduct to determine whether the plaintiff is entitled to any relief,806 it then engages in a second balancing process to determine the nature of that relief. In doing so, it considers factors such as the adequacy of the plaintiff’s legal remedy, any unreasonable delay by the plaintiff in bringing suit, any related misconduct by the plaintiff, the interests of third parties and the public, the practicability of framing and enforcing the injunctive decree, and the nature of the interest to be protected.807 Injunctive relief may be particularly appropriate in soil and water pollution cases due to “the enormous weight that is given to the preservation of our natural resources and the protection of the environment from physical impairment.”808 Finally, the courts often compare the relative hardship likely to result to the defendant if an injunction is granted and to the plaintiff if it is denied.809 Damage

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805. See Restatement, supra note 775, §§ 822 comment d, 941 comment c; W. Prosser & W. Keeton, supra note 775, § 88A, at 631.
806. See supra notes 802-03 and accompanying text.
807. See Restatement, supra note 775, § 936(1).
808. W. Prosser & W. Keeton, supra note 775, § 88, at 627. The recent decision by a federal district court in a Kansas case involving salt pollution of an underground aquifer appears to support this view. See Miller v. Cudahy Co., 592 F. Supp. 976, 1008-09 (D. Kan. 1984), where the court fashioned injunctive relief against defendant’s “deplorable” conduct in operating its salt business in an effort “to restore the [polluted] aquifer and prevent the spread of pollution.”
809. See Restatement, supra note 775, § 936(1)(e).
or the threat of damage to the plaintiff’s health or that of the community might weigh heavily in favor of an injunction.\textsuperscript{810}

3. Deficiencies in Common Law Nuisance as a Means of Regulating Groundwater Pollution

Although common law suits may be an effective means of compensating persons injured by activities that generate pollution, common law liability does not of itself provide a comprehensive or adequate means of preventing pollution in the future. Such litigation is by its very nature after the fact and ad hoc—pollution sources are subject to scrutiny only when they become defendants in individual lawsuits. Further, even when a pollution source admittedly causing harm is sued in a common law action, a court will not always force it to cease or restrict its polluting activities. The processes of determining whether a nuisance exists and, if so, whether it should be enjoined, involve the application of multifactor balancing tests. The outcomes in particular nuisance cases are extremely difficult to predict, and a pollution source is not likely to be effectively deterred from causing harm by the possibility of becoming a defendant in a nuisance suit.

Causation also operates as an obstacle to reliance on private nuisance litigation as a regulatory mechanism. Regardless of the theory invoked in a tort action against a pollution source, the plaintiff must demonstrate that the polluter caused the plaintiff’s injury, both factually and legally.\textsuperscript{811} In some cases, it will not be difficult to prove both kinds of causation.\textsuperscript{812} In others it will be much more difficult to trace the plaintiff’s harm to the defendant’s conduct.

First, it is sometimes difficult to trace the path of groundwater, so that it may be impossible to identify with certainty the source of an aquifer’s contamination.\textsuperscript{813} Second, even when the source of the


\textsuperscript{811} See, e.g., Cherry v. Board of Comm’rs, 202 Kan. 121, 125, 446 P.2d 734, 737 (1968) (public nuisance action). In many cases, to demonstrate cause in fact the plaintiff must prove that he would not have been injured but for the defendant’s conduct. See W. Prosser & W. Keeton, supra note 775, § 41 at 266-67 (concerning negligence). The concept of legal or proximate cause involves the extent to which the defendant could have foreseen the severity and magnitude of damage its action would cause. Id. § 43. See also Baldwin v. City of Overland Park, 205 Kan. 1, 6, 468 P.2d 168, 172 (1970).

\textsuperscript{812} See, e.g., Miller v. Cudahy Co., 592 F. Supp. 976, 984 (D. Kan. 1984) (“There is no credible evidence that indicates that any of the salt[t] presently polluting the aquifer came from any source other than American Salt.”).

pollution is evident, it may not be possible to identify the individual or company responsible for the plaintiff’s injury. Suppose, for example, that wastes leaking from a hazardous waste disposal site have contaminated an aquifer into which the plaintiff has drilled a well. If many companies have disposed of their wastes at the site, the plaintiff may not be able to prove that any particular company’s conduct caused the contamination, or even an identifiable portion of it.814 Some courts have made each of the parties who may have contributed to the injury jointly and several liable for the entire injury,815 but the Kansas courts have held that the State’s comparative negligence statute816 abolished joint and several liability in negligence and strict products liability cases, replacing it with a system in which each defendant is liable only for its proportionate fault.817 The comparative negligence statute, however, does not abolish joint and several liability in intentional tort cases such as private nuisance.818 Third, even if the plaintiff can prove that it was exposed to an environmental pollutant discharged by the defendant, it may be hard for the plaintiff to show that his illness or injury resulted from that exposure. This difficulty is likely to be especially troublesome in cases involving diseases such as cancer, with long latency periods between the exposure and the manifestation of the disease.819

This long latency period is associated with one final obstacle to a plaintiff’s recovery in a nuisance action. A plaintiff must initiate his lawsuit before the expiration of the statute of limitations.820 The


815. To avoid having to compensate the plaintiff for the entire injury, a defendant must prove that it did not cause any of the harm or caused only a traceable portion of it. See generally Comment, The Mutual Causation Defense: Causation in Acid Rain Litigation: Facilitating Proof with Joint Liability Theories, 1983 B.Y.U. L. Rev. 657 (1983); Note, Judicial Attitudes Towards Legal and Scientific Proof of Cancer Causation, 3 Colum. J. Envtl. L. 344 (1977).


820. Traditionally, the statute of limitations begins running at the time the plaintiff suffers injury, but the Kansas Legislature has enacted a “discovery rule” which states that a cause of action does not accrue until the act giving rise to the cause of action first causes substantial injury. Kan. Stat. Ann. § 60-513(b) (1983). If the fact of injury is not readily ascertainable until some time after the initial act, then the statute does not begin to run until the fact of injury becomes readily ascertainable to the injured party, but in no event can the limitations period extend more than ten years after the time of the act giving rise to the cause of action. Id.
Kansas courts have been unable to enunciate coherent rules specifying when the plaintiff first has a cause of action against a polluter whose activities continuously invade the plaintiff's interests over a period of years. The courts have also struggled in determining whether a plaintiff whose property interests have been harmed on a continuous basis by the defendant's conduct must seek full compensation in one action for all injury, past and future, or whether the plaintiff is entitled to bring a series of actions, each time seeking compensation for the injury suffered since the judgment in the previous suit. This uncertainty provides an additional reason not to rely too heavily on nuisance litigation as a mechanism for controlling groundwater pollution in Kansas.

4. Conclusion

Common law tort litigation provides an after-the-fact deterrent to groundwater polluting activities by assessing certain costs to the polluter. But, for the reasons described above, private civil litigation cannot substitute for preventive measures that avoid the harm in the first place.

J. Other Kansas Law

Other Kansas statutes are relevant to prevention of groundwater pollution. In 1981, the Legislature created a new Kansas Water Office within the Kansas Water Authority to assist in the planning and implementation of State policy concerning water resource use. Many of the Agency's responsibilities relate to the protection of groundwater quality. Other laws require collection and analysis of information concerning the quality of Kansas water resources.

823. Because most of these other laws either do not have groundwater quality protection as their primary objective or do not play a major role in current regulatory efforts, this section does not discuss them in depth.
824. KAN. STAT. ANN. § 74-2622(a) (Supp. 1985).
825. See id. § 74-2622(c).
826. Since 1965, it has been the policy of the State for all agencies having responsibilities affecting State water resources to carry on basic data collection, research and analyses concerning water quality, groundwater levels, character and geographical extent of groundwater reservoirs and their relation to both surface and underground waters, interrelation of surface and underground waters, methods and techniques for recharging groundwater reservoirs, and other similar matters. Id. § 82a-941. The KDHE has an obligation to implement this policy. Id. §§ 65-156, -157.
authorizing State regulation of activities such as farming, grazing, and mining also seek to prevent pollution of the State’s water resources. The Mined-Land Conservation and Reclamation Act contains several provisions designed to control threats to water quality resulting from surface mining operations. Other states also usually have a scattering of such special statutes.

K. Summary

The list of Kansas laws and regulations applicable to activities that may contribute to groundwater pollution is even longer than the list of similar federal laws. Most of those federal laws authorize the responsible federal agency, usually the EPA, to delegate some responsibilities to the states for developing, implementing, and enforcing the regulatory programs. Like most states, Kansas has taken advantage of these opportunities and has enacted other laws and regulations that cover many of the activities posing significant threats to groundwater quality.

Like the federal government, however, Kansas and other states have not yet coordinated this multitude of individual regulatory programs into a comprehensive groundwater protection program. This lack of coordination is reflected in the dispersal of regulatory authority among several agencies. In Kansas, these include the KDHE, the KCC, the State Board of Agriculture, the Chief Engineer of the Water Resources Division, the Mined-Land Conservation and Reclamation Board, the groundwater management districts, and the local zoning authorities. Undoubtedly, these agencies sometimes work in ignorance of what others are doing, or even at cross-purposes with the regulatory objectives of another entity.

827. The Legislature has announced that where surface mining operations are conducted, the reclamation of affected lands should be encouraged, so that the State’s natural resources may be conserved, developed, managed, and used in ways consistent with the protection of the health, safety, and general welfare of people in the affected area. See id. §§ 2-1904 to -1916 (1982 & Supp. 1985).


829. For example, the Mined-Land Conservation and Reclamation Board has the responsibility to issue cessation orders whenever it finds that mining practices or conditions are causing or may reasonably be expected to cause significant environmental harm to water resources. Id. § 49-405(m)(1). The Board may declare designated surface areas, including aquifers and aquifer recharge areas, unsuitable for certain types of surface coal mining operations if such operations could result in a substantial loss or reduction of long-range productivity of water supply. Id. § 49-405b(2)(C). The act prohibits surface mining without a permit, id. § 49-406(a) (Supp. 1985), and no permit may be issued unless the applicant demonstrates that the proposed operations have been designed to prevent material damage to the hydrologic balance outside the permit area. Id. § 49-407(a)(3) (1983).

830. The EPA’s recent grant of final authorization to Kansas for the State’s RCRA hazardous waste management program is only one of the latest examples. See 50 Fed. Reg. 40,377 (1985).

The absence of a single, comprehensive statute directly addressing protection of groundwater quality leaves significant gaps in regulatory coverage. The scope of some of the existing regulatory programs is unclear. Some of the State's pollution laws are vague (such as the law regulating the drilling of new oil and gas wells). \(^{832}\) Some are riddled with unnecessary exemptions, such as the exclusions for agricultural activities and nonconforming uses in the State's zoning laws. \(^{833}\) Other laws appear to provide adequate regulatory authority, but are not being fully implemented (such as the program relating to abandoned oil and gas wells). \(^{834}\) Finally, some bodies of law (such as the State's common law of nuisance) \(^{835}\) provide theoretical constraints on activities that generate pollution, but are burdened with so many obstacles to effective implementation that in practice these laws add relatively little to the State's efforts to prevent groundwater contamination.

The difficulties engendered by the current piecemeal approach to groundwater pollution problems in Kansas (and, probably, elsewhere) are well-illustrated by a recent Kansas Supreme Court decision. \(^{836}\) The operator of an aerial spraying service sprayed wheat fields in western Kansas with the pesticide endrin. Two days after the spraying, investigators found dead fish in a nearby creek. \(^{837}\) The KDHE issued an order assessing a civil penalty for improper application of pesticides which caused water pollution in violation of a Kansas statute. \(^{838}\) The Kansas Supreme Court affirmed the district court's decision invalidating the order. \(^{839}\) The court noted that the Kansas statutes governing water pollution first appeared in "primitive form" in 1907 and have been repeatedly amended since that time. \(^{840}\) According to the court, "[t]hese amendments have been enacted in a haphazard fashion which has resulted in an overlapping and confusing regulatory scheme." \(^{841}\) It held that the KDHE's order in this case was invalid because the Agency relied on the wrong statute as the basis for assessing the penalty. The statute relied upon \(^{842}\) restricted the discharge of waste products into the State's water, but the court

\(^{832}\) See supra pt. III, § G(2).
\(^{833}\) See supra pt. III, § H.
\(^{834}\) See supra pt. III, § G(3).
\(^{835}\) See supra pt. III, § I(2).
\(^{837}\) Id. at 283, 634 P.2d at 1076.
\(^{839}\) 230 Kan. at 286, 634 P.2d at 1078.
\(^{840}\) Id. at 284, 634 P.2d at 1076.
\(^{841}\) Id.
stated that the drift from aerial pesticide spraying is not waste. Furthermore, the court held, the statute was designed to prevent pollution detrimental to the public health, whereas this case involved pollution injurious to fish.\textsuperscript{843} The court added that the State had ample authority to assess penalties against the pesticide applicator,\textsuperscript{844} but not under the statute chosen by the Agency,\textsuperscript{845} (and perhaps only pursuant to State Board of Agriculture, not KDHE, initiatives).\textsuperscript{846}

There is no reason why the legislative scheme for preventing groundwater pollution must be so disjointed and complex that even those charged with implementing it are unsure of the scope and sources of their regulatory authority. The enactment of one statute directed specifically at groundwater pollution and its sources should eliminate the kind of confusion evident in the pesticide applicator case, and would eliminate such loopholes in regulatory coverage.\textsuperscript{847}

IV. Conclusion

Although groundwater contamination does not pose an immediate threat of massive proportions to the public health and environment either nationally or in Kansas, the problem is serious and getting worse. This article argues that unless government regulation is imposed on the myriad of known and suspected sources of groundwater pollution, a groundwater pollution crisis is inevitable. Despite numerous federal and state environmental laws applicable to groundwater polluting activities, an effective and coordinated governmental response to the groundwater pollution problem is lacking.

The second article in this series, to be published as part of a symposium in the next volume of this law review, will recommend the expeditious adoption and implementation of such a response. It will analyze the fundamental policy choices facing legislators and administrators in attempting to devise a groundwater quality protection strategy, using examples of regulatory approaches to groundwater pollution control being tried in other states. It will then describe a comprehensive program containing a series of detailed recommendations on how best to regulate all potential groundwater pollution sources. While these recommendations, and a proposed Groundwater Conservation Act to authorize and effectuate them, were drafted in response to the known and suspected groundwater contamination problems in Kansas, they can also provide a model for groundwater pollution control strategies in other states facing similar problems.

\textsuperscript{843} 230 Kan. at 285, 634 P.2d at 1076.
\textsuperscript{844} Id.
\textsuperscript{846} See 230 Kan. at 286, 634 P.2d at 1078.
\textsuperscript{847} The proposed Groundwater Conservation Act, attached as an appendix to Groundwater Pollution II, supra note 3, is an example of such a comprehensive statute.