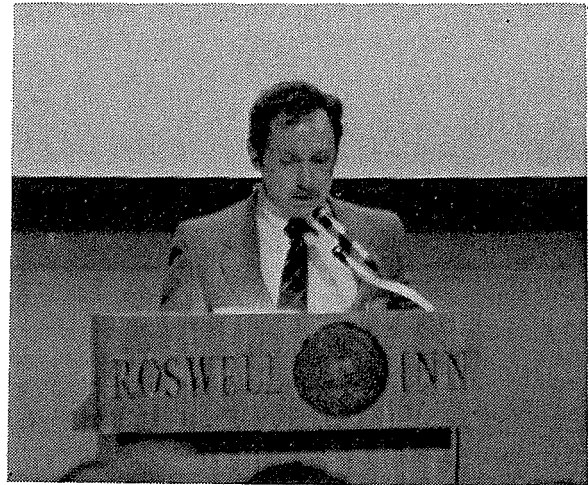


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ENVIRONMENTAL ISSUES IN NEW MEXICO'S OIL AND GAS INDUSTRY: SUCSESSES AND CHALLENGES

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ABSTRACT

Of the major industries in the United States, the exploration and production sector of the oil and gas industry remains largely unencumbered by federal environmental regulations. While national environmental groups bemoan this fact, it has allowed progressive states like New Mexico to develop regulatory programs that respond to actual or potential environmental problems based on the unique geology and hydrology of the region. A well-known example is the prohibition of unlined produced water pits in Southeast New Mexico in 1969.

As the industry approaches the 1990s and the end of this century, the emphasis is shifting away from just water disposal to the entire range of industry wastes, both liquids and solids. Federal disposal rules and guidelines are just over the horizon and are likely to be instituted in some form or another within the next five years. At the same time, the 50-year old oil fields of Southeast New

Mexico are reporting frequent instances of spills and leaks due to corrosion and failure of gathering lines and tanks. How the industry and state regulators respond to increasing national waste regulation and an aging infrastructure will determine, as much as the price of oil, the future direction of the industry in New Mexico.

INTRODUCTION

Historically, Oil Conservation Division (OCD) environmental programs were directed toward fresh water protection. The early programs were driven by actual instances of contamination. The "no-pit" order banning disposal of produced water in unlined pits in Southeast New Mexico beginning in 1969 resulted, in part, from the large amounts (50-150 acre-feet/square mile) of brine disposed in unlined pits south of the Monument and Oil Center areas. Inspection programs in the Hobbs area that require quarterly checks of production well surface casing

were instituted in 1957 because of casing leaks that caused oil to float on top of the water table in west Hobbs.

Within the past ten years, programs have become still more preventative in nature. An example is the defining of a "Vulnerable Area" in 1985 for the San Juan Basin to protect shallow ground water before large scale contamination occurs. Another is the testing of injection wells every five years (or more frequently when workovers occur) for mechanical integrity of the casing.

Now, as we approach the 1990s, new issues have arisen. They include disposal of so-called "solid wastes" (which can be physically solid, semi-solid or liquid) from production operations, and likely federal action to regulate these. Also, especially in Southeast New Mexico, aging oil field equipment is beginning to fail more frequently spilling oil and salt water on the surface and in some cases beneath the surface. This paper will touch on some of OCD's environmental successes and also present some of the challenges that lie ahead. This includes the need to address both the technical and regulatory issues resulting from aging industry equipment and increasing federal rules.

SUCSESSES

Underground Injection Control (UIC) Program

The sheer magnitude of water injected makes this OCD's biggest environmental program. State-wide, about 4 to 5 barrels of water are produced for every barrel of oil. In 1987, 345 million barrels (14.5 billion gallons) were produced. This water (commonly called "produced" or "salt water") is brackish to briny in nature and usually contains dissolved or emulsified hydrocarbons. That year, 88% of the water was reinjected into 5,200 wells for disposal or use in secondary recovery. The New Mexico UIC Program predates the 1980 federal rules under the Safe Drinking Water Act, but the federal program has helped OCD hire more inspectors and improve the testing of wells for mechanical integrity. A listing of fresh water protection rules and orders can be found in the Appendix.

Southeast "No-Pit" Order

In 1969, the OCD issued its historic order (R-3221) banning salt water disposal in unlined pits in Lea, Eddy, Chaves, and Roosevelt counties. It actually was the culmination of a process that began in 1958 with prohibition of disposal in and near the Hobbs, Monument, and other community areas in Lea County. Small volumes of one barrel per day

per lease were, and continue to be, exempted and larger volumes can be allowed in areas where no protectable fresh water exists (water is protected by OCD up to 10,000 milligrams per liter of total dissolved solids).

The "no-pit" order received scathing industry criticism at public hearings when it was first considered, but its adoption forced a better method of disposal (underground injection) to be developed and put into use. Two key persons played a crucial role during this time. Pete Porter, OCD director, and Steve Reynolds, state engineer, provided important support and their offices provided technical expertise for the various hearings that were held over several years in the 1960s.

Well Plugging

New Mexico's abandoned well program has received high marks from other states not having an administrative method or a Reclamation Fund to plug abandoned wells, or those where the posted bond does not cover total costs. In existence since the mid-1970s, the Reclamation Fund is limited only to locating and plugging abandoned wells and has supported the plugging of over 50 wells with the majority to date being in the San Juan Basin. The fund is financed by a tax on production and fluctuates between \$500,000 and \$1,000,000 each year.

Environmental Bureau

The Environmental Bureau was formed in 1984 to provide a focus for OCD's non-production related ground-water protection efforts. This includes approving discharge plans for natural gas processing plants, oil refineries, service companies, geothermal sites, and discharges of natural gas and crude oil hydrostatic test waters under the State Water Quality Act. The bureau provides permit review for crude oil recovery/treating plants and off-site surface waste disposal facilities under the Oil and Gas Act; and investigates ground-water contamination related to production and refinement activities. An organizational chart showing the bureau's relationship to other OCD functions is provided in the Appendix.

In 1985, the bureau defined areas of vulnerable ground water in the San Juan Basin needing protection from discharges of oil and gas fluids. This work needs updating since additional shallow ground water at depths less than 50 feet has been located. Also, an 18-month study of the "vulnerable area" funded by the Environmental Protection Agency (EPA) found contamination at shallow ground-water sites from pits that receive low volumes of produced

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water from oil water separators and possibly fluids from other on-site sources.

A comprehensive surface waste disposal rule (Rule 711) has been written and adopted that includes a financial assurance requirement. It also has a public notification section that requires (in addition to standard mailing list and newspaper legal notice) certified mail notification by the applicant to landowners and surface occupants within 1/2 mile of the proposed site. Landowners can protest the application and request a public hearing, but the permit can only be denied on technical grounds related to ground-water protection, safety, and public health, and not because of zoning or land-use considerations.

More recently, the bureau has been moving toward a comprehensive environmental permitting process that addresses nearly all aspects of waste disposal. This includes liquid and solid wastes, except "hazardous wastes," PCBs, asbestos, and air quality permitting. This authority comes from 1989 changes in the Oil and Gas Act giving OCD the authority to regulate liquid and solid wastes to protect public health and the environment. Issues arising from this new change are discussed in the next section.

Also in 1989, legislative memorials passed in both the New Mexico House and Senate requested return of brine production well jurisdiction to OCD where it existed prior to 1984. The Water Quality Control Commission (WQCC) made the change in June, 1989, and the Environmental Bureau now has a sizeable underground injection control responsibility since 21 facilities were transferred.

Reviews of WQCC discharge plans and OCD permit applications include all engineering and hydrologic aspects. All underground piping (product, process, or wastewater) at gas plants, refineries or other facilities over 25 years of age is required to be tested for integrity. All new underground sumps must have leak detection; existing sumps must have yearly integrity tests or be cleaned and visually inspected. Process areas that are subject to spills or equipment leaks (such as from valves or pump seals) must be paved and curbed, and tank and drum storage must be on lined pads that can contain leaks and spills. Major storage tanks for any nonfresh water fluids must be bermed to contain 1/3 more than their contents. In especially vulnerable ground-water areas, OCD has required integrity testing of above-ground product or crude oil storage tanks for detection of bottom leaks.

Recent Activities

Three recent OCD environmental efforts not initiated by the Environmental Bureau staff:

- **Temporarily Abandoned Wells** - The Hobbs district has proposed (and the legislature has funded) a program for temporarily abandoned (TA) wells. These are commonly low production wells that have been "shut-in" (that is, not in operation), usually to await a better price for oil produced. The OCD believes there may be up to 9,000 wells in this category. Though not producing, the casing can be corroded and oil, gas, or water can be leaking to other strata. The OCD plans to check these wells as follows:

1. After 1 year, a shut-in well must be formally "temporarily abandoned."
2. To be approved as a TA well, the well must have had a casing integrity test.
3. If it fails, the operator has 90 days to repair or permanently plug the well.
4. If the well passes, the approval is good for five years.

- **Migratory Birds** - As a result of documentation (with photographs and video tape) by U.S. Fish and Wildlife Service officers, OCD this past summer adopted a rule that all exposed lined or unlined pits, and large open tanks (exceeding 16 feet in diameter) must be netted or covered to protect birds. Written exceptions may be granted for pits with no oil, pits with 24-hour activity, pits used for emergencies only and emptied after use, or pits having adequate methods to prevent oil from reaching the pit. The Fish and Wildlife Service can fine violators having dead birds \$10,000 per bird.

- **Carbon Dioxide** - CO₂ is a "natural" gas and subject to OCD conservation rules. A new OCD policy requires that gas plants extracting CO₂ from coalbed methane gas present and implement plans for capturing CO₂ so as not to add to the "greenhouse" effect. One plant is planning a short pipeline to connect with an existing pipeline transporting CO₂ to oil fields for use in secondary recovery.

CHALLENGES

In the next several years, there will be challenges to both industry and the OCD concerning the environment. The challenges involve technical and regulatory issues that require response from both.

Solid Waste

The issue of where to put waste will have to be addressed. Some wastes such as oily grit and

sand can only have so much oil extracted for recycling. The remainder and other solid wastes need disposal in an environmentally sound manner.

OCD rule 711 has so far provided adequate flexibility in permitting. However, in Northwest New Mexico, public opposition has arisen to disposal locations selected by operators. "LULUs" have led to "NIMBY" protests. "Locally unpopular land uses" lead to citizens' shouts of "not in my back yard." Operator flexibility in choosing sites is limited because much of the land away from the river valleys is under federal or Indian jurisdiction.

In Southeast New Mexico, operators are wary of future federal liability even though their sites may be adequate from the standpoint of fresh-water protection and isolation. They also are careful about accepting waste only from known trucking companies to prevent the receiving of "hazardous" or other unauthorized waste.

Last year, the New Mexico legislature gave OCD additional authority for waste disposal permitting to protect not only fresh water, but also public health and the environment. This authority, and the staffing needed for it to be effective, is required since other than the Occupational Safety and Health Administration, air quality, and hazardous waste inspections (at refineries), OCD staff provide the only environmental compliance at 49 natural gas plants, 7 oil refineries, 22 oil treating plants, 10 commercial surface waste disposal operations, 21 brine production facilities, 3 geothermal sites, and several hundred oil field service companies. Environmental Bureau staff are responsible for permitting at these facilities as well as inspecting gas plants, refineries, and geothermal sites. District staff share in inspections at the other locations along with full responsibility for inspections at drilling, production and UIC sites under state jurisdiction.

Aging Infrastructure

The first oil fields in Southeast New Mexico are now more than 60 years old. Most of the other major fields are over 25 years old. Age and the corrosive nature of the production and injection fluids have deteriorated equipment and piping. Company staffing has been cut back as they try to survive low oil prices; several major companies have closed offices in Hobbs. A combination of decreased maintenance and aging equipment leads to more spills and leaks from failures of lines, tanks, and valves.

In August 1989, 48 leaks and spills (excluding fire and theft) were reported in Southeast New Mexico, where most oil, and hence most water, is

produced. An incident summary for that month can be found in Table 1. The largest spills reported were 123 barrels (5,170 gallons) of oil and 500 barrels (21,000 gallons) of salt water. Both of these were due to tank corrosion. Overall, corrosion was responsible for nearly one-half of the reported production line leaks, injection line leaks, and tank leaks during August 1989. Since the cause was not always listed on the spill report, the incidence of failure due to corrosion is likely higher.

In Northwest New Mexico, only two spills of oil and none of water were reported during August. This likely is due to the lower volumes of water produced and the absence of many injection lines connecting production and disposal systems. During winter months, failures reported from both areas of the state increase substantially due to broken water lines and valves resulting from freezing.

Most leaks are treated by vacuuming free fluids and covering the rest with dirt. OCD field staff visit spill sites, but very rarely is a ground-water investigation done. Expertise in hydrogeology is not always available in the districts and limited Santa Fe staff preclude follow-up assignment except for the most major spills. The usually thick unsaturated (vadose) zone has not protected fresh water in all past cases, but without follow-up at individual sites, there is no way to determine actual contamination.

Some possible solutions include:

1. For buried lines, integrity (pressure) tests for pipe older than 20-25 years. Such a test may have prevented the 1984 leak in the Monument area that contaminated a community water-supply well.
2. For surface facilities, berming requirements in all areas. Current rules only require berming near towns, roads, schools, churches, and inhabited structures.
3. For all spills, better investigation of the specifics of the leak's extent, the hydrogeology of the site, and the proposed cleanup. Some way to determine the potential threat to ground water (especially near communities and water wells) is needed. Companies should always be required to perform a ground-water contamination investigation where fresh water impacts are likely due to spill volume or location.

Federal Regulation

Additional federal regulation of oil and gas exploration and production wastes is a virtual certainty. In 1988, EPA decided to exempt exploration and production wastes from hazardous waste rules. Nationally, state rules were generally found ade-

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TABLE 1. SUMMARY OF REPORTED OIL FIELD SPILLS AND LEAKS
FOR AUGUST, 1989

SOUTHEAST NEW MEXICO

<u>Type</u>	<u>Number</u>	<u>Volume Range</u> (barrels)		<u>Volume Average</u> (barrels)		
		<u>Oil</u>	<u>Water</u>	<u>Oil</u>	<u>Water</u>	
Production Line Leaks:						
Corrosion	5	5-20	10	10	10	
Other	8	6-32	1-12	15	7	
Injection Line Leaks:						
Corrosion	8	--	7-100	--	45	
Other	9	--	10-160	--	53	
Tanks Leaks:						
Corrosion	6	60-123	20-500	30	117	
Other	3	5	150	5	150	
Miscellaneous	7	6-116	5-30	41	17	

NORTHWEST NEW MEXICO

<u>Type</u>	<u>Number</u>	<u>Volume Range</u> (barrels)		<u>Volume Average</u> (barrels)	
		<u>Oil</u>	<u>Water</u>	<u>Oil</u>	<u>Water</u>
Miscellaneous	2	1-10	--	5	--

quate, but EPA believes that a Resource Conservation and Recovery Act Subtitle D program (similar to municipal landfill rules) may be necessary. The program would likely include minimum national engineering and operating standards for waste management, and rules addressing gaps in state regulatory programs. EPA, with the Interstate Oil Compact Commission, is reviewing waste management issues with a goal of developing management and disposal guidelines for states to adopt.

EPA has stated its intention to work with Congress to develop necessary federal statutory authority to address treatment and transportation of oil and gas wastes. However, Congress will have the final say on the matter since RCRA is due for reauthorization.

A federal program should allow state flexibility since New Mexico has a wide variety of geology and hydrology, and an arid to semiarid climate. It should provide additional staff resources without an unreasonable increase in red tape. However, the current track record of the federal hazardous waste and UIC programs in generating regulatory and accounting paperwork does not lead to optimism.

Staffing

Currently, the OCD Environmental Bureau has three staff members including an environmental engineer and two geologists, one of whom is the bureau chief. An additional hydrogeologist requested to assist in regulation of the brine production wells transferred to OCD from the Environmental Improvement Division is awaiting legislative approval.

New solid-waste issues at the large number of OCD-regulated facilities and the need for expanded investigation of possible ground-water contamination demonstrate the necessity for more professional staff. Ideal staffing would include another environmental engineer in Santa Fe to handle solid waste management and oil field service company permitting; and an environmental geologist in Hobbs to cover southeastern New Mexico problems including spills and leaks, and facility inspections.

The Final Challenge - Environmental Education

Many major oil companies (already having environmental staffs) are leaving economically marginal and older oil fields. The independent producer, usually small, is taking over these wells and equipment. The 1969 no-pit order in southeastern New Mexico and the 1985 vulnerable areas designation in the San Juan Basin did not solve all waste disposal problems for New Mexico or the oil com-

panies. Oil companies need to be aware of the changing environmental climate.

Next spring an environmental education program will be ready for operators. It will join OCD's current presentations on gas proration and marketing given every several months throughout the state. The program will bring operators up-to-date on current OCD programs and likely future requirements. It will provide information on good management practices (especially those related to on-site housekeeping and disposal), and document the cost of remediation if cleanup rules adopted in the future place liability on today's operator. However, even now, poor housekeeping or contamination problems can hinder or preclude sale of properties leaving operators no way to recoup the cost of their investment.

SUMMARY

It will be a combination of OCD's successful programs together with modifications tailored to meet the new environmental realities that will allow us to meet the challenges of the 1990s. New environmental realities require addressing solid-waste issues and an aging infrastructure, and providing for education on these issues. If flexibility in application of environmental rules is to remain a feature of the program, an adequate number of experienced professional staff must be maintained.

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APPENDIX

MAJOR OCD FRESH WATER PROTECTION RULES

Major OCD Statewide Regulations

<u>#</u>	<u>TITLE</u>	<u>PURPOSE</u>
0.1	Fresh Water	Defines "Fresh Water" to be protected.
1.	Scope of Rules and Regulations	Rules 1, 2 and 3 state in general terms that fresh water is to be protected and OCD staff has the authority and duty to enforce such rules.
2.	Enforcement of Laws, Rules and Regulations	(See Rule 1)
3.	General Operations/Waste Prohibited	(See Rule 1)
8.	Lined Pits/Below Grade Tanks	Requires OCD approval of design and leak detection system.
105.	Pit for Clay, Shale, Drill Fluid, and Drill Cuttings	Requires on-site disposal in a manner to prevent fresh-water contamination.
106.	Sealing Off Strata	Requires wells to be drilled and abandoned in a manner to prevent water or contaminant migration.
107.	Casing and Tubing Requirements	Requires necessary surface and intermediate casing strings and cement to protect fresh water.
116.	Notification of Fire, Breaks, Spills, Blowouts	Notification and action requirements.
202.	Plugging and Abandonment	Requirements for plugging and abandonment of drill holes and wells.
308.	Salt of Sulphur Water	Monthly reporting of water volumes.
310.	Tanks, Oil Tanks, Fire Walls, and Tanks Identifications	Prohibits oil storage in earthen reservoirs and requires fire walls.
312.	Treating Plants	Specifies requirement for facilities performing oil recovery from production wastes.
313.	Emulsion, Basic Sediments, and Tank Bottoms	Prohibits pollution of fresh waters or surface damage from these wastes.

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<u>#</u>	<u>TITLE</u>	<u>PURPOSE</u>
701-708.	Rules for Injection of Fluids	Underground Injection Control regulations for salt water disposal, waterfloods and pressure maintenance.
709.	Removal of Produced Water From Leases and Field Facilities	Requires transporter authorization to move fluids off-site.
710.	Disposition of Transported Produced Water	Prohibits disposal in water courses, pits, or in any other place or manner which will constitute a hazard to fresh-water supplies.
711.	Commercial Surface Waste Disposal Facilities	Requires a permit for commercial operations collecting, storing or disposing of produced water, drilling fluids or cuttings, or any other oil field waste in surface pits, ponds or below grade tanks.
R-8952	Migratory Waterfowl Protection	Requires screening, netting, covering or other protective measures to prevent migratory birds from contacting oily waste. Modifies rules 8, 105, 312, 313 and 711.

Major OCD Area-wide Orders

<u>#</u>	<u>DATE</u>	<u>AREA</u>	<u>PURPOSE</u>
R-1224-A	1958	Hobbs, Monument and other community areas within Lea County Underground Water Basin.	Prohibits disposal of produced water in unlined pits.
R-2526	1963	Oil pools of Pennsylvanian and Wolfcamp geologic age, Lea County.	Prohibits disposal of produced water in unlined pits.
R-2788	1964	An area 12 miles in length within 2 miles of the Pecos River in Chaves County.	Prohibits disposal of produced water in unlined pits.
R-3164	1966	Vacuum Oil Field (NW of Hobbs) Lea County.	Prohibits disposal of produced water in unlined pits.

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<u>#</u>	<u>DATE</u>	<u>AREA</u>	<u>PURPOSE</u>
R-3221 (as amended)	1967	All of Lea, Eddy, Chaves and Roosevelt counties (effective 1969).	Prohibits disposal of produced water in unlined pits. Areas have been and can be specifically excepted from the general order after demonstration through formal OCD hearing of no protectable fresh water.
R-7940	1985	Defined "vulnerable" ground-water areas in the San Juan Basin, mainly along the San Juan, Animas and La Plata River valleys.	Prohibits disposal of produced water in unlined pits, with small volume exceptions dependent on salt concentration and depth to ground water.
R-7940-A	1986	All of San Juan Basin (San Juan, McKinley, Sandoval and Rio Arriba counties).	Requires permits for commercial surface disposal facilities and registration and approval of centralized surface disposal operations.

OIL CONSERVATION DIVISION
Organizational Chart By Responsibility

