CHAPTER FIVE GROUND WATER QUALITY IN NEW MEXICO

The Importance of Ground Water In New Mexico

New Mexico's ground water resources are of vital importance in sustaining life, and must be preserved for both present and futures generations. Approximately 90% of the total population of the State depends on ground water for drinking water. Seventy-eight percent (78%) of the population are served by public systems with water derived from ground water sources. Approximately 150,000 people, or 10% of the State population, depend on private wells for drinking water. Nearly half of the total water annually withdrawn for all uses in New Mexico, including agriculture and industry, is ground water, the only practicable source of water in many areas of the State.

About 4.4 billion acre-feet of recoverable fresh and slightly saline water are estimated to be present in underground storage in New Mexico. Overall, the quality of these waters is assumed to be good, although there are significant pollution problems known to affect certain areas throughout the State. A comprehensive survey of the State's ground water quality has not been done, so a quantitative statement concerning ground water quality cannot be made.

Sources of Ground Water Contamination

In the late 1970s, the New Mexico Environment Department (NMED) began evaluating existing information on vulnerable aquifers and major known and potential contamination sources. Evaluation of existing information by NMED has become an ongoing process as focus has shifted from identification of major potential sources of contamination to specific questions about known or suspected ground water problems. An initial inventory of known or suspected cases of groundwater contamination resulting from surface impoundments and other facilities was concluded in 1980 (**1**). An update, expansion and computerization of this inventory of ground water contamination incidents of all types from all sources during the years 1927 through early 1999 is currently in progress.

In general, groundwater contamination most frequently occurs in vulnerable aquifer areas where the water table is shallow although other factors including precipitation, soil type and preferential flow pathways also affect vulnerability. Vulnerability maps, based on aquifer depth, were prepared in 1989 for all counties in the State. These county maps are available for inspection at the appropriate NMED field offices and at the NMED Underground Storage Tank Bureau office in Santa Fe. The New Mexico Energy, Minerals and Natural Resources Department's developed vulnerability maps for the San Juan Basin in northwestern New Mexico in 1985 and 1992, which are available for inspection at their office in Santa Fe.

At least 1,235 ground water contamination plumes emanating from point sources, and numerous areas of widespread contamination from nonpoint sources, have been identified in the State from 1927 through November 1999 (Figure 15). This contamination has impacted 188 public and 1,719 private water-supply wells (Figures 14 and 16). To date, 363 cases have received or will soon receive some degree of remediation (Figure 17). For the purpose of this report, remediation is defined as either removal of polluted ground water for beneficial use or recycling, removal of floating hydrocarbons or purification of polluted ground water followed by reinjection or discharge to surface waters. Remedial actions include removal of floating non-aqueous-phase liquids, vapor ventilation, air sparging, bioremediation, monitored natural attenuation, and a variety of pump-and-treat, pump-and-waste, or pump-and-use methods. The above remediation activities have occurred in the past, are occurring now or are expected to occur in the near future.

Ground water contamination is known to have occurred at a small percentage of facilities operating under a Ground Water Discharge Permit approved by NMED or OCD since the regulations became effective in 1977. Prevention of ground water contamination is clearly more cost effective and technically achievable than remediation. Approximately 13% of ground water contamination in the State have been caused by nonpoint sources, predominantly household septic tanks or cesspools. Nonpoint source contamination may be caused by diffuse sources such as large numbers of small septic tanks spread over a subdivision, residual minerals from evapotranspiration, animal feedlot operations, areas disturbed by mineral exploration and/or storage of waste products, urban runoff or application of agricultural chemicals. Point source categories are shown in Figure 18. These sources are include publicly and privately owned sewage treatment plants with flows over 2,000 gallons a day, dairies, mines, food processing operations, industrial discharges, landfills and accidental spills or leaks.

Nonpoint Sources of Contamination: Household Septic Tanks and Cesspools

It is estimated that there are over 208,000 household septic tanks or cesspools in the State discharging roughly 78 million gallons per day of wastewater to the subsurface. In shallow water table areas, the effluent percolates rapidly to underlying aquifers. These systems can pollute ground water with the following contaminants:

- total dissolved solids (TDS);
- iron, manganese and sulfides (anoxic contamination);
- nitrate;
- potentially toxic organic chemicals; and
- bacteria, viruses and parasites (microbiological contamination).

TDS contamination occurs largely from 'mineral pickup,' the increase of minerals during domestic use.

Anoxic contamination is a chemical condition in which the water is deficient in oxygen. It can be caused by septic

Figure 14.

Point Sources of Ground Water Contamination in New Mexico.

1,235 Cases, Distributed County-by-County.

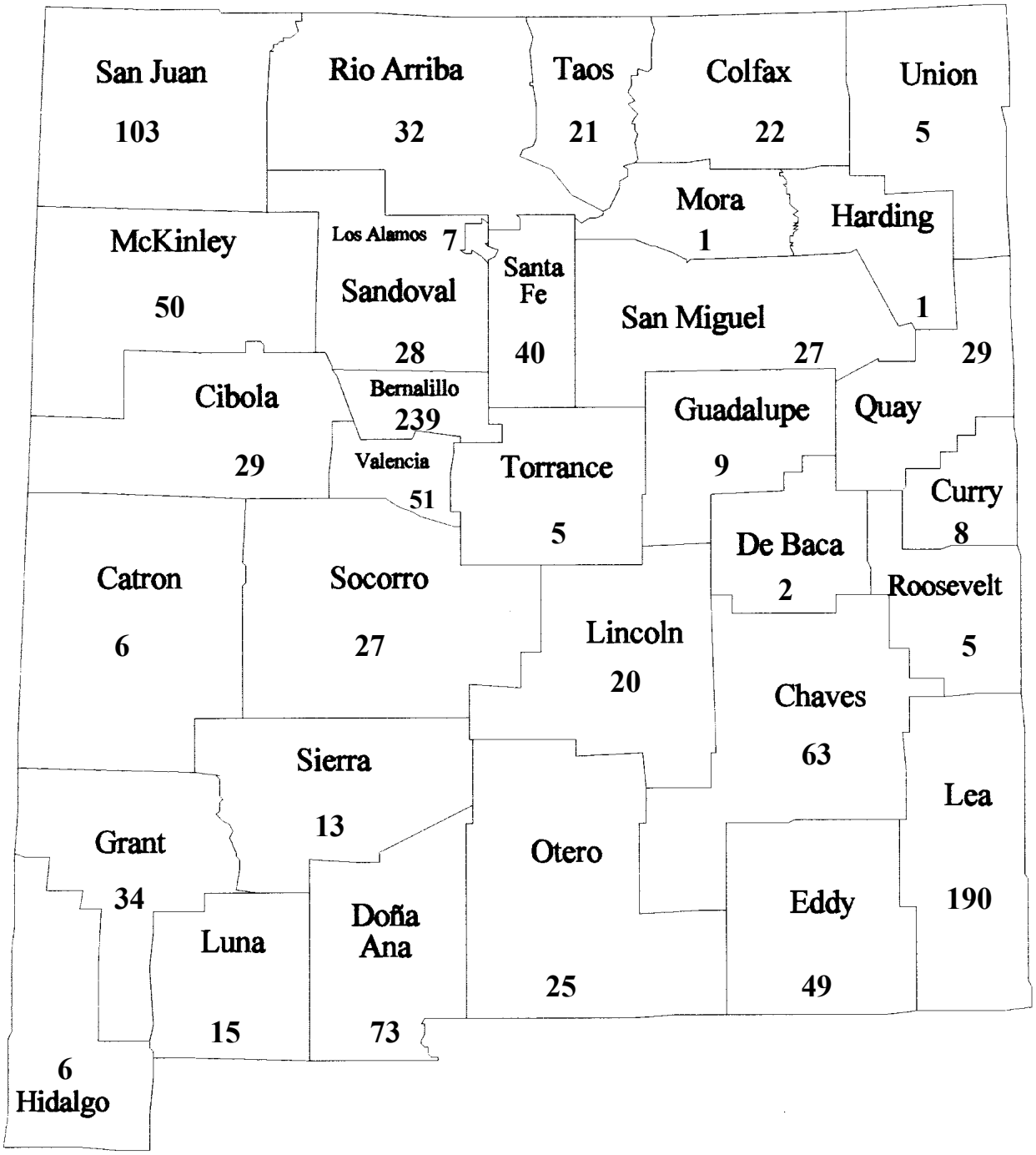


Figure 15.

Contaminated Water Supply Wells in New Mexico.

(Public and Private)

1,907 Sites, Distributed County-by-County.

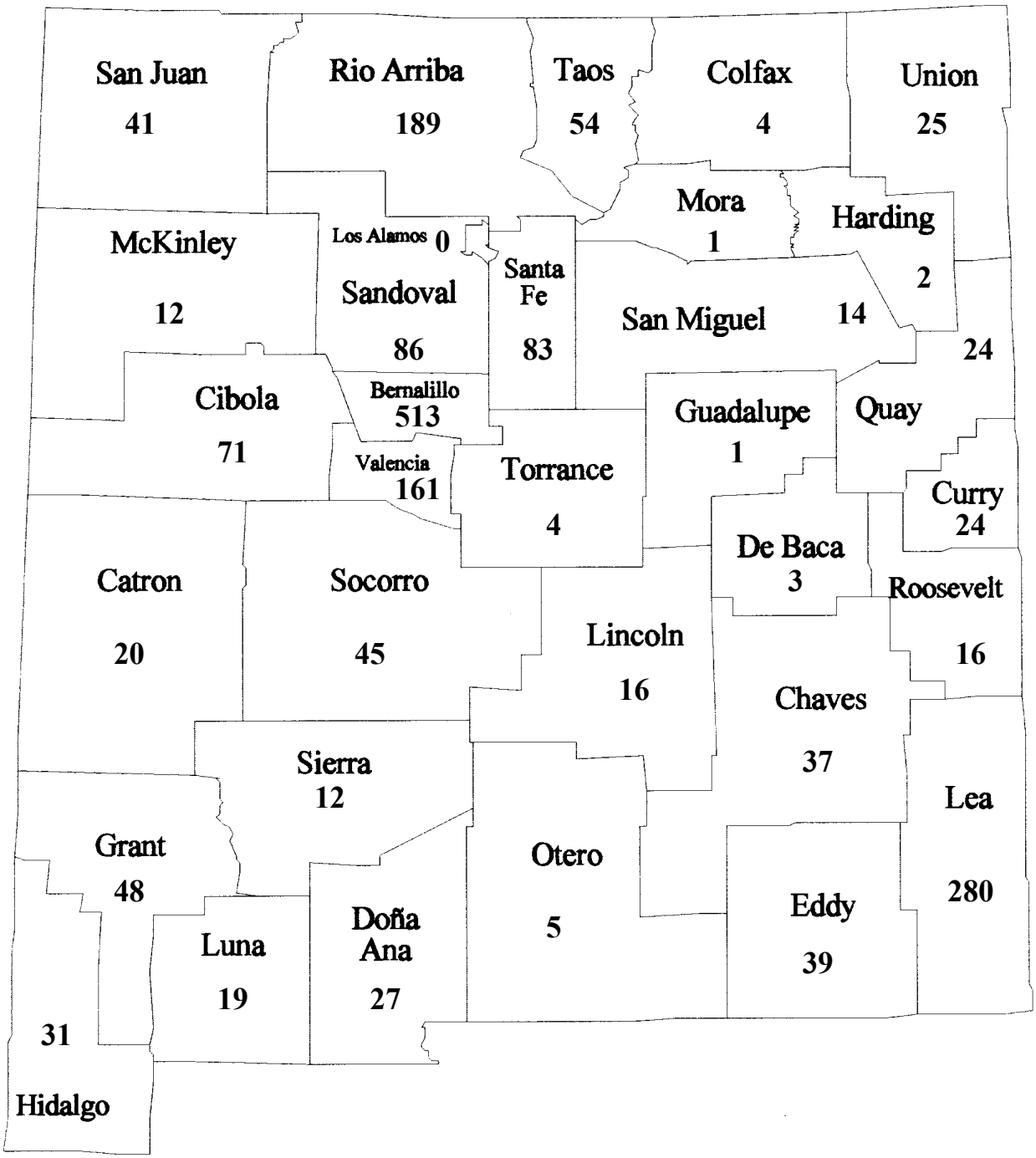
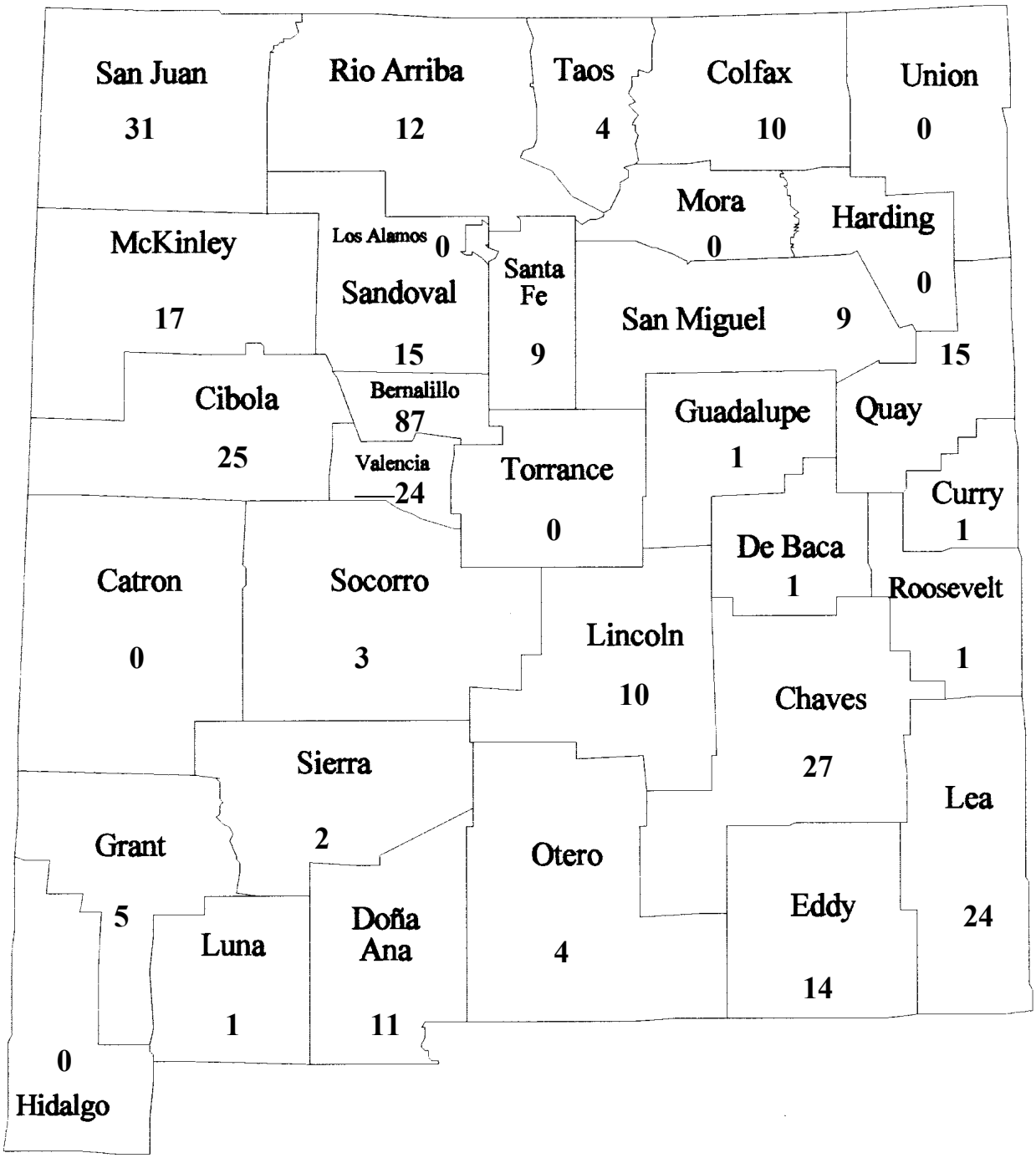


Figure 16.

Ground Water Cleanups in New Mexico.

363 Sites, Distributed County-by-County.



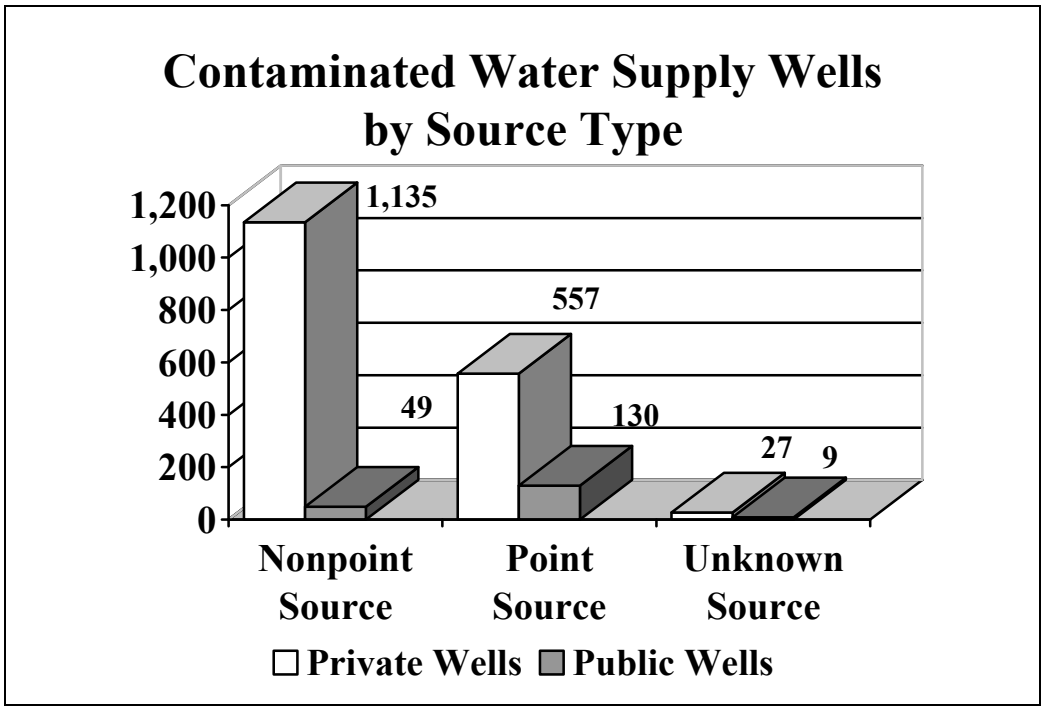


Figure 17. Contaminated Public and Private Water Supply Wells by Source Type in New Mexico.

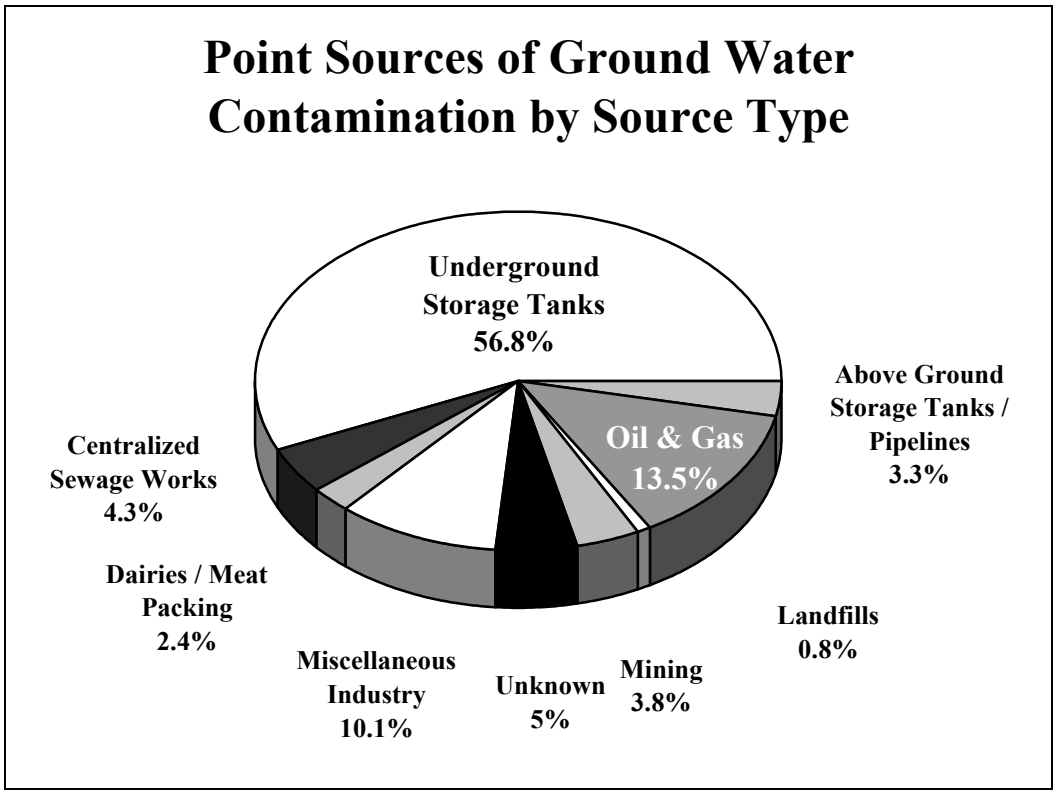


Figure 18. Point Sources of Ground Water Contamination in New Mexico by Source Type.

tank discharges or by naturally occurring geologic deposits such as humus and peat. Iron, manganese and hydrogen sulfide, typical anoxic contaminants, can cause severe taste and odor problems and can stain laundry and porcelain, but are not known to be hazardous to human health. Nitrate contamination, on the other hand, typically lacks such aesthetic problems, but can cause methemoglobinemia, a rare but potentially serious and sometimes fatal disease affecting infants. Questions have also been raised as to whether nitrates can cause cancer in healthy adults. Ground water nitrate levels resulting from household septic tank contamination have been monitored at concentrations as high as thirty milligrams per liter as nitrogen (thirty mg/L as N), three times the health standard.

Conditions of severe anoxic and nitrate contamination are mutually exclusive due to differences in the oxidation-reduction potentials of the ground water involved. Organic chemicals and disease-causing microbes, however, can occur in conditions of both anoxic and nitrate contamination. Many household products, especially cleaners, contain organic chemicals. Trichloroethylene, in particular, is a well-known ground water contaminant released by septic tank discharges.

Household septic tanks and cesspools constitute the single largest known source of ground water contamination in the State. Widespread nitrate contamination and/or anoxic conditions have been documented in Chamita, Española, Pojoaque, Tesuque, Santa Fe, Bernalillo, Corrales, Albuquerque and its South Valley, Carnuel, Bosque Farms, Los Lunas, Belen, Carlsbad, Nara Visa, Lovington and Hobbs.

Agriculture

Evapotranspiration (ET) is a process in which water enters the atmosphere either by direct evaporation or by transpiration from living plants. Minerals left behind in the soil following ET water losses can increase the TDS of shallow ground water and form alkali deposits. In the Rio Grande Valley, for example, irrigation canals have diverted river water for hundreds of years. Percolating irrigation water has caused the shallow water table in many valley areas to rise and be more vulnerable to ET. This problem can be remedied by the construction of drains to lower the water table, as was done in Albuquerque in the 1930s.

Another concern with agriculture is the application of agricultural chemicals. NMED, and the U.S. Geological Survey have conducted various sampling projects for pesticides in ground water. Trace concentrations (low ug/l or less) of arsenal, atrazine, bromacil, carbaryl, carbofuran, dacthal, disulfoton, DDE, DDT, heptachlor, lindane, metolachlor, napropamide, prometon, and propazine have been detected in ground water at various locations in the state. Carbon tetrachloride, a former grain fumigant, has been detected at levels up to 500 ug/l. Additionally, agricultural fertilizers have contaminated ground water with nitrate at several locations.

Point Sources of Contamination: Oil Field Sources

The most common cause of oil field contamination is the past practice of disposal of produced water to unlined pits. Other causes include leaks of crude petroleum and/or produced water from pipelines and well casings.

Produced waters, often brines, tend to gravitate to the lowest part of a freshwater aquifer and migrate along a hydraulic gradient different from that of the water. In addition to inorganic contaminants, such as chloride, most produced waters contain aromatic hydrocarbons that also can contaminate ground water. At the present time, ninety percent of the approximately 454 million barrels of water produced annually in the State is injected into deep wells for the purposes of secondary recovery, pressure maintenance or disposal.

Crude oil and natural gas condensate, if discharged in the liquid phase by upsets or spills, will float atop the water table and their water soluble constituents will dissolve into the ground water.

An August 1989 OCD survey of reported spills found that nearly half were due to corrosion of tanks, valves or pipelines.

Oil field contamination of ground waters has been a more serious problem in southeastern production areas of the State than in those in the northwest part of New Mexico. This is due to the larger quantity and generally poorer quality of water produced in the southeast, as well as the relative vulnerability of southeastern sole-source aquifers (e.g. the Ogallala). Cases of documented ground water contamination as a result of oil and gas exploration and production, however, are increasing in northwestern New Mexico. A priority OCD study of unlined pits in northwestern New Mexico funded by U.S. Environmental Protection Agency (EPA) under a Clean Water Act (CWA) grant documented ground water contamination resulting from produced water disposal to unlined pits (**2**).

Oil Conservation Division Ground Water Quality Studies

The Cedar Hill/Animas Valley Gas Study is attempting to determine the source of natural gas in ground water and domestic water wells in the area along the Animas River north of Aztec in San Juan County, and extending to Bondad, Colorado. The study is continuing and has identified some oil and gas production wells as conduits for migration of natural gas. Wells found to be acting as conduits are required to have remedial cementing or to be plugged. In addition, OCD has instituted new cementing requirements for oil and gas wells in the San Juan Basin.

Refined Petroleum Product Sources

The most common cause of petroleum product contamination in the State is leaking underground storage tanks (LUSTs). It is estimated that less than 5% of the approximately 4,051 underground storage tanks in the State are leaking. Causes of leaks include overfill, and faulty installation, as well as tank and line corrosion. All tanks systems had to comply with strict new performance standards by December 22, 1998. In addition to ground water contamination, LUSTs can cause explosive hazards when product vapors migrate to basements and utility corridors.

Other sources of refined petroleum product contamination include leaks and

tank-bottom water discharges from above-ground storage tanks, leaks and hydrostatic test water discharges from pipelines, transportation accidents and waste oil disposal.

Nitrate Sources

Point sources of nitrate contamination include sewage treatment plants, residential and commercial septic tank leachfields, food processing facilities, dairies, slaughterhouses, fertilizers, mining facilities, explosives disposal sites, and other industrial facilities. Nitrate contamination, such as from mining, can result in considerably higher concentrations (e.g. 500 mg/L as N) than those resulting domestic wastewater, which seldom exceed 30 mg/L as N (the health standard is 10 mg/L). Dairies, which are common in New Mexico, can cause nitrate contamination up to 280 mg/L as N.

Many discharge plans reviewed by NMED are for domestic wastewater disposal systems. Systems subject to discharge plan requirements include both private domestic wastewater systems discharging over 2,000 gallons a day, such as those serving trailer parks and resort developments, and public systems such as municipal sewage disposal systems which do not discharge to "waters of the United States" (40 CFR § 122.2).

The number of dairies in New Mexico has rapidly increased over the last decade. Currently there are 164 dairies in the state, and as of the end of 1998, there were approximately 155 dairies which discharge wastewater under ground water discharge permits. Ground water contamination identified at dairy operations is generally characterized as nitrate, chloride and\or TDS concentrations which exceed the WQCC ground water standards.

Solvents Sources

Halogenated or aromatic solvents are used by many different industries such as machine shops and electronics firms, and also occur in a variety of household products. The most common solvents being detected in the State's ground water are benzenes and chlorinated methanes, ethanes, ethylenes and propanes.

Metals/Minerals Sources

Extraction of a variety of minerals is an important activity in New Mexico, with copper, molybdenum and uranium receiving major permitting attention in past years. At present, all former uranium mills are closed or undergoing reclamation and remediation with the exception of Quivera Mining Company which is on standby for possible ore processing in the future. Copper and molybdenum mining operations continue to operate and expand operations in New Mexico. Mining ground water discharge permitting is expected to be a priority for the next few years and NMED is in the process of modifying all mining permits to incorporate comprehensive corrective action plans to address existing ground water contamination and closure plans which will protect ground water quality after mining operations cease.

Contamination by metals and/or minerals may be caused by mining and milling or other ore processing activity. Common contaminants include sulfate, pH, nitrate, total dissolved solids, heavy metals, radionuclides and other trace elements.

Ore refining mills produce large quantities of tailings, the raffinate of which typically contains elevated levels of metals/minerals. Due to engineering convenience and economic advantages, tailing impoundments have often been located in alluvial valleys close to the mill. This frequently causes ground water contamination, which persists long after removal or amelioration of the sources of contamination.

Public Landfills

Concern about the potential for landfills to contaminate ground water has grown in recent years. Very little is known about the composition of wastes buried in landfills in the State. Constituents known to occur in landfill leachate include chlorides, nitrogen species, solvents and a large number of other organic contaminants.

Household wastes alone contain a large number of leachable constituents. In Oklahoma, for example, more than forty organic compounds, including phthalates and alkybenzenes, were detected in ground water contaminated by a landfill that did not receive appreciable amounts of industrial wastes (**3**). In an Albuquerque survey of household hazardous waste, more than 50% of the wastes identified were disposed of in area landfills, including more than 53,000 gallons of used motor oil per year (**4**).

Large quantities of septage (solids and liquids pumped from septic tanks periodically) have in the past been discharged to unlined pits at several landfills in the State, a practice no longer allowed. The septage in several cases has been commingled with industrial wastes such as produced water, waste petroleum products and chlorinated solvents.

NMED has conducted a limited study of ground water quality impacts of landfills in the State. Ground water contamination has been documented at eight landfills (**5**, **6**). The United States Bureau of Land Management is conducting studies at several of its landfills, particularly in Doña Ana and San Juan Counties.

Septage Disposal

Vacuum truck operators provide a vital service to septic tank owners by periodically removing accumulated solids. In some areas of the State, however, operators do not dispose of septage using legally or environmentally sound mechanisms. Several septage disposal sites have been found to contain petroleum products, metals, minerals and solvents. To help correct the situation, NMED is in the process of developing septage tracking regulations and is working with local governments and private operators to permit environmentally sound and legal septage disposal facilities around the state.

PROGRAMS FOR GROUND WATER POLLUTION CONTROL

New Mexico relies on several programs to protect and maintain ground water quality. These include programs established under the New Mexico Water Quality Act (§ 74-6-1 et seq., NMSA 1978), the major statute dealing with water quality management at the State level, as well as other programs and actions taken under other State law and regulations which have components related to ground water pollution (see Appendix E). In addition, the State cooperates with the federal government on various ground water pollution control programs derived from federal mandates. Counties and municipalities also have broad authorities relevant to ground water pollution control. Important aspects of both State and federal programs and of local authorities are described below.

State Regulation of Ground Water Quality

New Mexico's ground water protection program was well-established before most federal legislation addressing ground water quality was adopted. In 1967, the State's first water quality protection law, the Water Quality Act, was adopted by the New Mexico legislature. This law was amended in 1973 to allow the State to adopt regulations requiring permits for water quality protection. By 1977 the State had adopted a comprehensive ground water quality program applicable to most types of discharges in the form of regulations promulgated by the New Mexico Water Quality Control Commission (WQCC). These regulations have been modified and updated over the years, but the framework for water quality protection in New Mexico has remained essentially the same since 1977. Key features of New Mexico's 1977 water quality protection rules include a requirement for dischargers to obtain a Ground Water Discharge Permit to prevent ground water contamination from discharges that have the potential to impact ground water quality, requirements for reporting and addressing spills and releases, and numerical standards for common ground water contaminants. The rules and standards protect all ground water in New Mexico that has a total dissolved solids concentration of 10,000 mg/l or less. These rules have been updated through the years to include additional ground water quality standards, ground water pollution assessment and abatement regulations, and underground injection control (UIC) requirements. Programs established under the New Mexico Oil and Gas Act, Hazardous Waste Act, Ground Water Protection Act, Solid Waste Act, Emergency Management Act, Voluntary Remediation Act and Environmental Improvement Act also contain provisions which are designed to protect ground water quality and which implement the WQCC ground water quality standards by reference.

NEW MEXICO WATER QUALITY ACT AND WATER QUALITY CONTROL COMMISSION REGULATIONS

Under the authority of the Water Quality Act, the New Mexico Water Quality Control Commission (WQCC) has promulgated regulations to protect the State's ground waters, including the broadly applicable ground water protection regulations of Subpart III, the more detailed additional requirements of Subpart V for underground injection control, and the spill response and abatement regulations found in Subparts I and IV. and the found in Subparts I and IV.These regulations are commonly referred to as the WQCC Regulations and are described in more detail below (**7**).

Subpart I - Notification of Discharge/Removal

Section 1203 of the WQCC regulations imposes notification and corrective action requirements on any unpermitted discharger of any water contaminant. The majority of discharges currently handled under this regulation are spills of petroleum products, sewage and industrial chemicals.

Relatively minor discharges handled under a WQCC § 1203 Corrective Action Report and are closed out in a short period of time, usually under 180 days. For cases that cannot be cleaned up to standards in 180 days, NMED and OCD may require the submission of an abatement plan pursuant to Subpart IV of the WQCC regulations. For more complicated cases, NMED uses the Toxic Sites Triage System, a multi-media risk-based numerical priority model to assign case priorities. Because of limitations of staff at both NMED and OCD, only the most serious problems are assigned active case status (Figure 19).

Subpart III - Permitting and Ground Water Standards

Subpart III of the Water Quality Control Commission Regulations includes the State's ground water quality standards and ground water discharge permit/pollution prevention requirements. These regulations are designed to protect all ground waters with total dissolved solids concentrations of 10,000 mg/L or less for present and potential future use as domestic and agricultural water supply, and to protect those segments of surface waters which are gaining because of ground water inflow for uses designated in the New Mexico Water Quality Standards for Interstate and Intrastate Streams (**7**). As of 1998, 47 numeric ground water quality standards had been adopted by the Water Quality Control Commission. Additionally, 87 organic compounds are listed as toxic pollutants which cannot exceed concentrations in ground water which create a lifetime risk of more than one cancer per 100,000 exposed persons.

The cornerstone of the State's pollution prevention efforts are the ground water

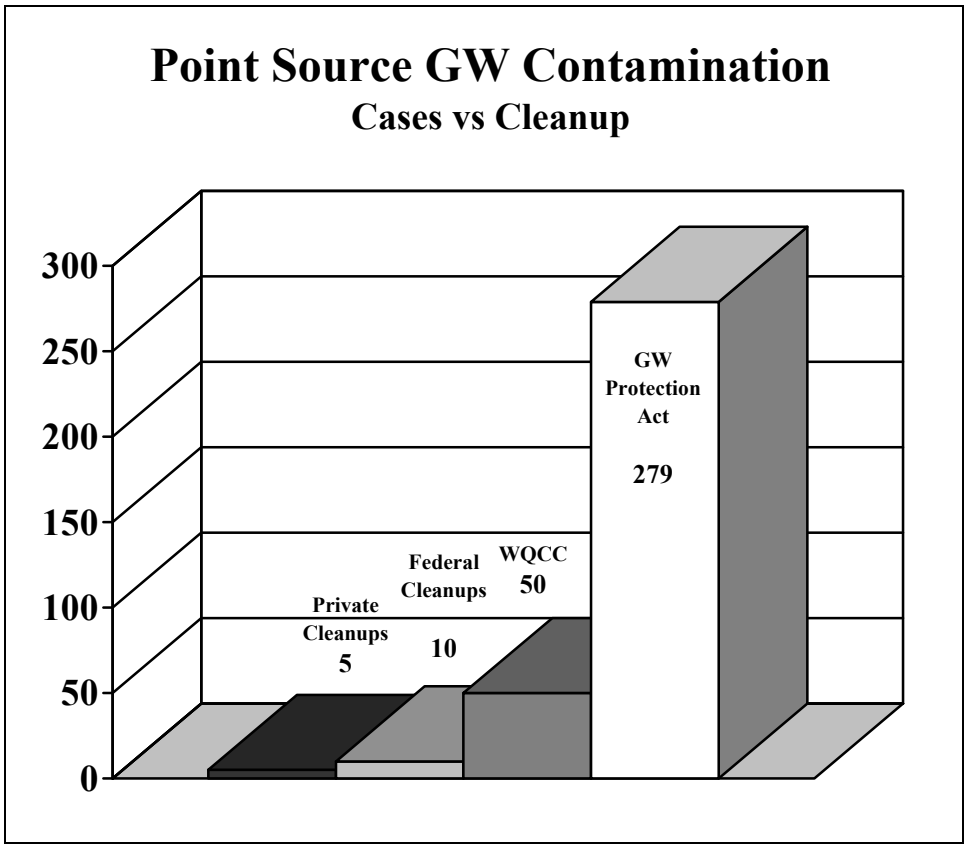


Figure 19. Point Source Ground Water Contamination Cases in Relation to Cleanup Efforts by Regulatory Authority.

discharge permit regulations. These regulations require that a person discharging onto or below the surface of the ground demonstrate he will not cause ground water standards to be exceeded in ground water at any place of withdrawal for present or foreseeable future use, and will not cause any stream standard to be violated. Ground water discharge permits include operational requirements for the facility, ground water and effluent monitoring programs, and contingency and closure plans. The regulations also provide authority to require financial assurance for proper closure of the facility. Since their adoption, these regulations have been a relatively effective tool in preventing ground water contamination.

NMED is delegated responsibility for enforcement of the State ground water protection regulations as they apply to industrial facilities (including mining), domestic waste treatment and disposal systems, municipal discharges, food processing facilities, and agricultural discharges. By the end of 1998, NMED had received and processed over 1,245 discharge plans.

OCD is delegated responsibility for enforcement of the State ground water protection regulations as they apply to oil refineries, natural gas processing plants and compressor stations, carbon dioxide facilities, geothermal installations, natural gas transmission lines, brine production wells and oil field service companies. Through December 1999, OCD was responsible for approximately 325 discharge permits. The discharge permit requirement can be described as a discharge plan prepared by the discharger which the New Mexico Environment Department (NMED) or the Energy, Minerals and Natural Resources Department's Oil Conservation Division (OCD) approves, approves with conditions or disapproves. Discharges that are covered by these regulations include discharges to surface impoundments and leach fields, application of wastes to land, and injection or infiltration of contaminants into the subsurface. Among discharges specifically exempted are those related to coal surface mining which are regulated under the New Mexico Coal Surface Mining Act (§§ 69-25A-1 et seq., NMSA 1978), discharges from oil and natural gas exploration and production activities which are regulated under the New Mexico Oil and Gas Act (§§ 70-2-1 et seq., NMSA 1978) and individual domestic septic tank discharges of less than 2,000 gallons a day, which are regulated under the State's liquid waste disposal regulations. Water used in irrigated agriculture is also exempted unless the irrigation water is effluent from a system for treating or disposing of sewage, industrial wastes, or other wastes that will pollute any waters of the state.

Discharge permits usually are approved for a period of five years. Because the regulations became effective in 1977, many discharge plans have been in effect for five years or more. As a result, an increasing portion of the discharge permit review process is for renewal or modification of existing discharge plans. The number of new

requests for discharge permits also continues to increase. New permit requests include domestic wastewater treatment and disposal facilities, dairies, and new industrial dischargers.

Fees collected from facilities seeking a ground water discharge permit help fund NMED and OCD discharge permit programs. Fees pay for approximately 10% of the cost of issuing, modifying and renewing permits, and periodic monitoring of permitted facilities.

Implementation of the ground water discharge permit program also involves the compliance inspection of permitted facilities, as well as the review and evaluation of self-monitoring reports and enforcement. Compliance inspections generally are scheduled annually, and include split-sampling of monitor wells with the permittee. Most facilities are required to sample monitor wells on a quarterly basis, and the once a year split-sample is considered adequate to assure the accuracy of the self-monitoring data. For NMED's regulated facilities, basic information including date of receipt, whether the data was complete and whether there was an exceedance of the ground water standards, is entered into a computerized database. All NMED programs have direct access to this database.

Subpart V - Underground Injection Control

The State of New Mexico has primary enforcement authority for the underground injection control program established by the federal Safe Drinking Water Act (SDWA). Primacy was obtained in 1982 for injection wells used in drilling for and production of oil and natural gas, known as Class II wells in the EPA's classification system, and for all other classes of wells in 1983. Primacy makes a state eligible for an annual federal grant under the SDWA. In New Mexico, primacy also avoids the necessity of having EPA run a federal underground injection control program in the State in duplication of the long-established State ground water discharge permit program.

New Mexico's underground injection control program is carried out partly under the authority of the New Mexico Oil and Gas Act and partly under the authority of WQCC regulations promulgated pursuant to the New Mexico Water Quality Act. OCD is the lead State agency for the under ground injection control program because the majority of injection wells in the State are associated with oil and natural gas production. Regulation of these wells is described below under Oil and Gas Act.

The WQCC regulations apply to underground injection wells other than those associated with oil and natural gas production. NMED administers this program except for OCD-administered brine production wells and those wells disposing of effluent from refineries, geothermal operations and the oil field service industry. All types of injection wells subject to WQCC regulations must comply with general ground water protection provisions of Subpart III. Injection wells used for effluent disposal and *in situ* mineral extraction must also meet the technical requirements imposed by Subpart V of the WQCC regulations, which were adopted in 1982.

In 1998 NMED issued a UIC permit for the injection of 648,000 gallons per day of saline water from the Lake Meredith Salinity Control Project into a class V disposal well. Lake Meredith is the drinking water source for 500,000 residents of 11 Texas cities. Since its construction, lake Meredith has experienced a gradual decline in water quality due to increasingly high salt concentrations due to a leaking brine aquifer. The salinity control project is designed to decrease the input of saline water to the lake by pumping from the shallow brine aquifer and reinjecting the brine into a deeper formation approximately 4,000 feet below the ground surface.In 1998 NMED issued a renewed/modified ground water discharge permit for DLD Resources to discharge a maximum of 200 gpm of neutralized hydrochloric and sulfuric acid wastewater to the subsurface using a Class 1 Non-Hazardous Injection well. The injectate is neutralized and injected approximately 4,350-5000 feet below ground surface. Although the permit has been issued, this facility is currently not operating. The ground water discharge permit requires financial assurance to be in place prior to discharging.

An inventory of operating underground injection wells in New Mexico as of the end of 1998 shows the following:

Class I (industrial effluent disposal)	5
Class II (oil and gas activity)	5500
Class III (mineral extraction)	29
Class IV (unpermittable injections)	0
Class V (miscellaneous)	369

Enforcement of Water Quality Control Commission Regulations

Enforcement of WQCC regulations for ground water pollution control are pursued as resources allow. Major enforcement efforts are aimed at assuring that intentional discharges of sewage, industrial and mining effluents–dairy wastewater, and other effluents are in conformance with discharge permit requirements, which in turn should assure that ground water will not be degraded beyond standards. Other major enforcement efforts are aimed at requiring responsible parties to address pollution caused by leaks, spills, or other discharges not made in conformance with regulations.

In general, three methods for achieving compliance with regulations are used by the State. These include attempts to obtain voluntary compliance, including notices of noncompliance and settlement

agreements; issuance of Notices of Violation and compliance orders; and civil law suits filed in State district court under the Water Quality Act or applicable portions of the Public Nuisance Statute (c.f., §§ 30-8-3, 30-8-12, NMSA 1978) or both (including negotiated settlement agreements filed with the court pursuant to those suits).

The Water Quality Act was amended in 1993 to provide constituent agencies of the WQCC with the authority to issue compliance orders which can include administrative penalties (§ 74-6-10. A. and C. NMSA 1978). Compliance Order authority provides both a deterrent to future illegal activities as well as providing a more rapid enforcement capability when voluntary compliance cannot be achieved.

Effectiveness

NMED has been working to improve the effectiveness of the ground water discharge permit program. For example: written policies and guidelines have improved consistency in the requirements imposed on different facilities and in communicating to the regulated community minimum standards for permit approval and the State's ground water pollution prevention program has adopted a team approach to issuing permits which should streamline the process and provide consistency. Requiring permits for facilities that were in operation at the time the program started in 1977 (pre-1977 facilities) has been an increasing priority for the ground water discharge program. Additionally, the program has been collecting industry-specific information on unpermitted facilities in order to systematically require these facilities to obtain permits.

The program has also been working with older permitted facilities to bring them into compliance with current standards, policies and guidelines. Contingency plans which delineate corrective actions for operational failures or violations of ground water standards are required for all new permits and at renewal for existing permits plans. Corrective action may include source control measures or ground water remediation. Closure plans are also being required for new permits and for modifications and renewals of older permits. Financial assurance for closure and contingency plans has also been required for some facilities.

Historically, facilities often made great efforts to avoid the permitting process. During the past several years, however, the State has established a proactive and cooperative working relationship with industry groups, and many facilities now view the permitting process as a routine part of their business startup and day-to-day operations. Furthermore, many lending institutions are working closely with the State to ensure that the facilities have obtained necessary permits before business loans are approved or renewed. There are many positive indications that the program is effective at protecting New Mexico's ground water resources.

NEW MEXICO OIL AND GAS ACT

In addition to the WQCC regulations, OCD administers several water protection programs under the Oil and Gas Act. The Act authorizes OCD to "regulate the disposition of water produced or used in connection with the drilling for or producing of oil and gas, or both, and to direct surface or subsurface disposal of such water in a manner that will afford reasonable protection against contamination of fresh water supplies designated by the State Engineer" (§ 70-2-12.B (15) NMSA 1978). The designation by the State Engineer generally protects all streams and surface waters and all ground water having 10,000 mg/L or less total dissolved solids, except for those ground waters having no present or reasonably foreseeable beneficial use.

The OCD requires that permits be obtained statewide for drilling, for waste oil treatment plants and for commercial and centralized surface waste disposal. Most regulated activities allow for a public hearing to be requested before permit issuance.

Statewide rules require surface disposal of oil and gas related waste (including produced water, sediment oil, and drilling fluids) to be performed in a manner which prevents contamination of fresh water. For certain geographic areas of the State, specific rules have been adopted that prohibit or limit certain disposal practices. Examples include limitations on disposal of produced water into unlined pits in southeastern New Mexico beginning in 1969, and in northwestern New Mexico beginning in 1985. In 1986, rules were adopted to require permits for commercial and centralized produced water disposal facilities in the San Juan Basin of northwestern New Mexico. In 1988, extensive statewide rules for licensing of commercial surface waste disposal facilities were adopted.

The Oil Conservation Commission in January 1993 adopted Order R-7940C, a set of stringent rules governing the disposal of produced water from oil and gas wells. These rules expand previously defined vulnerable ground water areas, create wellhead protection areas and prohibits the disposal of oil and gas wastes and water into unlined pits in vulnerable ground water areas in northwestern New Mexico. Order R-7940C prohibits disposal of all oil and gas wastes into unlined pits in these areas and requires existing pits to be closed in accordance with OCD regulations and guidelines. In 1993 the OCD issued Surface Impoundment Closure Guidelines which provide recommended risk-based cleanup levels and closure procedures to be used in the closing of surface impoundments and for remediation of leaks, spills and releases. An additional fresh water related problem currently receiving attention is the large

number of production wells that have been shut in or temporarily abandoned. The reason for this increase is that the lower price of oil and natural gas since 1985 has led to the shutdown of marginal producing wells. However, these wells cannot be left indefinitely in this condition because natural processes cause casing deterioration that can lead to interstrata communication and possible fresh water contamination. As of the end of 1996, there were 48,022 producing oil and gas wells and 7,420 wells which were shut in. OCD has instituted rule changes to require proper temporary plugging for wells shut in for over six months. Such plugging would be allowed for a maximum of five years without reapproval.

In 1989 amendments to the Oil and Gas Act and to the Environmental Improvement Act (§§ 74-1-1 et seq., NMSA 1978) transferred responsibility for regulating some nonhazardous wastes away from NMED (under authority of the Environmental Improvement Act) to OCD (under authority of the Oil and Gas Act). The wastes now regulated under the jurisdiction of OCD are non-domestic solid wastes resulting from the exploration, development, production, transportation, storage, treatment or refinement of crude oil, natural gas or geothermal energy. These wastes may be generated at production sites, gas plants, refineries and oil field service companies. OCD is required to regulate disposal to protect public health and the environment, and is incorporating review of solid waste practices in discharge plan review and in review of surface disposal applications.

OCD performs ground water monitoring both to carry out responsibilities delegated to it by the Water Quality Control Commission and to ensure reasonable protection of fresh water as required by the Oil and Gas Act. OCD performs necessary monitoring as part of discharge plan review and at approved discharge plan sites. These discharge plans include the regulation of natural gas plants, natural gas compression facilities, oil refineries, geothermal installations, brine production wells and oil field service companies. At a minimum, inspections and sampling of effluents and ground water are conducted before plan approval and again prior to plan renewal In addition to monitoring carried out by OCD personnel, self-monitoring is also required of dischargers under conditions specified in individual discharge plans. Finally, monitoring at selected locations is conducted in response to citizen complaints in areas of oil and gas production activity. OCD is currently developing a computerized database management system for discharge plan and water quality monitoring.

As with the discharge permit process under the Water Quality Act, the permitting process under the Oil and Gas Act is much more effective at preventing new pollution from current activities than it is at coping with historical pollution problems. The most common cause of oil field contamination is the past practice of produced water disposal in unlined pits. This has been regulated in the southeastern part of the State since 1969 and in the northwestern part since 1985, but effects of past practices still persist. Although generally effective in controlling the effects of present discharges, the effectiveness of the regulatory program under the Oil and Gas Act could be improved in two areas: (1) upgrade temporary abandonment procedures to guard against interstrata communication at wells that are temporarily out of production; and (2) additional integrity testing and berming requirements to provide better environmental protection from leaks and spills at aging pipelines, tanks and other equipment.

NEW MEXICO HAZARDOUS WASTE ACT

The New Mexico Hazardous Waste Act (§§ 74-4-1 et seq., NMSA 1978) authorizes the Environmental Improvement Board (Board) to adopt regulations for the management of hazardous waste and underground storage tanks (USTs). These regulations are to be equivalent to, and under certain circumstances may be more stringent than, federal regulations adopted by the EPA pursuant to the federal Resource Conservation and Recovery Act (RCRA). However, the Board may adopt regulations for the management of hazardous waste that are more stringent than federal regulations adopted by the EPA pursuant to RCRA, after notice and public hearing, if the Board determines that such federal regulations are not sufficient to protect public health and the environment. Under this authorization, hazardous waste management regulations (which currently incorporate the federal regulations by reference) and underground storage tank regulations have been adopted. These two regulatory programs are described below. This Act also authorizes NMED to take action to protect persons from harm arising from hazardous substance emergency incidents and establishes an emergency fund to be used for cleanup of such incidents. The genesis and makeup of the Board are described in the section on the Environmental Improvement Act later in this chapter.

Hazardous Waste Management Regulations

Under the New Mexico Hazardous Waste Act, the Board adopted the hazardous waste management regulations in 1983, and most recently amended them in 1995. Since these regulations, with their subsequent amendments, are equivalent to EPA's regulations promulgated under RCRA, New Mexico retains authorization to administer most of the federal hazardous waste management program. This program applies to those wastes meeting the specific criteria to be considered 'hazardous wastes' subject to the regulations. Many substances otherwise considered "hazardous" do not meet these criteria.

The federal Hazardous and Solid Waste Amendments of 1984 (HSWA), which amended RCRA, required significant changes to be made to the New Mexico program if authorization was to be retained. New Mexico legislation enacted in 1987 and 1989 provided the legislative authority to adopt most of the HSWA requirements. Although the State does not have complete primacy to administer HSWA, the State can and does use its authority to enforce State regulations (which mirror federal HSWA-derived regulations) at RCRA facilities. On January 2, 1996, New Mexico received Corrective Action Authorization from EPA in the Federal Register at FR 2450 (1/26/96). EPA provides oversight of these actions.

Administration of the State hazardous waste management regulations is carried out by NMED for all types of facilities, including oil refinement facilities. The regulations provide for 'cradle to grave' tracking and management of materials meeting the definition of 'hazardous waste'. Generators of hazardous waste must have EPA identification numbers, and can dispose of their waste only at an authorized facility.

TSD Facilities

Hazardous waste treatment, storage or disposal facilities (TSDFs) are required to obtain operating permits. Because site-specific detailed permits could not be issued immediately for every TSDF already in operation, EPA created a two-part permit system. Facilities that properly notified and submitted a short form (Part A) permit application were granted 'interim status'; in effect, a temporary operating permit until a site-specific operating permit could be issued. Interim status facilities are subject to a set of category-specific regulations. An interim status facility must either close under an approved closure plan or apply for an operating permit by submission of a 'Part B' application. All TSDFs in New Mexico have either applied for an operating permit or submitted closure plans for their hazardous waste units. In New Mexico, there are thirteen permitted TSDFs, six of which are open burn open detonation operations and three of which are mixed waste permit operations. Eight facilities have submitted applications for post closure care.

A primary intent of the hazardous waste management program is to prevent contamination of water resources by hazardous waste units. Any facility which has a landfill, surface impoundment, waste pile, or land treatment unit which is used to treat, store, or dispose of hazardous waste is subject to ground water monitoring requirements. If ground water contamination does exist, then the permit will specify a corrective action program to halt the escape of hazardous wastes and to restore the ground water, both on-site and off-site.

In New Mexico, the owners and operators of facilities that treat, store, or dispose of hazardous waste are subject to the ground water monitoring requirements.

Small Quantity Generators

An exemption from most of the hazardous waste management regulations is granted to 'conditionally exempt small-quantity generators,' facilities which generate less than 100 kilograms (kg) of hazardous wastes a month. There is also a category of small quantity generator for the generation of between a 100 kg and a 1,000 kg a month. This category must follow more of the regulations than the generator of less than a 100 kg a month but not as many as the generator of more than a 1,000 kg a month. In any case, no facility is allowed to dispose of hazardous wastes on its own property unless it is permitted as a disposal facility. There is currently no authorized disposal facility in New Mexico for off-site hazardous wastes. However, there are two storage transfer facilities within the State to serve as an accumulation point to which the generators can consign their wastes. The storage facility operator finds an appropriate disposal facility and the generator does not have to deal with the disposal facility.

Household Wastes

Household wastes are currently exempt from the hazardous waste regulations, but the disposal of items such as cleaners, thinners, solvents, pesticides poses a threat to the ground water beneath local landfills and surface waters down gradient from such landfills. The City of Albuquerque periodically sponsors household hazardous waste collection events. During these events, household wastes are accepted by a City contractor, packaged and shipped to an approved disposal facility. Such projects should become more common as other municipalities become aware of the hazards to ground water posed by even relatively small quantities of domestic waste items.

Under the State's Hazardous Waste Program, ground water data is being collected at fourteen individual sites as follows: two United States Department of Energy sites, six United States Department of Defense sites, one United States National Aeronautics and Space Administration site, and seven sites at private facilities. Monitoring parameters at all sites are hazardous constituents regulated under the federal Resource Conservation and Recovery Act.

These State regulations are patterned after the requirements of the federal Resource Conservation and Recovery Act. Although they are stringent, they are extremely cumbersome and lengthy.

NMED's Hazardous and Radioactive Materials Bureau (HRMB) is developing measures of effectiveness. They have found the "population at risk" index recommended in EPA guidance to be inadequate. A measurement index should enable comparisons of ground water contamination over time based on the volume of contaminated water at each site. HRMB proposes that the index include three components: (1) the population living within a fixed distance from each site; (2) a current estimate of the volume of contaminated aquifer associated with each site; and, (3) "*aquifer at risk*" from site contamination should be factored into the risk estimate. Also needed is a measure to list sites with a potential for release of contaminants to aquifers.

Data are not currently available to support this proposed measure for the six sites with contamination that has migrated off-site.

Underground Storage Tank Program

In New Mexico, there are an estimated 4,252 underground storage tanks (USTs). NMED is currently aware of 2,216 past and current cases of soil contamination including 639 documented cases of ground water contamination resulting from leaking USTs (LUSTs) through reports from NMED inspectors, voluntary reporting and complaint investigations. Approximately 39 public wells, 47 private and 150 water supply wells have been contaminated or threatened by LUSTs. For ten years the department aggressively promoted and enforced implementation of leak detection and upgrading of UST systems to more stringent construction and design standards. Approximately 98% of active tanks now meet the December 22, 1998 standards for construction, operation and leak detection.

Although USTs are located throughout the State, they are predominantly associated with service stations, petroleum suppliers, and government facilities, all of which tend to be located in population centers. These population centers in turn are concentrated near surface water and vulnerable aquifers in river valleys characterized by permeable, unconsolidated sediments and shallow water tables. Without monitoring, a leak can go undetected for years, thus creating severe environmental and health problems that might easily have been remedied initially. Widespread compliance with the 1998 pollution prevention requirements is interpreted to result in a much lower percentage of leaks from the UST population in New Mexico.

Requirements to report and cleanup leaks and spills from LUSTs and other sources that might impact water quality have been part of the WQCC regulations for many years. In 1987, the New Mexico Hazardous Waste Act was amended to give NMED specific authority to control many more aspects of USTs. This program applies to any owner or operator of an UST system which contains a regulated substance, including petroleum products and hazardous substances, with very few exceptions.

NMED is responsible for ensuring that the environment and public health are not threatened by operation of underground storage tanks. This is accomplished by both prevention and corrective action activities including:

. inspecting the installation, operation and removal of USTs in the State;
. requiring upgrade of all USTs by December 22, 1998;
. investigating suspected and confirmed releases from USTs, and overseeing the cleanup of resulting contamination;
. implementing a public education program, which includes an annual conference and trade show, and extensive use of the Internet;
. administering a Corrective Action Fund which is used to remediate contamination caused by leaking underground storage tanks, and which significantly relieves tank owners and operators of the financial burden of taking corrective actions;
. rigorously enforcing regulations requiring presence and operation of leak detection mechanisms;
. development and use of innovative remediation technologies that ensure technically adequate and cost-efficient cleanups; and
. certifying both tank installers and scientists performing corrective action on behalf of tank owners and operators.

New Mexico UST Regulations

The New Mexico Underground Storage Tank Regulations were adopted by the Environmental Improvement Board in phases starting in 1989. By 1991, the State had in effect regulations covering the following areas: registration of tanks, assessment of fees, new and upgraded UST systems, general operating requirements for UST systems, release detection, reporting and corrective action; closure of USTs, financial responsibility for tank owners, and certification of tank installers. In 1990 certain provisions of the regulations were found to be more stringent than the federal requirements which is a violation of the Hazardous Waste Act. To remedy the situation, the Board adopted those federal requirements by reference. At the present time the UST Regulations are being revised to better clarify the existing regulations, adopt new revisions including the implementation of risk-based decision making which enable the UST Bureau to better focus its resources on sites where the risk to public health and the environment are greatest, and the addition of new options that local governments can use to meet their financial responsibility requirements.

In June 1991 the Environmental Improvement Board (Board) passed Part XV of the Ground Water Protection Act (GWPA) Regulations. This established department priorities for corrective action at sites contaminated by releases of regulated substances from Underground Storage Tanks, defined the minimum site assessment for which an owner or operator is responsible, and set out procedures for administering the Corrective Action Fund. This fund is used for State-sponsored activities such as investigations, mitigation, containment, and remediation of contamination resulting from releases of regulated substances.

On September 22, 1992 NMED adopted the corrected the Corrective Action Fund Payment and Reimbursement Regulations as directed by the 1992 amendments to the GWPA. NMED developed proposed revisions to them in December 1993 and they were adopted on March 4, 1994. Further revisions were adopted in December 1994, April 1997 and October 1999. These regulations establish a program and procedures to reimburse the owners, operators, or their agents for their costs for corrective action

As of October 1999 USTB of NMED was overseeing corrective action at 1,100 leaking underground storage tank (LUST) sites. Since the program began, 1,106 LUST sites have been granted "No Further Action" status, including 76 sites that had ground water contamination. Federal LUST trust funds are used to oversee corrective action at sites. Most tank owners and operators take the required corrective action; but where tank owners are unknown, unwilling, or unable to take corrective action, the state Corrective Fund has been used by USTB to take the necessary corrective action. USTB has addressed 97 sites in this

manner at a cost of $28.6 million. A total of $77.9 million in state funds has been spent on corrective action at LUST sites to date. From the inception of the program to October 1999, USTB has made over 5, 482 payments totalling $49.3 million. NMED currently processes from 55 to 60 payments a month.

The prevention area of the program (from October 1, 1995 through November 8, 1999) completed 4,078 compliance inspections and issued 466 notices of violation. Most facilities, either have corrected their violations or closed, and 98% of all active facilities are in compliance with the regulations for system installation and operation.

GROUND WATER PROTECTION ACT

The Petroleum Storage Cleanup Act, enacted by the New Mexico Legislature in 1988, was repealed in 1990 and replaced with the Ground Water Protection Act (§§ 74-6B-1 et seq., NMSA 1978). The new act provides a State Corrective Action Fund for corrective action at sites contaminated by the contents of leaking underground storage tanks. It also recognizes that the owners and operators of facilities containing underground storage tanks must, under federal law, provide financial assurance and allows the "Corrective Action Fund" to serve that purpose as well. In 1991, the Ground Water Protection Act was amended to define "owner" as owner of an underground storage tank rather than owner of a site containing an underground storage tank, and allow for reimbursement of tank owners and operators for costs of corrective action.

EMERGENCY MANAGEMENT ACT

The Emergency Management Act, (§§ 74-4B-1 et seq., NMSA 1978) as amended in 1986 and again in 1989, is the statutory authority for New Mexico's hazardous materials emergency response program. Under the Act, the State government has the primary responsibility for management of hazardous materials incidents, including incidents contaminating surface or ground waters. Local governments assist the State in performing emergency response functions in their respective jurisdictions. The 1989 amendments provided that the Secretary of the New Mexico Department of Public Safety shall have the final authority to administer the provisions of the Act, and shall serve as the central coordinator to direct the response function of the State agencies which may be involved in a hazardous materials or radiological incident.

Under the authority of the Act, New Mexico developed a Hazardous Materials Emergency Response Plan (**8**) which defines procedures and response functions of various State agencies. NMED is one of the agencies with responsibility for providing information necessary to control and mitigate hazardous materials and radiological discharge incidents.

NMED attempts to provide such information to those on-site entities at any incident which threatens the quality of the environment, or poses a threat to public health or safety. NMED contracts with the New Mexico Health Department's Epidemiology unit to receive and properly refer emergency incident reports. During a hazardous materials or radiological incident, NMED may provide technical assistance and advice, provide for environmental monitoring and sampling when necessary, ensure that adequate cleanup is performed, and take appropriate enforcement action. NMED staff, however, do not enter the exclusion zone during a hazardous materials or radiological incident. A contract is maintained with one or more firms with emergency response capability to furnish immediate response to emergency incidents. Work under contract is funded through the Hazardous Waste Emergency Fund established by § 74-4-8 of the New Mexico Hazardous Waste Act.

NEW MEXICO ENVIRONMENTAL IMPROVEMENT ACT

The New Mexico Environmental Improvement Act (§§ 74-1-1 et seq., NMSA 1978) was enacted in 1971. It established the Environmental Improvement Division (EID) of the Health and Environment Department. In 1991 EID was elevated to Executive Office Cabinet-level status and redesignated the New Mexico Environment Department by the first session of the 40th Legislature. The Environmental Improvement Act also established the Environmental Improvement Board, consisting of five members appointed by the Governor for terms not to exceed five years, and gave the Board authority to promulgate regulations in numerous areas relevant to environmental management and consumer protection. Among regulations adopted by the Board are several affecting ground water quality, including those described above in the section on the Hazardous Waste Act, as well as Liquid Waste Disposal Regulations, Solid Waste Management Regulations, and Regulations Governing Water Supplies.

Liquid Waste Program Regulations

Liquid waste is the wastewater discharged from homes and other establishments and normally includes wastes from toilets, baths, dishwashers, clothes washers, sinks and garbage disposals. In situations where such wastes cannot be disposed of through a

community sewage treatment plant, treatment and disposal must be accomplished through individual facilities. The potential problems from such systems vary depending upon a number of factors, including the type and design of the system, the amount of waste to be discharged, nearness to surface or ground water, amount of precipitation, type of soil, area and slope of land involved, and pollutant loading density due to other discharges in the area.

In New Mexico it is estimated that there are over 175,000 on-site liquid waste disposal systems, serving approximately 460,000 people statewide. Approximately 6,000 new systems are installed each year according to program permitting records. The large majority of such systems ultimately discharge to ground water. Bacteriological, viral, and chemical ground water pollution can result from improperly sited, designed, constructed, and/or maintained individual liquid waste systems. More than one-half of the recorded cases of ground water contamination in New Mexico are attributed to on-site liquid waste systems.

NMED's liquid waste program is directed at preventing and abating adverse environmental and public health effects from individual liquid waste systems receiving, treating, and disposing of up to 2,000 gallons of domestic wastewater a day. The large majority of such systems are 'conventional' systems consisting of a septic tank and drainfield serving a single residence. Where the standards cannot be met with installation of a conventional system due to site limitations, one of various recognized 'alternative' systems may be required. By nature, nearly all such systems are buried, which makes their location, configuration, performance, and even existence difficult to determine. Their major negative environmental impact, degradation of ground water quality, is gradual, cumulative, and extremely difficult to legally prove or to correct.

The Liquid Waste Disposal Regulations (LWDR) were first adopted by the Board in 1973, and were most recently amended in December 1989. They contain specific requirements that each system include a treatment unit and be situated in conformance with standards designated to protect surface and ground water from degradation. The regulations include provision for granting variances to the requirements in cases where it can be shown that site-specific conditions or additional treatment processes exist which will provide adequate protection. The regulations also allow the imposition of more stringent requirements where necessary to prevent a hazard to public health or the degradation of a body of water. The LWDR cover only systems that are exempt under the WQCC regulations which cover any system receiving more than 2,000 gallons a day design flow or any non-domestic waste.

The principal method for limiting the impact of microbiological and soluble chemical contaminant pollution due to liquid waste systems is to restrict the density of systems. Many subdivisions were platted, approved and sold prior to the adoption of the current liquid waste disposal regulations. Lots platted prior to February 1, 1990 complying with the requirements of minimum lot size standards in effect at the time of their platting are allowed to be developed with a single house per lot (**9**). While real estate developers have generally sought to subdivide property to the highest density legally permissible, this has resulted in restricting purchasers to using expensive alternative systems or using community subdivision wastewater systems. A certain number of lots exist which are simply not appropriate for conventional on-site systems, yet people desire to build and live on these lots. In such instances, alternative systems, lot expansions and legitimate variance allowance must be considered.

Local city and county governments have legal authority for zoning and subdivision approval, as well as authority to adopt environmental protection standards more stringent than the State's, if necessary. In those areas of environmental sensitivity or current ground water problems, the counties and municipalities are encouraged to exercise their authority to prevent further local degradation of ground water. NMED is seeking local government cooperation in requiring evidence of an approved NMED liquid waste permit before issuing building or mobile home moving permits. This would insure a higher percentage of installations meeting standards.

Enforcement

Enforcement activities generally result from information contained in a complaint to the local NMED office concerning a failed system or an improper installation. Nearly all complaints are followed up, and nearly all discovered violations are voluntarily corrected by the system owners without court action. It should be noted that the violations most commonly found are obvious ones, such as system installation without a permit, improper proximity of a system to a well or watercourse, system failure such that raw sewage reaches the soil surface, or improper dumping of septage. Systems existing prior to November 1973, were 'grandfathered-in' and, as a consequence, so were any potential problems associated with them. Problems and complaints about these earlier systems concern cesspools, surfacing sewage, overflowing tanks, and illegal pumping. Correction of such problems often involves modification of the existing system or providing for new installations.

These regulations adopted under the authority of the Environmental Improvement Act control discharges from individual domestic septic systems. These systems are responsible for more instances of known ground water contamination in New Mexico than any other source. The reasons for the relative ineffectiveness of these regulations are: (1) system siting standards are applied at the time of installation or modification, and requiring existing system upgrades to meet subsequent more stringent standards is commonly impractical, systems installed under less stringent standards are allowed to continue to discharge; and, (2) lots divided prior to the February 1, 1990 change in minimum lot size standards are still allowed to develop with on-site systems. Therefore, the hazard to ground water from these older systems, or from new systems allowed to be installed on lots divided prior to February 1990, is considered to be

substantial. The primary available remedy consists of community collection, treatment and disposal, which is outside the scope of these regulations.

Septage

Another problem associated with liquid waste disposal is the disposal of the residual solids (i.e., septage) from septic tanks. Regular pumping of septic tanks is encouraged to preserve the capacity, and treatment efficacy, of disposal systems. Traditional methods for septage disposal (i.e., to municipal wastewater treatment plants and landfill pits) are facing increasing question as to their environmental safety. Municipal wastewater treatment plants face ever-increasing pressures for compliance with stricter NPDES effluent limitations, and are sometimes unwilling to bear the costs associated with treating septage. Landfill operators are faced with legal liability for contamination from septage disposal and find that public land administrators are less willing to take the liability associated with accepting septage disposal to pits. Also, the New Mexico Solid Waste Management Regulations ban disposal of liquids at landfills. In the arid southwest, the most environmentally beneficial method of disposal of septage derived from residential sources would involve wide-area land application with incorporation into the soil in areas where there is no threat to surface or ground waters. However, this procedure has largely been precluded by EPA's technical criteria for sludge (including septage) which was published in October 1991 pursuant to the federal CWA. The number of septage disposal sites for which approval was applied for under WQCC regulations has continued to increase in the most recent biennium, but the number of approved sites still falls far short of the need. Illegal dumping of septage into sewers, watercourses, or arroyos is practically impossible to prevent. Such practices will predictably increase unless safe, legal methods are defined and promoted. NMED is in the process of developing septage-tracking regulations which will help to minimize illegal dumping of septage in unpermitted areas.

Public Drinking Water Supply Programs

The quality of water provided by public water supply systems in New Mexico is one measure of ground water quality. The primary contaminants in public water supply systems in New Mexico are total coliforms and nitrates, most often originating from human and animal waste and septic tanks respectively. However, as a result of expanded federal sampling requirements volatile organic contaminants (VOCs) are being discovered to be more widespread than previously recognized. Some wells have been shut down because of VOCs, while others have installed treatment systems. New Mexico also has naturally occurring elements including arsenic, fluorine, radium, radon, selenium, and uranium which may adversely affect the quality of drinking water.

1996 reauthorization of the federal Safe Drinking Water Act (SDWA) mandates that EPA set new or revised standards for two constituents which are naturally occurring in New Mexico ground water: radon and arsenic.

EPA must promulgate a standard for radon by December 2000, with a proposal by August 1999. There is at present no drinking water standard for radon. Radon is an important issue for this state. Present sampling data suggest that radon could possibly be evident in 84% of New Mexico's water supply wells. Annual treatment costs to remove radon could be substantial, depending on the level at which EPA sets the standard. Under the 1996 amendments to the Safe Drinking Water Act, New Mexico may seek a waiver from this rule by:

- Seeking a risk assessment and risk reduction study from an independent scientific organization;
- Propose a standard based on that assessment;
- New Mexico may adopt a less stringent standard with multimedia mitigation.

EPA promulgation of a revised regulation for arsenic has been mandated for no later than January 1, 2001. The present standard for arsenic is 0.05 mg/l, and suggestions for a revised standard range from 0.002 mg/l upwards. In New Mexico, arsenic naturally occurs at or above 0.002 mg/l in more than fifty percent of the state's water supplies. Like radon, the costs to remove arsenic could be substantial depending on the level at which EPA sets the standard.

Recent studies for the City of Albuquerque have shown that compliance with a new SDWA standard for arsenic would have capital outlay costs ranging from $100 million for a standard of 20 ug/L to >$300 million if the standard is set at 5 ug/L. Annual operating and maintenance fees for the compliance program would range from about $2 million to over $15 million using the above figures. Conservative statewide costs could double these estimates. These are huge costs that will have no measurable benefit in terms of reduced mortality or morbidity. EPA is in the process of conducting epidemiology studies to support this standard, however, they will not be completed until 1 to 2 years *after* the standard has been promulgated. There have been no scientific studies to date in the United States which demonstrate any verifiable evidence of deleterious health risks to humans greater than 10^{-4} concerning longterm ingestion of aqueous-phase arsenic in concentrations below 50ug/L.

The State, in addressing these naturally occurring constituents, would like to approach these problems by a new approach:

Assume a low vulnerability for most water systems and that the State should be allowed to set sampling frequencies based on vulnerability;

- Sample low vulnerability systems every five years which would reduce the frequency of sampling for most small systems;
- There would be more frequent monitoring for vulnerable systems thus focusing the resources based on the probable risk;
- Detection level (percent of Maximum Contaminant Level as set by EPA) triggers more frequent sampling;
- Simplification of sampling requirements so that it is the same for all types and sizes of systems.

Since the 1920s, almost 200 public water supply wells in New Mexico have been adversely affected by pollutants caused by human activities. More than half of these wells have been taken out of use for human consumption. Some are still used for non-sensitive activities such as road watering, while others are being used for blending with water from other wells or treated to remove impurities. The details of these contamination incidents are described below.

Water Supply Regulations

The Water Supply Regulations, adopted by the Board and which follow the Federal Primary Drinking Water Regulations, apply to public water supply systems. The State of New Mexico was granted primacy for the enforcement of regulations governing water supplies pursuant to the federal Safe Drinking Water Act on April 1, 1978. The State regulations have been, and will continue to be, further amended to meet the requirements of the SDWA amendments of 1996 if the State wishes to retain primacy.

As an example of how the State is supporting local communities in meeting these standards is the Composite Correction Program (CCP) (**10**) which is an approach developed by the EPA and Process Applications, Inc. to improve surface water treatment plant performance and help assure cost-effective compliance with the Surface Water Treatment Rule (SWTR) which is included in the New Mexico Water Supply Regulations. The SWTR, which took effect on June 29, 1993, requires a minimum 3 log (99.9%) removal/ inactivation of giardia cysts, a minimum 4 log (99.99%) removal/inactivation of viruses, requires lower finished water turbidity, and requires minimum levels of disinfection. These requirements are also listed in the NMED Primary Drinking Water Regulations.

The CCP approach consists of two aspects, the Comprehensive Performance Evaluation (CPE) and Comprehensive Technical Assistance (CTA). A CPE is a thorough evaluation of an existing treatment plant resulting in an assessment of the unit treatment process capabilities and the impact of the operation, maintenance and administrative practices on optimal performance of the plant. CTA is used to optimize the performance of an existing plant by addressing the factors limiting performance which were identified during the CPE. The CCP approach can be utilized to evaluate the ability of a water filtration plant to meet the turbidity and disinfection requirements of the SWTR.

The New Mexico State University (NMSU) Doña Ana Branch Water Utilities Technical Assistance Program has been contracted by NMED's Drinking Water Bureau to implement the evaluation and technical assistance process at surface water treatment facilities in New Mexico.

The Safe Drinking Water Act was amended in 1996 (PL 104-182) and established new guidelines for the protection of the nation's public water systems. Congress, in amending the act, was relying on a good working partnership between the States and the EPA to carry out these new provisions. The 1996 Amendments include, among other things, the following:

. Elimination of mandatory additional water quality standards (standards for 25 new contaminants every three years). Provisions for national regulation if the contaminants exist in significant and sufficient areas to warrant regulation (§ 1412 SDWA);
. Incorporating risk assessment and good scientific data as criteria for establishing standards. Include was the provision for increased flexibility for states to tailor monitoring and treatment requirements for all water systems and to grant variances and waivers to small systems (§ 1412 SDWA);
. Specification of minimum standards for certification (and recertification) of the operators of community and noncommunity public water systems (§ 1419 SDWA);
. Establishment of a Capacity Development Program for the states. In New Mexico, the capacity development program is operated by the Environmental Finance Center through the New Mexico Engineering Research Institute/ University of New Mexico. The long term goal of this project is to create a more reliable and consistent method of evaluating small water systems viability and to provide information to the State which will ultimately improve the focus and application of technical assistance and funding to small water systems (§ 1420 SDWA);
. Provisions for a federal financial assistance program administered by the States as a Drinking Water State Revolving Loan Fund. This fund would provide low interest loans to water systems for capital improvements and other activities (§ 1452 SDWA); and
. More emphasis on proactive protection of sources for drinking water rather than the reactive after the fact detection and treatment (§§ 1429, 1453 and 1454 SDWA).

Most requirements of the State regulations pertain to the quality of water delivered (i.e., end of pipe) by public water supply systems. Other provisions provide for protection of public health by setting requirements for siting, construction, operation, and maintenance of public water supply systems. The State regulations have been, and will continue to be, further amended to meet the requirements of the SDWA amendments of 1986 if the State wishes to retain primacy.

The first session of the 39th Legislature empowered NMED to collect fees from water systems for services provided to water systems to assist in complying with the new requirements. In the Fall of 1989, a fee structure was established to fund NMED services requested by water systems in pursuit of compliance with the Amendments.

NMED currently regulates 1,223 public water systems in New Mexico. Nearly all of these water supplies are derived from ground water sources. Four hundred ninety-five are '*non-community water systems*' which are sampled for nitrates once every 4 years. There are 596 '*community systems*' which are sampled for nitrates, fluoride and trace elements (i.e., arsenic, barium, cadmium, chromium, lead, mercury, selenium and

silver) once every 3 years; for radiological parameters (gross *a* (alpha), radium^{226} and radium^{228}) every 4 years; and 8 regulated organic chemicals and 51 other contaminants once every 3 to 5 years depending on the vulnerability of the water supply sources.

Monitoring for trihalomethanes is required annually for systems serving populations greater than 10,000. A new class of public water supply has been defined: '*non-transient non-community*' water systems. New Mexico has 159 such systems serving schools, factories, etc. These systems will be required to monitor the same parameters and on the same schedule that '*community systems*' do now. All public water supply systems are required to conduct periodic microbiologic analyses. Analyses consist of total coliform counts and are done on a frequency determined by the population served.

Monitoring required by the State and federal regulations governing water supplies is usually performed by the water supply operators. In addition, NMED periodically collects samples for all parameters.

Source Water Protection: Wellhead Protection Programs

The NMED Drinking Water Bureau is the primary contact for Wellhead Protection throughout New Mexico. Since its approval by EPA in 1990, the New Mexico Wellhead Protection Program (WHPP) has increased community participation in drinking water protection by providing technical assistance, identifying potential sources of contamination, and creating Wellhead Protection Areas throughout New Mexico. The WHPP became a part of the Source Water Assessment and Protection Program (SWAPP) with the 1996 Amendments to the Safe Drinking Water Act.

In New Mexico, Wellhead Protection is a voluntary, community-based program designed to prevent pollution and protect drinking water quality. A Wellhead Protection Area (WPA) is a delineated space around a wellhead (i.e. a 1000-foot radius) to reduce potential sources of contamination in that zone. Other specific wellhead protection measures include a sanitary seal of the well, a four-inch thick cement pad sloping away from the well casing, and a fence or wellhouse to protect the well from vandalism and contamination.

New Mexico communities have a vested interest in safeguarding their sources of drinking water. With a growing population and increased demands for safe, clean water, more communities are recognizing the need to create WPAs, enact longterm water resource plans, and implement best management practices that directly relate to the public water supply. Using the following five-step process, a WHPP is useful for pollution prevention and drinking water quality protection.

Five steps to wellhead protection include:

1. Form a community-based wellhead protection team;
2. Define the area to be protected;
3. Identify actual and potential sources of contamination;
4. Manage the wellhead protection zone; and
5. Develop a plan for emergencies and the future.

NEW MEXICO SOLID WASTE ACT

New Mexico has responded to increasing discoveries of ground water pollution below old landfills and the additional perceived threat of large scale disposal of other states' solid waste in New Mexico.

In 1990, the State Legislature passed the Solid Waste Act. This new law (§§ 74-9-1 through 74-9-42 and §§ 74-9-72 through 74-9-73, NMSA 1978) mandated development of a comprehensive statewide solid waste management program. It also authorized NMED to impose fees for processing permit applications, seek increased penalties for noncompliance and expand facility requirements for permitting and financial responsibility. The Act was amended in 1993 and required local governments to provide financial assurance and established permit life criteria for private and public entities while expanding the public notice requirements to tribal governments. In October of 1991, EPA promulgated the federal Part 258 requirements for municipal landfills, which became effective in October of 1993. Certain options were provided to states that could demonstrate that their permit programs were sufficient to implement requirements equivalent to the federal criteria. In response to the amendments to the Solid Waste Act, the promulgation of the federal criteria, and recommendation provided in a statewide solid waste management plan, the Environmental Improvement Board adopted extensive amendments to the regulations on July 8, 1994. The regulations became effective on August 17, 1994. Application to EPA for federal approval of the State program was made on July 18, 1994 was received on December 21,1994.

The Solid Waste Management Regulations establish permit requirements for landfills, recycling facilities, processing facilities (preparation of waste for reuse), special waste (waste with unique handling, transport or disposal requirements ~ such as asbestos and infectious waste), composting facilities, transformation facilities (e.g., incinerators, distillation and gasification operations) and transfer stations. Particular categories of waste handling and disposal facilities are governed by specific siting and design criteria, operational requirements and closure and postclosure requirements. Financial assurance is required for closure and postclosure care and ground water monitoring. Certified operators are required for most solid waste facilities. Where monitoring wells show ground water contamination, remediation is required. Numerical standards for water quality parameters are established, and for contaminants with potentially serious

health, safety or environmental effects, remedial action levels are generally set at 75 % of the standards. The standards adopted by the Board are at least as stringent as those adopted by the WQCC.

Solid Waste Disposal

The most widely used method of solid waste disposal is land disposal. As of December 1999, there are approximately 48 active landfills operating in New Mexico of which 33 are municipal, 5 are federally owned and ten are privately owned. Since 1989, approximately 150 landfills have closed, with a number of them being replaced with transfer stations for eventual transport to other landfills. More landfills are expected to close to avoid the additional requirements imposed by the 1994 regulations, which are equivalent to the federal Part 258 requirements. It is expected the requirements of the Act and regulations will result in fewer, larger, better-located sites that will afford significantly increased protection of water resources.

The new regulations, which became effective on January 31, 1992, provide a basis for adequate protection of the surface and ground water resources. They require permits for new and existing facilities that require geologic and hydrologic evaluations of sites.

OTHER STATE PROGRAMS

There are several other State programs that contribute to the protection of ground water quality. These are summarized below and also are listed in Appendix E.

Ground Water Storage and Recovery Act

The recently adopted Ground Water Storage and Recovery Act (§§72-5A-6 et seq., NMSA 1978) authorizes any governmental entity to apply for and obtain a permit from the State Engineer to transfer existing surface or ground water rights to underground aquifers where the stored water may be recovered for future use by the permittee through ground water pumping. Permitted projects allow the permittee to add measured volumes of water by injection or infiltration to an aquifer or system of aquifers, to store the water underground, and to recover it for beneficial use. Water added to an aquifer to be stored for subsequent recovery for beneficial use pursuant to a project permit is not public water and is not subject to forfeiture.

In adopting the Ground Water Storage and Recovery Act the legislature found that ground water recharge, storage and recovery have the potential to:

(1) offer savings in the costs of capital investment, operation and maintenance and flood control and may improve water and environmental quality;

(2) reduce the rate at which ground water levels will decline and may prevent overstressing or dewatering aquifer systems;

(3) promote conservation of water within the state;

(4) serve the public welfare of the state; and

(5) may lead to more effective use of the state's water resources.

Coal Surface Mining Regulations

The protection of ground water quality at coal mines is controlled under the Coal Surface Mining Regulations adopted by the Coal Surface Mining Commission pursuant to the New Mexico Surface Mining Act (§§ 69-25A-1 et seq., NMSA 1978). The regulations are administered by the Mining and Minerals Division of the Energy, Minerals and Natural Resources Department. This Division also administers programs under the Abandoned Mine Reclamation Act (§§ 69-25B-1 et seq., NMSA 1978).

Hard Rock Mining Regulations

Permitting of hard rock mines is required pursuant to the New Mexico Mining Act (§§ 69-36-1 to 69-36-20 NMSA 1978) which is administered by the Mining and Minerals Division of the Energy, Minerals & Natural Resources Department. Rules to implement the Mining Act were adopted by the newly created Mining Commission in 1994 and have been amended a number of times. New and existing mining operations and exploration operations must obtain Mining Act permits which include reclamation or closeout requirements. The Mining Act requires the issuance of these permits to be closely coordinated with other established regulatory programs including NMED's ground and surface water protection programs, in order to ensure that conflicting and/or duplicative requirements are not imposed on facilities. A key provision of the Mining Act is a requirement that the Secretary of NMED provide a determination that environmental standards, including water quality standards, are expected to be met, before a new mine permit or a closeout plan for an existing mine can be approved.

Pesticide Use and Disposal

The use and disposal of pesticides is controlled under 21 NMAC 17.50 under the Board of Regents of NMSU. This order was adopted pursuant to the Pesticide Control Act (§§ 76-4-1 et seq., NMSA 1978) and is administered by the Division of Agricultural and Environmental Services of the NM Department of Agriculture. This regulatory order does not include specific provisions to protect ground water quality. However, the Department of Agriculture is developing a generic Pesticides State Management Plan Guidance for Ground Water Protection which will focus on management of pesticides to prevent negative health and environmental effects.

Office of the State Engineer

The New Mexico Office of the State Engineer has authority under several statutes (§ 69-3-6, § 70-2-12.B (15), §§ 72-12-1 through 72-12-28, § 72-13-4 and § 72-13-6, NMSA 1978) to control activities affecting ground water quality. New Mexico Supreme Court decisions have further defined this authority (Appendix E). The State Engineer has general supervision of certain water quality issues in the State. His office has authority over plugging mine discovery or drill holes, drilling, casing, and plugging artesian wells to prevent

commingling, pumpage control to prevent salt water encroachment, and designation of aquifers to be protected by the OCD.

The 1991 Legislature amended State law to provide that periods of non-use during which water rights are placed in a water conservation program approved by the State Engineer and prepared by a conservancy district, acequia or community ditch or the Interstate Stream Commission (ISC) are not computed as part of the four-year forfeiture period.

In 1987 the New Mexico Legislature authorized the ISC to appropriate ground water or purchase water rights on behalf of the various regions of the State and to make grants or loans for the purpose of regional water planning. The purpose of the regional water planning effort is to identify future water needs and to develop information needed to conserve water for future use. Since 1987 the Legislature has appropriated over $2,500,000 for the preparation of regional plans, for an update of the State water resources assessment data and for the initiation of a State water conservation program. These monies have been matched by approximately $500,000 in local funding plus many thousands of dollars of in-kind services and volunteer time. This program has funded initial water planning efforts in water planning regions that cover 32 of New Mexico's 33 counties as well as several water assessment studies and water conservation demonstration projects. The program has also funded the development and distribution of related educational materials.

State Land Office

The New Mexico State Land Office (SLO) administers approximately 9,000,000 acres of surface estate and 13,000,000 acres of mineral estate held in trust for New Mexico schools, universities and other beneficiaries. By State statute, the agency is required to maximize the long-term return to the Trust and protect the resource. The SLO is not authorized to expend Trust funds for improvement of Trust Land; however, federal Agricultural Stabilization and Conservation Service funds or private funds may be expended by lessees to improve Trust Lands.

The SLO has developed and is enforcing reclamation standards for oil and gas development, in addition to a road policy which contains elements of appropriate Best Management Practices designed to control sediment, erosion, and other pollutants. The agency has also revised its sand and gravel lease procedure to (1) require a spill prevention and control plan which outlines leak and spill prevention methods and subsequent cleanup methods of any accidental spills; (2) require water diversion ditches up-gradient and runoff berms downgradient from the operation to prevent sediment runoff; (3) enforce stringent reclamation requirements; and is (4) currently developing the requirement of a systematic field inspection schedule for active sand and gravel leases.

The agency encourages its agricultural lessees to enter into Great Plains Contracts or ranch/farm plans with the federal Natural Resources Conservation Service which provides information and encourages proper range management practices. In an effort to promote the longterm health of New Mexico's range resources, the agency has designed a program which rewards lessees who excel in managing State Trust Lands called the Range Stewardship Incentive Program. The central feature of this voluntary program is a 25 % fee reduction on each acre in good or excellent condition with a stable or upward trend. By definition, there is minimal erosion and therefore minimal nonpoint source pollution from rangeland in high ecological condition. Approximately 325,000 acres are currently managed under this program.

The agency has made Educational Easements available to schools to provide the opportunity to teach environmental education and enhance student understanding of resource issues and the need for protection of the Trust resource for future generations. The SLO has worked with NMED concerning surface water monitoring and ground water discharge plans and reviews discharge proposals for potential impacts to the Trust resources regarding surface and ground waters. The agency is active in the Upper Rio Grande Basin Ecosystem Management Project, the Zuni River Watershed Project, the Statewide Water Plan, and the Riparian Council. In addition to the above, leasing of State Trust Lands for mining, grazing, rights-of-ways, and commercial use is being reviewed to address biological, archaeological, and other environmental concerns, and to apply appropriate stipulations to the leases in order to protect the quality of ground and surface waters.

Additional programs initiated by the SLO include a riparian improvement program (RIP) whose purpose is to identify, prioritize, and implement restoration projects in riparian areas and associated watersheds located on state trust lands in cooperation with lessees, adjoining land owners, and land management agencies. The SLO has also initiated a program to identify and control noxious weeds found on state trust lands. The program relies on cooperative efforts with land management agencies, county governments, and other interests to prevent to the extent possible the spread of noxious weeds and the consequent loss of productive agricultural lands.

PUBLIC INVOLVEMENT

In New Mexico public involvement is an important aspect of programs to protect ground water quality. Public participation includes public notices, opportunities for public hearing, and the formation of advisory groups for regulation development and revision and the recommendation of public policy. Public recognition is given to businesses and organizations that have shown excellence in their efforts to protect the State's ground water. An example is

given below.

Water Fair Program

At one or two-day water fairs, NMED, cooperating agency staff, and local volunteers set up a mobile laboratory and conduct free field testing of drinking water samples collected by private citizens from their individual water supplies. Public concern about contaminated private wells led NMED to develop a program to conduct free tests for nitrate, pH, mineral content, and volatile organic chemicals. Tests for iron, manganese, sulfate, fluoride and sulfide can be done if warranted. Well numbers are assigned to each source and the sample results entered into the water fair database. Although the information is suitable only for screening purposes, follow-up samples are collected for laboratory analysis when health threatening pollutants are detected at levels of concern.

When contamination of the well is noted by the water fair testing, follow-up samples are collected for laboratory analysis. The water supply users are advised of proper steps to take to protect themselves, and a referral is made to the proper ground water program so that the source of contamination can be found. In many cases, either the State or the party responsible for the contamination has provided a new water supply.

In addition to water quality test results, visitors to a water fair are provided with health and pollution prevention information. Published in English and Spanish, packets include fact sheets about water-borne diseases, health risks from drinking contaminated water, household toxics and pesticides, and an illustrated brochure about New Mexico's ground water resources (**11**) which suggests ways to prevent contamination. Water fairs bring water scientists to small communities where they are available to discuss ways to protect ground water and proper waste disposal while answering questions about our ground water resource. The basic ground water information generated becomes available to the public and all NMED programs.

FEDERAL PROGRAMS RELATED TO GROUND WATER QUALITY

There are a number of federal programs that contribute to ground water quality protection in New Mexico. Some of these, such as the hazardous waste, underground injection control, and underground storage tank programs, are being carried out by the State under authority of State legislation and are described in the sections on the relevant State acts. Others, such as Superfund, are essentially federal programs in which the State plays a role.

Department of Energy Environmental Oversight and Monitoring Program

The four DOE facilities in New Mexico are Sandia National Laboratories (SNL) and the Lovelace Respiratory Research Institute (LRRI), formerly the Inhalation Toxicology Research Institute (ITRI) in Albuquerque, the Los Alamos National Laboratory (LANL) in Los Alamos and the Waste Isolation Pilot Plant (WIPP) in Carlsbad. The New Mexico Agreement-in-Principle is designed to help assure that activities at DOE facilities are protective of the public health and safety and the environment. To accomplish the goals of the agreement, an oversight program was developed with four primary objectives:

. To assess the DOE's compliance with existing laws including regulations, rules, and standards;
. Prioritize cleanup and compliance activities;
. Develop and implement a vigorous program of independent monitoring and oversight; and
. To communicate with the public so as to increase public knowledge of environmental matters about the facilities, including coordination with local and tribal governments.

The DOE Oversight Bureau carries out the oversight and monitoring activities of the program. Although the Oversight Bureau has no regulatory status, it facilitates compliance with applicable environmental regulations by reporting water quality concerns and infractions to DOE and the appropriate regulatory NMED Bureaus (i.e., Surface Water Quality, Ground Water Quality, and Hazardous & Radioactive Materials). DOE Oversight Bureau staff communicate routinely with the public to increase public knowledge of oversight, monitoring, and environmental issues involving the facilities. The Oversight Bureau issues quarterly and annual implementation reports to the DOE describing the scope of work, objectives, accomplishments and significant issues that occurred during each period. Results of oversight and monitoring activities are also available to the public along with numerous documents transmitting technical comments and concerns relative to specific program areas. These reports and documents are a source of reliable technical information for the writers of facility proposals and decision makers at regulatory agencies.

Ground Water Protection at DOE Facilities

NMED is responsible for preserving, protecting and perpetuating the State's ground water resources for future generations. The oversight program accomplishes this at DOE facilities through review and technical investigation in four broad areas: site wide and site-specific hydrogeology, waste management, surveillance and environmental restoration. Oversight Bureau staff evaluate the facility's conceptual hydrogeologic model, review the facility's investigations to improve their conceptual model and conduct studies necessary to better understand the hydrogeologic systems and to support technical recommendations at the facilities.

One of the early NMED deliverables in the oversight program was an assessment of the ground water surveillance at each facility. This involved evaluating the adequacy of existing ground water monitoring networks and practices at the facilities, in view of their hydrogeologic

setting and the location, number and character of waste disposal sites. On-going surveillance activities include sampling and co-sampling of ground water at wells and springs; compiling a database of previous analytical results, as well as determining and investigating any trends in the concentration of constituents of concern.

For information on ground water and surface water data, conclusions and recommendations from oversight and monitoring at New Mexico DOE Facilities see the NMED report titled *Initial Inspection of Site Water Systems and Wells at DOE Facilities in New Mexico*, (**12**) which satisfies X.A.B.3, Action No. 17 of the DOE/NMED Agreement in Principle.

Superfund

The 1980 federal Comprehensive Environmental Response, Compensation and Liability Act (Superfund), as modified by the Superfund Amendments and Reauthorization Act of 1986 (SARA), provides for cleanup of inactive hazardous waste sites ranked on the National Priorities List (NPL). Superfund also provides for emergency response by the EPA to clean up hazardous waste sites which pose an imminent hazard to public health or the environment. Superfund further directs EPA to determine liability for improper hazardous waste disposal and to recover costs from responsible parties for cleanup. Finally, Superfund provides a mechanism for states and others to file claims to gain compensation for damages to natural resources.

With the exception of the emergency incident provisions of the Hazardous Waste Act that has limited applicability, New Mexico has no State-funded program to address the problems of inactive or abandoned hazardous waste sites. EPA administers the federal Superfund program and is the lead agency for most Superfund activities in New Mexico. NMED maintains a Multi-Project Cooperative Agreement with EPA. This agreement provides 100 % federal funds to allow the State the lead role in certain projects and to permit State involvement in projects where EPA is the lead agency. The State takes the lead role in identifying and investigating potential new Superfund sites. Twenty to thirty sites are investigated each year. The most serious sites are scored using the Hazard Ranking System and are nominated for the NPL. Nationally, there are approximately 1,236 sites on this list.

Eleven New Mexico sites are currently included on the NPL: Albuquerque South Valley Site; United Nuclear Corporation Uranium Mill Tailings in McKinley County; Homestake Mining Company Uranium Mill Tailings in Cibola County; Atchison, Topeka and Santa Fe Railroad sites in Clovis and Albuquerque; Prewitt Refinery in McKinley County; Cleveland Mill in Grant Count; Lee Acres Landfill in San Juan County and Cimarron Mining Company in Lincoln County. The North railroad Avenue Plume site in Española, Rio Arriba County, and the Fruit Avenue plume in downtown Albuquerque, Bernalillo County, were included on the NPL in 1999. The old Rinchem Company site in Albuquerque was deleted from the NPL in December 1998.

EPA is the lead agency for the required Remedial Investigations and Feasibility Studies at these sites with the exception of the North Railroad Avenue Plume site in Española and the Fruit Avenue plume in Albuquerque that are a State-lead sites. EPA funds NMED to participate in these projects by reviewing and commenting on workplans, proposals and reports. Federal law requires New Mexico to pay ten % of final Superfund remedies when federal Superfund money is used for remedial actions.

Superfund has conducted several emergency removals in New Mexico. EPA investigates candidates for emergency removals and performs the cleanups, if deemed necessary. NMED works with EPA to determine when such action is necessary. Between January 1997 and December 1998, NMED oversaw the removal assessments at 4 sites and removal actions at 2 abandoned mining sites.

Between January 1997 and December 1998, NMED's federally funded Superfund Program completed 35 site investigations requiring varying degrees of effort. These sites investigated can be categorized as follows: 24 solvent sites; 7 mining sites, 1 landfill, and 4 other sites. Several sites have received more than one level of investigation.

The Superfund Program has also provided Management Assistance to EPA on 9 EPA-lead NPL sites which have required varying degrees of effort from reviewing and supplying comments to creating reports such as *Human Health and Ecological Risk Assessments* and overseeing Administrative Orders on Consent.

OTHER GROUND WATER QUALITY MONITORING

More Federal Programs

Please see the Office of Technology Assessment's Protecting the Nation's Ground Water from Contamination (**13**) and the Environmental Protection Agency's Protecting the Nation's Ground Water: EPA's Strategy for the 1990s (**14**) for summaries of federal programs, including some of the programs described below.

U. S. Geological Survey

USGS, through its Water Resources Division's District Office in Albuquerque, often obtains information on the quality of ground water as part of limited duration studies conducted in New Mexico. These studies are conducted for specific ground water systems in cooperation with State, local or other federal agencies. Information about these and other activities are available through bibliographies and catalogs of information. USGS also publishes "Water Resources Data New Mexico," an annual report which includes ground water levels and water quality data. The report explains how to obtain access to

WATSTORE, the national water data storage and retrieval system established for handling water data collected through the activities of USGS, and for providing an effective and efficient means of releasing the data to the public.

More State Programs

Office of the State Engineer

The Office of the State Engineer along with the SWCD, the SPD and the USGS cooperate in ground water quality monitoring in conjunction with the State Engineer's primary mission of administering use of the State's water resources. Areas from which extensive salinity data are available include the Roswell and San Juan Basins, the Bolson-Mesilla Valley, and Curry and Roosevelt Counties.

Other Sources

Other organizations who collect, record, or make use of other sources of ground water data to create useful reports include the New Mexico Water Resources Research Institute, the New Mexico Agricultural Extension Service, the Mining and Minerals Division of the Energy, Minerals, and Natural Resources Department and New Mexico Bureau of Mines and Mineral Resources. Monitoring activities are also undertaken by the United States Bureau of Land Management under their statutory authority.

Ground Water Quality Monitoring and Data Management

During the past several decades, numerous federal, State and other government agencies have generated a large body of ground water quality and related data in New Mexico. Also, large amounts of data concerning known and potential contamination sources are kept by various entities. There is, however, no comprehensive bibliographic or data retrieval system for all ground water quality resources in New Mexico.

The plethora of ground water-related databases creates two major problems. First, it is difficult for water quality investigators to acquire comprehensive information needed, for example, to establish background water quality conditions. Secondly, information pertaining to historic water quality problems has often been filed away, forgotten or otherwise effectively lost. This situation creates unnecessary hardships for those who must deal with new developments in such cases. Poorly accessible information may cause investigators to arrive at erroneous conclusions, repeat past investigations or spend excessive amounts of staff time obtaining data.

Substantial progress has been made during the past few years to rectify some of the above problems. A major effort to computerize data management systems within NMED has been undertaken. Also efforts to integrate State and federal data systems have been started.

There is a widespread need to share ground water data between programs within NMED. In part because of this need, a Data General minicomputer system was installed in early 1990. One purpose of this system was to make data sharing among NMED programs easier by having programs transform their databases currently stored on multiple personal computer systems to a single database on the minicomputer. This solves the problem of having data on stand-alone independent computer systems using incompatible hardware and software and widely varying data formats. Finally, the minicomputer has a dedicated hookup to the EPA computer network. The result of this new computer system has been to facilitate data exchange within NMED, as well as enhance electronic communication with EPA.

Other ground water quality data management activities in New Mexico are noteworthy and are summarized in the rest of this section. NMED has developed substantial capability to model hydraulic head, mass transport and geochemical conditions in ground water. As more data management applications are transferred to NMED's minicomputer system, it is expected that some of these models will become available on the minicomputer.

Also of note is the growing use of geographic information systems (GIS) in the State for the management of ground water and other related environmental data. ARC/INFO software has become the *de facto* standard for GIS development in New Mexico. The Water Resources Division of USGS in Albuquerque has developed extensive GIS map data-layers relating to ground water quality issues. The City of Albuquerque has also accumulated some information in their GIS that is useful for ground water quality analysis. The State Engineer Office has started to develop GIS capabilities that will be used for ground water administration and data analysis.

Currently, the SWQB uses GIS to document water quality impacts and to provide coverages for use by various bureaus within the department for public meetings, grant-related requirements and general information dissemination.

COUNTY AND MUNICIPAL AUTHORITIES RELATED TO GROUND WATER QUALITY

The New Mexico State Legislature has given extensive authority to counties and municipalities in the areas of regulation of land use and of protection of public health and safety, areas with substantial implications for ground water quality protection. The principal statutes in these areas are summarized in Appendix E, while the most important aspects for water quality are described below. The statutes grant to local governments broad authority to adopt regulations or take other measures pertaining to protection of health, suppression of disease, sewage facilities, water facilities, refuse collection and disposal, etc. In reviewing these statutes, one should be aware of the provision in § 4-37-1, NMSA 1978 which states: "All counties are granted the same powers that are granted municipalities except for those powers that are inconsistent with statutory or constitutional limitations placed on counties."

Although counties and municipalities have extensive legislative authority to institute measures to protect ground water quality, most have not taken full advantage of this authority. One reason is that most counties and municipalities have limited resources. Another factor that deters some local governments from instituting aggressive ground water protection programs is a division of opinion among citizens about land use regulations that limit what they can do with their property, and whether such programs are desirable.

Subdivision Regulations

The New Mexico Subdivision Act, first adopted in 1973, was extensively amended in 1995. The new amendments change the definition of "subdivision" to include almost all divisions of land. They require counties to adopt regulations regarding items of critical concern such as water availability and quality, utility easements, roads, protection of cultural sites, and liquid and solid waste disposal. Under the new amendments the subdivider must meet the needs of the subdivision with respect to these items; previously, the subdivider only had to satisfy whatever proposals he made in his disclosure statement. The Counties of Bernalillo, Doña Ana and Santa Fe had until July 1, 1996 to adopt regulations meeting the new criteria, whereas all other counties have until July 1, 1997 to do so.

Planning and Zoning

Counties and municipalities have authority for planning and platting and, under the Zoning Enabling Act (§§ 3-21-1 et seq., NMSA 1978), authority to establish zoning restrictions designed, among other things, to promote health and general welfare and to facilitate adequate provision for water and sewerage. Newly discovered ground water contamination problems, resulting from old underground storage tanks, industrial wastes, septic systems, and evapotranspiration system leakage, have aroused the interest of public officials in new planning and land-use approaches based on very real, current needs, and may well provide the impetus for a new generation of realistic land-use regulation.

Conditions Applied to State Requirements

A condition affecting what the State can require of local governments was added to the Constitution of the State of New Mexico in 1984:

"*A State rule or regulation mandating any county or city to engage in any new activity, to provide any new service or to increase any current level of activity or to provide any service beyond that required by existing law, shall not have the force of law, unless, or until, the State provides sufficient new funding or a means of new funding to the county or city to pay the cost of performing the mandated activity or service for the period of time during which the activity or service is required to be performed.*"

REFERENCES: PROGRAMS FOR GROUND WATER POLLUTION CONTROL

New Mexico Environmental Improvement Division

1) 1980 Boyer, David G., Dennis McQuillan and Maxine S. Goad. New Mexico Surface Impoundment Assessment, February 1980. Santa Fe. 98 pages plus appendices.

New Mexico Oil Conservation Division

2) 1989 Olson, William C. Volatile Organic Contamination of Ground Water Around Unlined Produced Water Pits. Open File Report H89-9, Hydrology Program, New Mexico Institute of Mining and Technology. 69 pages.

3) 1974 Robertson, J.M., C.R. Toussaint and M.A. Jorque. Organic Compounds Entering Ground Water From a Landfill. EPA-660/2-74-077. 47 pages.

Albuquerque Environmental Health and Energy Department

4) 1983 Salas, A., L.J. Gordon and R. Anglada. City of Albuquerque Residential Hazardous/Toxic Waste Survey. Albuquerque. 32 pages.

New Mexico Environmental Improvement Division

5) 1986 McQuillan, Dennis and Patrick Longmire. Water Quality Investigations at Lee Acres Landfill and Vicinity, San Juan County, New Mexico. Santa Fe. 47 pages.

6) 1988 Baker, David L. and Dennis McQuillan. Los Angeles Landfill Site Summary, City of Albuquerque, New Mexico. New Mexico Environmental Improvement Division. Santa Fe. 53 pages.

New Mexico Water Quality Control Commission

7) 1996 Regulations, 20 NMAC 6.2, as amended through November 15, 1996. Santa Fe. 83 pages.

New Mexico Emergency Management Task Force

8) 1986 Hazardous Materials Emergency Response Plan and Procedures Manual. New Mexico State Police. Santa Fe. 50 pages plus appendix.

University of New Mexico

9) 1989 Lamberson, Anna Weniger. Estimate of Compliance Costs and Benefits of Proposed Revisions to the New Mexico Liquid Waste Regulations. Bureau of Business and Economic Research. Albuquerque. 69 pages.

U.S. Environmental Protection Agency

10) 1991 Renner, R.C., B.A. Hegg, J.H. Bender, and E. M. Bissonette, *Handbook - Optimizing Water Treatment Plant Performance Using the Composite Correction Program*, EPA 625/6-91/027, U.S. EPA, Cincinnati, Ohio, February 1991.

New Mexico Environmental Improvement Division

11) 1989 Deardorff, Anna Maria. Ground Water: New Mexico's Buried Treasure. Ague Subterranean: Tesoro Escondido de Nuevo Mexico. Santa Fe. 8 pages.

New Mexico Environment Department

12) 1993 Stone, W.J., Monahan, P.K. and McDonald, W.S. Initial Inspection of Site Water Systems and Wells at DOE Facilities in New Mexico. September 1993. Report NMED/DOE/AIP-93/2, 49 pages.

United States Office of Technology Assessment

13) 1984 Protecting the Nation's Ground Water from Contamination. Congress of the United States. Washington, DC. 503 pages.

United States Environmental Protection Agency

14) 1991 Protecting the Nation's Ground Water: EPA's Strategy for the 1990s, the Final Report of the EPA Ground Water Task Force. Office of the Administrator (WH-550G). Washington, DC. 84 pages.