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### Groundwater Quality: The Issues, Remedies and Strategies

Kathleen M. Kulasza

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GROUNDWATER QUALITY: THE  
ISSUES, REMEDIES AND STRATEGIES

Kathleen M. Kulasza  
Holme Roberts & Owen, Denver

Groundwater: Allocation, Development and Pollution

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I. Introduction

- A. Groundwater is a significant source of water supplies, both through public water systems and through individual wells.
- B. The contamination of groundwater, including alluvial or water table groundwater and artesian or confined groundwater has become a serious problem.
- C. The federal government has adopted a number of programs to control the problem. This regulation effort is relatively recent, is incompletely implemented, and does not constitute a comprehensive, coherent program.
- D. State and local programs in large part are derived from the federal programs, although the states have and continue to regulate certain facets of the problem independently. Again, a single, coherent approach does not exist.

II. Federal Statutes and Regulatory Programs

- A. Clean Water Act - 33 U.S.C.A. § 1251 et seq.
  - 1. The CWA is intended to protect groundwaters as well as surface waters, and directs EPA (in cooperation with federal and state agencies) to develop programs

to prevent, reduce or eliminate the pollution of ground waters. 33 U.S.C.A. § 1252.

2. However, the CWA has not been effective in dealing comprehensively with groundwater contamination.
  - a. The basic regulatory mechanism is a prohibition on the "discharge" of "pollutants" to the "navigable waters" from "point sources," except pursuant to a permit. The NPDES program (33 U.S.C.A. § 1342) provides for the issuance of permits allowing such discharges, subject to treatment and quality standards.
  - b. The term "navigable waters" has been broadly defined to include all interstate waters, including waters used by interstate travelers and by industries in interstate commerce, 40 C.F.R. 122.2, and all waters tributary to such waters. Therefore, discharges into groundwaters which are tributary to surface waters arguably are subject to the NPDES permit requirements.

- c. However, the case law indicates that the discharge of pollutants into wells may not be regulated by EPA under the NPDES program. U.S. v. GAF Corp., 389 F. Supp. 1379 (D.C. Tex. 1975), held that the disposal of chemical wastes into deep wells that do not affect surface water was not subject to the program. Exxon Corp. v. Train, 554 F.2d 1310 (5th Cir. 1977), confirms that conclusion, even when the disposal is done in conjunction with disposal into surface water. To the contrary is United States Steel Corp. v. Train, 556 F.2d 822 (7th Cir. 1977). In any event, the EPA has not consistently asserted the authority to regulate deep well injection under CWA.
- d. Certain well injection clearly is excluded from regulation under NPDES. By definition, "pollutant" does not include water, gas, or other material injected into a well

to facilitate production of oil or gas or produced water disposed of by injection.

- e. Furthermore, the prohibition on discharge without a permit applies only to "point source" discharges and therefore does not include seepage, runoff, and other diffuse sources of pollution.

3. Protection of groundwaters by EPA under the CWA has been addressed more by way of information and through state programs.

- a. EPA is to develop guidelines concerning groundwater quality criteria and information regarding the factors necessary to restore and maintain groundwater quality. 33

U.S.C.A. § 1314(a)(1) and (2).

- b. EPA also is to issue to federal and state agencies information including guidelines for evaluating non-point sources of pollutants and methods to control pollution from underground mines and disposal wells. 33

U.S.C.A. § 1314.

c. State programs implementing the CWA are required to include provisions for issuing permits to control the disposal of pollutants into wells. U.S.C.A. § 1342(b)(1).

B. Safe Drinking Water Act - Underground Injection Control Program - 42 U.S.C.A. § 300f

1. The 1974 SDWA includes a program for underground injection control ("UIC"). 42 U.S.C.A. § 300h.
2. The goal is to protect underground sources of drinking water by preventing injection which may cause a public water supply derived from underground sources to violate national drinking water standards.
3. The regulatory program, however, encompasses regulation of almost all underground injection:
  - a. All well injection is prohibited except pursuant to a permit. 42 U.S.C.A. § 300h.
  - b. "Well" is broadly defined to include any hole deeper than its greatest surface dimension, and well injec-

tion includes the subsurface em-  
placement of any material which  
flows or moves. 40 C.F.R. § 144.3.

- c. The protected underground sources of drinking water ("USDW") include not only those aquifers currently supplying a public water system but also those containing sufficient water to supply a public water system and having fewer than 10,000 mg/L total dissolved solids, unless exempted pursuant to a specified procedure.
  - d. However, UIC regulations may not interfere with or impede oil and gas production unless essential to protect a USDW.
4. The federal regulatory program categorizes injection wells into five classes (40 C.F.R. § 144.6 and 40 C.F.R. § 146.5):
- a. Class I includes industrial wells, municipal wells and hazardous waste disposal wells injecting beneath the lowermost formation containing a USDW within 1/4 mile.

- b. Class II includes wells which inject fluids for the enhanced recovery of oil and gas and dispose of fluids produced in connection with oil and gas.
  - c. Class III includes wells which inject for the extraction of minerals, including solution mining and in situ production.
  - d. Class IV includes wells which dispose of hazardous or radioactive wastes into or above a USDW within 1/4 mile.
  - e. Class V includes all other injection wells such as multi-unit cesspools and septic systems, cooling water return flow wells, and drainage wells.
5. A permit is required for the operation of any injection well, although the type of permit may vary.
- a. Injection into existing Class I, II, III and V wells may be authorized by rule.

- b. The construction and operation of most new injection wells requires an individual permit, although areawide permits may also be issued for wells within a single field or project.
  - c. Class IV wells are to be prohibited, except those injecting into exempted USDW. 40 C.F.R. § 144.13.
6. Certain basic requirements apply to all injection wells, subject to more technical standards for each class. 40 C.F.R. Part 146.
- a. No well may be operated in a manner that will cause the movement of any contaminant into a USDW so as to cause a violation of a primary drinking water standard or otherwise adversely affect the health of persons.
  - b. To that end, all wells must be cased and cemented to prevent the movement of fluids into or between USDW, and injection between the casing and well bore is prohibited.

- c. Injection pressure must be regulated in order not to initiate or enlarge fractures which may cause contamination of the aquifer.
  - d. Wells must be monitored and reports submitted.
  - e. Wells must be plugged and abandoned in accordance with technical requirements.
7. Primary implementation and enforcement responsibility is intended to be exercised by states.
- a. Many states have sought approval only for a program covering Class II (oil and gas) wells or have a separate program for regulation of such wells by the oil and gas regulatory agency: North Dakota, Kansas, New Mexico, Oklahoma, Alabama, Wyoming, Utah, Colorado, California, and Nebraska.
  - b. Other states have proposed a unified regulatory program: North Carolina, New Jersey, Ohio, Maine, New Hampshire, and Massachusetts.

C. Surface Mining Control and Reclamation Act  
("SMCRA") - 30 U.S.C.A. § 1201 et seq.

1. This statute is designed solely to regulate the environmental effects resulting from coal mining operations, by requiring a permit for all such operations.
2. Permits must require operators to protect groundwater quality and quantity, including preventing contamination by leachate and toxic and acid drainage.
3. The statute and implementing regulations also impose detailed environmental protection performance standards which are designed to minimize the disturbance to the quality and quantity of groundwater, including avoiding acid and toxic drainage. 30 U.S.C.A. § 1265(b)(10).
4. Activities, including the disposal of coal mine wastes and overburden, which are subject to a permit under this statute are exempted from regulation under RCRA (see D. below), although the regulatory agencies are required to coordinate the programs in order to provide adequate protection from the possibly

hazardous waste generated by coal mining. 42 U.S.C.A. § 6905.

D. Resource Conservation and Recovery Act  
("RCRA") - 42 U.S.C.A. § 6901 et seq. -  
Hazardous Waste Management ("HWM") Program -  
Subchapter III

1. RCRA was enacted to fill a perceived need for legislation enabling the states and the federal government to deal effectively with the pollution of underground water resulting from disposal of solid and hazardous wastes. Cong. Record. H11148 (September 27, 1976) (statement of Rep. Rooney); H. Rep. No. 94-1491, 94th Cong. 2d Sess. (1976).
2. The HWM program is intended to deal comprehensively with hazardous wastes by a manifest and reporting system which follows such wastes from generation to disposal and by regulating the facilities at which such wastes are stored, treated and disposed.
3. A primary thrust of the HWM program is to protect groundwater from the effects of existing hazardous waste treatment, storage and disposal facilities.

- a. Facilities existing on November 19, 1980, and qualifying for "interim status" were required to implement a groundwater monitoring program within a year from that date, to determine the effect of the facilities on the uppermost aquifer (including all aquifers hydraulically connected thereto.) 40 C.F.R. Part 264, Subpart F.
- b. If a significant impact is discovered, additional monitoring is required, in order to determine the rate and extent of migration.
- c. Specific operating requirements apply to the various types of facilities, but in general, run-on and run-off must be controlled and leachate must be collected, in order to minimize the effects on groundwater.
- d. Each facility must be closed in compliance with an approved plan which minimizes the escape of hazardous wastes to the environment, including

groundwater. Post-closure monitoring and maintenance must be guaranteed for at least 30 years.

4. Permits are required for all new facilities after November 19, 1980.
  - a. EPA regulations published July 26, 1982, 47 Fed. Reg. 32273 (to be codified at 40 C.F.R. Part 265), set forth specific operating requirements for the land disposal of hazardous waste, including surface impoundments, waste piles, land treatment, and landfills.
  - b. The basic permit requirement is that hazardous constituents entering the groundwater not exceed the drinking water standards or the background level of such contaminants, at the compliance point, which is the down-gradient limit of the waste management area.
  - c. The technical standards require, in general, that leachate formation be minimized by controlling run-on, by restricting the disposal of liquids, and by installing liners and caps.

- d. In conjunction with these control mechanisms, operators of HWM facilities are required to implement monitoring systems at the waste boundary to detect the presence of contaminants in the groundwater.
  - e. If contamination in excess of the protection standard is discovered, corrective action is required: either removal of the contamination or treatment of the contamination in place.
  - f. All new facilities must be closed in a manner that will minimize environmental harm and provide for 30 years of maintenance.
5. EPA has the authority to issue compliance orders and bring actions for injunctions to correct violations of any of the statutory or regulatory requirements. 42 U.S.C.A. § 6928.
6. EPA has exercised its authority under 42 U.S.C.A. § 6973 (the "imminent hazard" provision) to restrain all persons "contributing to" situations which are causing an imminent hazard.

- a. EPA has attempted to assert this authority even as against past, non-negligent generators, with mixed results.
  - b. EPA also has tried to use this authority to address problems resulting from inactive or abandoned sites. The courts have split on this issue. In U.S. v. Price, 688 F.2d 204 (3rd Cir. 1981), the court held that an injunction is available to require the clean-up of previously discharged waste. Other courts have held the reverse - U.S. v. Waste Industries, 556 F. Supp. 1301 (E.D.N.C. 1982); U.S. v. Wade, 546 F. Supp. 785 (E.D. Pa. 1982).
7. The HWM program incompletely addresses even hazardous waste contamination in that it exempts from regulation: waste generated from the combustion of fossil fuels, solid waste from the extraction and processing of ores and minerals, cement kiln dust waste; and fluids and wastes associated with the production of oil and gas.

E. RCRA - Solid Waste Management - 42 U.S.C.A.  
§ 6901 - Subchapter IV

1. RCRA is also intended to regulate and protect the environment, including groundwater, from the effects of solid waste disposal.
2. EPA has published criteria for classifying facilities as open dumps or as sanitary landfills and has published an inventory of open dumps, pursuant to statutory directives.
3. Primary enforcement is by the states, pursuant to approved solid waste management plans.
4. EPA criteria for solid waste disposal facilities are designed to prevent adverse effects on health and the environment. 40 C.F.R. Part 257.
  - a. With respect to groundwater, the regulations prohibit the contamination of underground sources of drinking water beyond the solid waste boundary. The maximum allowable contaminant levels again are the drinking water standards.



in the adoption of a compromise which was signed into law on December 11, 1980.

CERCLA is intended to deal comprehensively with the response to discharges of hazardous substances and pollutants to the environment, including, but not limited to, contamination resulting from abandoned and inactive disposal sites.

(The legislative history of this statute is the subject of a three-volume treatise published by The Environmental Law Institute - Superfund: A Legislative History.)

2. CERCLA provides, first, for the discovery of hazardous situations by requiring that persons at any time associated with hazardous substance facilities (as a generator, transporter or operator) notify EPA of the location of such facilities. In addition, all releases of hazardous substances are required to be reported. 42 U.S.C.A. § 9603.
3. On the basis of information received through the notification requirements, and additional information and recommen-

dations from the states, EPA on December 20, 1982 published a national priority list of the 418 worst hazardous waste sites in the country. These sites were identified in large part on the basis of the contamination of groundwaters and the potential harm which may result. Hazardous Waste Site Ranking System, 40 C.F.R. Part 300, Appendix A.

4. The identified hazardous waste sites are subject to response by the federal government, including immediate response by EPA using the Hazardous Waste Contingency Fund. Actions requiring expenditures in excess of \$1,000,000 are subject to cooperative action by the federal government and the states.
5. EPA has broad discretion to plan and direct response action.
  - a. Response actions are conducted pursuant to the National Contingency Plan, 40 C.F.R. Part 300.
  - b. Immediate response may include removal of hazardous substances, placing physical barriers, and provision of substitute water supplies.

- c. Long-range remedial activities (relating to groundwater) may include the installation of impermeable barriers, leachate control, provision for alternate water supplies, removal of hazardous wastes, and capping or removal of contaminated soil.
  - d. Other action may include extensive investigation, analysis, and monitoring programs.
6. EPA has the authority to recover from the "responsible parties" all sums expended for removal or remedial actions or to require, in the first instance that the "responsible persons" contribute the funds needed for the response measures.
- a. Responsible persons include not only the former owners and operators of abandoned and inactive sites but also all generators who disposed of waste at the sites. Liability is strict liability, regardless of fault.

- b. EPA has been joining all generators in actions, because they are often the most financially responsible parties available.
  - c. The extent of liability is open to question. The statute suggests that joint and several liability should be imposed, but the legislative history indicates that this standard was not intended.
7. CERCLA is, by its terms, the most comprehensive of the environmental statutes, in that it is designed to address releases of any hazardous substances which may cause adverse effects to health or to the environment.

### III. State Programs

- A. State regulatory programs relating to the issue of groundwater contamination do not deal comprehensively with the issue but instead are addressed to limited aspects of the problem. In large part, the states programs implement federal requirements, but the states also have unique authority over certain matters. The Colorado framework will be used as an example.

B. Colorado Water Quality Control Act, C.R.S.

1973 § 25-8-101 et seq.

1. This statute implements the federal NPDES program, but is somewhat broader, giving the Colorado Department of Health ("CDH") additional authority.
2. The statute broadly defines the regulated "waters of the state" as all surface and subsurface waters contained in or flowing through the state, thus clearly giving CDH authority over groundwaters. CDH may promulgate water quality standards for all state waters and may classify waters in terms of goals to be met. Thus far, CDH has not promulgated any specific standards for groundwaters, but has made the basic anti-degradation standard (which prohibits degradation so as to interfere with present uses) applicable to groundwater. 5 C.C.R. 1002-8, § 3.13. However, it has not yet classified groundwaters by uses.
3. The permit requirement applies only to discharges of pollutants through point sources and thus cannot address all potential contamination sources.

4. However, the enforcement authority of CDH is broad enough to provide for the issuance of cleanup orders addressed to the dumping, spilling, or other depositing of any material which may pollute state waters. C.R.S. 1973 § 25-8-605. These orders may be enforced by civil actions, including restraining orders and injunctions. CDH has used these provisions to require after-the-fact cleanup of polluted groundwaters whether from point sources or diffuse seepage.

5. CDH regulations also control the construction, installation and operation of individual septic systems and domestic waste water treatment works.

C. Regulation of Mining Activities

1. Colorado Surface Coal Mining Reclamation Act, C.R.S. 1973 § 34-33-101 et seq., is the state statute implementing the federal SMCRA program and therefore contains similar requirements.

a. All coal mining operations are required to implement a reclamation plan that describes the measures to

be taken to protect groundwater from adverse effects.

- b. All operations must meet specific environmental protection standards, including preventing the creation of toxic and acid leachate, and minimizing disturbances to the quality and quantity of groundwater by preventing toxic drainage, treating drainage, sealing shafts and wells, and otherwise preventing groundwater contact with toxic and acid-forming materials.

2. Colorado Mined Land Reclamation Act, C.R.S. 1973 § 34-32-101 et seq., addresses the effects of other types of mining, including open mining, surface operations, and disposal of refuse from underground and in situ mining.

- a. A permit is required for such operations and must require that acid and toxic producing materials are handled in a manner that will minimize the disturbance to the quality of groundwater.

b. Performance standards are also imposed on prospecting operations in order to prevent contamination through exploratory wells.

D. Underground Injection Control

1. Although the federal UIC statute contemplates that the states will implement and enforce the program, Colorado has not yet passed legislation enabling CDH to administer the program.
2. The Colorado Oil and Gas Commission has applied for authority to regulate Class II wells (see G below).

E. Hazardous Waste Regulation - C.R.S. 1973

§ 25-15-101 et seq.

1. The hazardous waste management program, C.R.S. 1973 § 25-15-301 to -311, authorizes CDH to implement the RCRA HWM program. CDH may issue permits for treatment, storage and disposal facilities and otherwise regulate hazardous wastes pursuant to regulations which may not be any more stringent or inclusive than the federal regulations. Federal regulations require that state programs be at least

as strict as the federal requirements. Thus, the federal operating standards will be imposed and enforced.

2. The Colorado act provides for county review of the location of hazardous waste disposal sites. (See Part IV below.)

F. Solid Waste Disposal - C.R.S. 1973 § 30-20-101

1. Principal authority for siting solid waste disposal facilities rests with the counties. (See Part IV below.)
2. CDH also has the authority to approve or disapprove applications according to its own criteria.
3. CDH regulations implement federal performance standards for sanitary landfills. C.C.R. 1007-2.
  - a. Minimum standards require that all facilities be operated so as to prevent water pollution.
  - b. Operating standards require that groundwater quality be monitored.
  - c. Site standards prohibit the location of facilities in areas that may adversely affect groundwater: aquifer recharge areas, areas within the

range that groundwater may flow from the facility to the nearest domestic wells or springs; or areas containing groundwater that has a potential or existing beneficial use or direct communication with surface water or an aquifer.

- d. Engineering design standards require that groundwater be protected from leachate.

G. Oil and Gas Regulation - C.R.S. 1973 § 34-60-106

- 1. The Colorado Oil and Gas Conservation Commission historically has had the authority to protect groundwater from the adverse effects caused by at least some oil and gas operations.
- 2. The Commission has promulgated regulations implementing this authority:
  - a. The owners and operators of wells are required to take precautions to prevent pollution of groundwaters by oil, gas, saltwater, brackish water, and other wastes.
  - b. In addition, retaining pits must be designed in order to prevent seepage which could contaminate groundwater.

c. The operators of oil and gas wells also may not do any act which will violate any requirements of the Water Quality Control Commission.

3. In 1981, the legislature also granted to the Commission the authority to implement the UIC program as to Class II (oil and gas) injection wells. C.R.S. 1973 §34-60-106(9). The Commission recently adopted regulations regarding injection wells and has applied to EPA for approval of the plan, which approval would enable it to assume permitting and enforcement authority of the UIC program for Class II wells. 2 C.C.R. 404-1.

#### H. State Engineer Regulations

1. The Colorado State Engineer is the official charged with the administration of tributary water rights and with the regulation of well construction and operation for tributary and non-tributary wells.
2. Pursuant to this authority, he has adopted regulations designed, in part, to protect groundwater quality.

- a. Construction regulations require casing and sealing of wells to prevent pollution to saturated zones.
- b. Abandonment regulations also require sealing the wells to prevent contamination to groundwater.

I. Colorado Groundwater Strategy

1. From the foregoing discussion, it is clear that there is no coherent statewide policy designed to protect groundwater resources.
2. CDH has appointed an Ad Hoc Groundwater Quality Advisory Committee to address the possibility of a comprehensive regulatory scheme, including the classification of and adoption of numeric standards for groundwater bodies and the coordination of the various regulatory programs.

IV. Local Programs

- A. In general, local governmental bodies do not directly regulate groundwater quality, but may indirectly do so through land use planning. In Colorado, two programs specifically give county governments some authority over groundwater quality control.

1. Solid Waste Disposal Site Act, C.R.S. 1973 § 30-20-101 et seq., requires that a certificate of designation be obtained from the board of county commissioners before a solid waste disposal facility may be operated. In evaluating an application, the board may consider the recommendations of local health departments and the ability of the operator to comply with the operating and health standards adopted by CDH.
2. Hazardous Waste Disposal Site Act, C.R.S. 1973 § 25-15-201 to -215, requires that a certificate of designation be obtained from the board of county commissioners before a hazardous waste disposal facility may be operated. An application may be denied if CDH finds the site cannot be operated in compliance with regulations, if the county determines that the site does not conform to local land use plans, or if the county finds that site would pose a substantial threat to the safety of the public.

- B. Local agencies also plan a role in groundwater quality control through the development of areawide waste treatment management plans pursuant to 33 U.S.C.A. § 1288. Under this provision, designated regional agencies within states are to develop processes to identify and control (if feasible) non-point sources of pollution such as irrigation return flows and mine run-off, which may have particularly adverse effects on groundwater. For the most part, these plans set goals and policies rather than enforcement requirements.
- C. State and local agencies also may address problems of groundwater contamination through actions to enjoin a public nuisance.
1. The Utah Supreme Court recently ruled that liability for groundwater pollution in a nuisance action is strict liability for creating an abnormally dangerous situation. Branch v. Western Petroleum, Inc., 657 P.2d 267 (Utah 1982). Although a private nuisance action, the legal principle may make it easier to maintain nuisance actions for groundwater contamination.

2. In other states, environmental regulatory agencies frequently bring public nuisance actions under the common law of statutory provisions.
3. In Colorado, a solid waste or hazardous waste disposal facility operated in a manner that violates design and operation criteria, including regulations for the protection of groundwater, is deemed a public nuisance and may be enjoined by an action brought by the board of county commissioners or governing body of the municipality in which the violation occurs.