PERFORMANCE AUDIT

OIL AND GAS CONSERVATION COMMISSION

A Report to the Arizona Legislature
By the Auditor General
September 1984
84-7

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OFFICE OF THE
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September 19, 1984

Members of the Arizona Legislature
The Honorable Bruce Babbitt, Governor
Mr. A. K. Doss, Executive Director
Oil and Gas Conservation Commission

Transmitted herewith is a report of the Auditor General, A Performance Audit of the Oil and Gas Conservation Commission. This report is in response to an April 27, 1983, resolution of the Joint Legislative Oversight Committee. The performance audit was conducted as a part of the Sunset Review set forth in A.R.S. §§41-2351 through 41-2379.

This performance audit report is submitted to the Arizona State Legislature for use in determining whether to continue the Oil and Gas Conservation Commission beyond its scheduled termination date of July 1, 1986. The report addresses the Commission's effectiveness in regulating oil and gas operations in Arizona and makes recommendations to: 1) improve the information available for issuing permits, 2) clarify policies for protecting groundwater, and 3) increase bond requirements.

My staff and I will be pleased to discuss or clarify items in the report.

Respectfully submitted,

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SUMMARY

The Office of the Auditor General has conducted a performance audit of the Arizona Oil and Gas Conservation Commission in response to a resolution of the Joint Legislative Budget Committee. This performance audit was conducted as part of the Sunset Review set forth in Arizona Revised Statutes (A.R.S.) §§41-2351 through 41-2379.

The Oil and Gas Conservation Commission (OGCC) regulates all oil, gas, helium, and geothermal wells, and oil and gas storage wells in Arizona. A.R.S. §27-502 establishes a state policy to conserve oil, gas and other natural resources, protect ownership rights and safeguard public health. OGCC executes this policy by reviewing and issuing permits to drill wells and monitoring drilling activity. In addition, OGCC maintains information on all wells under its jurisdiction and assists individuals seeking information on Arizona's petroleum resources.

The Oil and Gas Conservation Commission Does Not Obtain The Necessary Additional Information Before Issuing Drilling Permits (see page T3)

The Oil and Gas Conservation Commission does not obtain needed information on proposed drilling operations and groundwater location before approving applications for permits to drill. The Commission does not require all applicants to provide sufficient information on proposed operations, nor does it notify the Department of Water Resources (DWR) of proposed drilling until after the permits have been issued. Lack of sufficient information on proposed drilling operations and groundwater location and quality may reduce OGCC's effectiveness in ensuring safety and protecting groundwater and other natural resources.

OGCC should require all operators applying for drilling permits to submit drilling programs that provide specific information on drilling conditions, anticipated problems, and drilling operations and procedures. The Commission should also review information from DWR on water location and quality before issuing any permits to drill exploratory wells.

Policies For Protecting Groundwater Are Not Well Defined (see page 23)

Although groundwater is an important resource in Arizona's arid climate, OGCC rules and procedures do not provide clear guidance for making decisions on requirements to protect groundwater during oil and gas operations. Commission regulations stipulate the use of surface casing to protect water, but the Commission does not always enforce this requirement. Instead, OGCC relies on other methods, which may not be equally effective in protecting vital groundwater resources. The Commission needs to review its regulation requiring surface casing and either enforce it consistently or revise it based on clear definitions of fresh water and consistent criteria for evaluating alternative means of protection.

Bond Requirements For Single Oil and Gas Wells In Arizona Are Inadequate (see page 31)

Arizona's bonds requirements for single oil and gas wells are not adequate to ensure that wells are properly closed off when all operations are completed. Wells drilled for exploration and production can pose significant harm to groundwater, minerals and other natural resources if wells are not properly closed off and the area around a well site is not restored. Although bond requirements for multiple wells in Arizona appear to be adequate, current bond amounts do not cover the costs of closing off individual wells and restoring drilling sites deserted by owners. Increasing the individual bond requirement to $10,000 would ensure adequate funds to close most wells without discouraging exploratory drilling in Arizona.

TABLE OF CONTENTS

	Page
INTRODUCTION AND BACKGROUND	1
SUNSET FACTORS	7
FINDING I: THE OIL AND GAS CONSERVATION COMMISSION DOES NOT OBTAIN NECESSARY INFORMATION BEFORE ISSUING DRILLING PERMITS	13
Information On Drilling Operations And Groundwater Is Limited	13
Lack Of Information May Limit Regulatory Effectiveness	17
Additional Requirements Would Not Burden Industry	19
Recommendations	21
FINDING II: POLICIES FOR PROTECTING GROUNDWATER ARE NOT WELL DEFINED	23
OGCC Does Not Consistently Enforce Casing Requirements	23
Alternatives To Surface Casing May Not Be Adequate	26
New Regulations May Be Needed To Ensure Groundwater Protection	28
Recommendations	29
FINDING III: BOND REQUIREMENTS FOR SINGLE OIL AND GAS WELLS IN ARIZONA ARE INADEQUATE	31
Bonding Is Necessary To Protect Natural Resources	31
Current Bond Levels For Single Wells Are Too Low	33
Recommendations	36
OTHER PERTINENT INFORMATION	37
AREAS FOR FURTHER AUDIT WORK	39
AGENCY RESPONSE	41

LIST OF TABLES

Page

TABLE 1 - Oil And Gas Leases In Arizona, 1982 Estimate. 3

TABLE 2 - Oil And Gas Exploration In Arizona, 1980 Through 1983 . . . 3

TABLE 3 - Oil And Gas Conservation Commission Revenue And Expenditures, Fiscal Years 1979-80 Through 1983-84. 5

TABLE 4 - Bonding Requirements For Oil and Gas Wells In Selected States. 41

LIST OF FIGURES

Page

FIGURE 1 - Arizona Oil And Gas Production, 1963 Through 1983 2

INTRODUCTION AND BACKGROUND

The Office of the Auditor General has conducted a performance audit of the Arizona Oil and Gas Conservation Commission in response to a resolution of the Joint Legislative Budget Committee. This performance audit was conducted as part of the Sunset Review set forth in Arizona Revised Statutes (A.R.S.) §§41-2351 through 41-2379.

The Oil and Gas Conservation Commission (OGCC) regulates all oil, gas, helium, and geothermal wells, and oil and gas storage wells in Arizona. A.R.S. §27-502 establishes a state policy to conserve oil, gas, water and other natural resources, protect ownership rights and safeguard public health. OGCC executes this policy by reviewing and issuing drilling permits and monitoring drilling activity. In addition, OGCC maintains information on all wells under its jurisdiction and assists individuals seeking information on Arizona's petroleum resources.

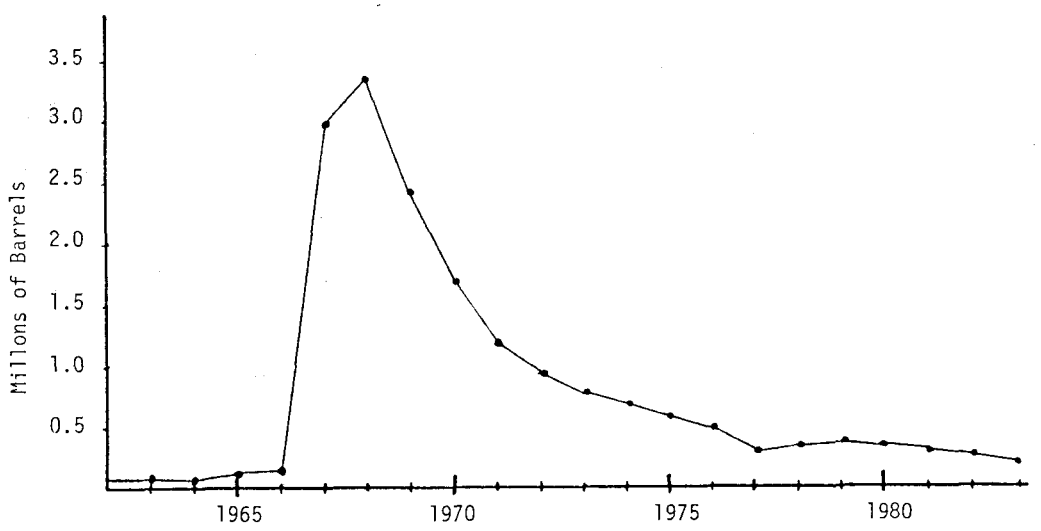
Oil and Gas Activity in Arizona

Arizona has been a site for oil and gas exploration since 1903, when the first exploratory hole was drilled in the Chino Valley area north of Prescott. More than 120 exploratory wells were drilled in Arizona before the first oil was discovered on the Navajo Indian Reservation in northeastern Arizona in 1954. All subsequent oil production in Arizona has occurred on the Navajo Reservation. Altogether, 731 oil and gas wells have been drilled in Arizona. Seventy-four wells have produced oil from 13 separate fields.

Arizona wells produced 18.6 million barrels of oil through the end of 1983. However, Arizona's annual oil production has never exceeded 1 percent of total U.S. production. Almost 90 percent of Arizona's production has come from the Dineh-bi-Keyah field, discovered on the Navajo Reservation in 1967. In 1968 this field produced almost 3.4 million barrels of oil, Arizona's highest annual yield. Annual production

from the field decreased to 196,883 barrels in 1983. Total annual production in Arizona has declined to 239,613 barrels in 1983 (Figure 1).

FIGURE 1
ARIZONA OIL AND GAS PRODUCTION
1963 THROUGH 1983



Source: Compiled from Oil and Gas Conservation Commission data

Despite the declining production, approximately 18 million acres, one-fourth of Arizona's total land area, are under oil and gas leases on federal, Indian, state and private lands (Table 1). Most leases are on federal or Indian land. All production is located on Indian land. Several federal agencies have primary responsibility for regulating wells drilled on federal and Indian lands. However, OGCC also has some responsibility for regulating these wells, in cooperation with federal authorities.

TABLE 1

OIL AND GAS LEASES IN ARIZONA
1982 ESTIMATE

	Acres	Percent
Federal	10,500,000	58%
State	2,500,000	14
Private	5,000,000	28
Total	18,000,000	100%

Source: Interstate Oil Compact Commission

Because Arizona has relatively few proven oil fields and little production, most oil drilling in the state is exploratory. An exploratory well is one drilled in an area that has no known oil production. Exploratory activity in Arizona has varied widely in recent years (Table 2). None of the 65 wells drilled since 1980 have identified new oil fields. The last new field was discovered in 1971. In contrast to Arizona, most drilling in major oil producing states such as Texas or California takes place on known oil fields.

TABLE 2

OIL AND GAS EXPLORATION IN ARIZONA
1980 THROUGH 1983

	1980	1981	1982	1983
Drilling permits issued	11	27	30	15
Wells drilled	9	18	26	12
Producing wells	0	6 (1)	1 (1)	1 (1)

(1) Wells drilled on existing fields

Source: Oil and Gas Conservation Commission

Development of OGCC

OGCC was established in 1959. The Commission consists of five members appointed by the Governor for 5-year terms. A.R.S. §27-514 requires that members be U.S. citizens and residents of Arizona for 5 years prior to their appointment. No more than three members may be of the same political party. In addition to the appointed members, the state land commissioner is an ex officio member of OGCC. Before 1959, the State Land Department regulated oil and gas operations in Arizona.

The Commission's role has changed since it was first established in 1959. Originally, OGCC felt its purpose was largely to promote the development of a petroleum industry in Arizona. More recently the Commission has emphasized regulation of critical activities and conservation. Revised rules added regulatory responsibilities in 1965 and 1971. Currently, OGCC staff states that protecting public health and natural resources are among its primary goals.

Growth of OGCC's regulatory role reflects the increased awareness of potential problems in oil and gas operations. Although the industry has existed since the late 19th century, oil and gas drilling and production technology has not always been equal to modern techniques. As a result, some of the early drilling resulted in problems in several states, such as leaking wells and groundwater contamination. Thus, some regulation is necessary to ensure that the industry follows proper procedures in seeking and producing oil and gas.

Personnel and Budget

OGCC has a staff of four full-time employees who carry out the daily operation of the Commission. The staff consists of an executive director, a director of enforcement, an administrative assistant and a secretary. The Commission's operating budget is appropriated from the general fund. A 5-year summary of revenues and expenditures is provided in Table 3.

TABLE 3

OIL AND GAS CONSERVATION COMMISSION REVENUE AND EXPENDITURES
FISCAL YEARS 1979-80 THROUGH 1983-84

	Actual 1979-80	Actual 1980-81	Actual 1981-82	Actual 1982-83	Estimated 1983-84
Full-time equivalency positions	5	5	4	4	4
Revenues:					
Permit fees	$ 175	$ 625	$ 2,025	$ 725	$ 1,250
Expenditures:					
Personal services	96,100	101,900	92,755	102,300	102,100
Employee related expenses	17,400	18,300	17,339	20,200	22,000
Professional and outside services	600	100	75	600	400
Travel					
In state	6,400	7,200	8,433	7,200	7,700
Out of state	1,500	2,300	2,245	900	0
Other operating expenses	16,200	16,600	14,314	8,400	4,000
Total	$138,200	$146,400	$135,161	$139,600	$136,200

Source: OGCC budget requests, 1979-80 through 1983-84

Audit Scope and Purpose

The purpose of this audit is to evaluate the need for and adequacy of regulation by the Oil and Gas Conservation Commission, as required by A.R.S. §§41-2351 through 41-2379. In addition, we examined three specific categories of Commission activities - issuing drilling permits, monitoring activity and enforcing regulations.

Our audit work suggests that, given the relatively small amount of exploration and production in Arizona, OGCC handles the on-site monitoring of oil and gas operations as well as any of the 12 other states we surveyed. Moreover, recent administrative changes have strengthened the Commission's ability to monitor drilling activity. With the exception of bond requirements (see Finding III, page 31), we found no major

enforcement problems. However, our audit work indicates the need to improve information available before drilling permits are issued and to review Commission requirements for casing wells.

The audit report presents findings in three specific areas.

- The adequacy of information available to OGCC for making decisions to issue drilling permits.
- The need to review OGCC regulations on groundwater protection.
- The adequacy of OGCC bond requirements.

In addition, we developed information on OGCC professional salaries. The section Other Pertinent Information presents this information.

Due to time constraints, we were unable to address one potential issue identified during our preliminary audit work. The section Areas for Further Audit Work describes this potential issue.

The Auditor General and staff express appreciation to the members of the Oil and Gas Conservation Commission, the executive director and staff for their cooperation and assistance during the audit.

SUNSET FACTORS

In accordance with Arizona Revised Statutes (A.R.S.) §41-2354, the Legislature should consider the following 12 factors in determining whether to continue or terminate the Oil and Gas Conservation Commission (OGCC).

1. Objective and purpose in establishing the Commission.

   OGCC's objectives encompass both regulation and promotion of oil, gas, helium and geothermal operations in Arizona. A.R.S. §27-502 establishes the Commission's basic functions. Generally these functions include:

   - Conserving oil and gas resources,
   - Protecting and adjusting ownership rights,
   - Promoting the development of oil and gas resources,
   - Encouraging a continuous and economical supply of oil and gas resources, and
   - Safeguarding the health, property and public welfare of citizens of the state.

2. Effectiveness with which the Commission has met its objective and purpose and the efficiency with which the Commission has operated.

   The Commission has been generally effective and efficient in meeting its objectives and purpose, but it needs to improve coordination with the Department of Water Resources. OGCC promptly reviews applications for drilling permits and closely monitors drilling operations. OGCC strengthened its procedures in 1982 to more effectively monitor critical aspects of drilling operations. Our examination of recent years' records found no evidence to indicate that Arizona's natural resources have been harmed by oil and gas operations. However, the Commission has not adequately coordinated the review of drilling applications with the Department of Water Resources to ensure that it has complete data on groundwater location before issuing permits (see page 15).

3. The extent to which the Commission has operated within the public interest.

OGCC has operated within the public interest by protecting Arizona's subsurface resources from hazards associated with drilling and production activities. OGCC's permit review and enforcement activities appear to reduce the likelihood of major environmental or public health threats in the development of oil, gas, helium and geothermal resources. However, the Commission needs to improve coordination with the Department of Water Resources (see page 13), and review its requirements for casing wells (see page 28).

4. The extent to which rules and regulations promulgated by the Commission are consistent with the legislative mandate.

OGCC rules and regulations appear to be consistent with the Commission's legislative mandate. The current rules and regulations were reviewed and approved by the Attorney General in 1982.

5. The extent to which the Commission has encouraged input from the public before promulgating its rules and regulations and the extent to which it has informed the public as to its actions and their expected impact on the public.

The Commission has properly informed the public about scheduled hearings in recent years. The Commission has held 57 hearings since 1957, all of which were properly publicized. However, OGCC has not prepared specific agendas for its regularly scheduled bimonthly meetings, thus limiting public awareness of the business before the Commission. OGCC's Attorney General representative informed the Commission in March 1984 that the Arizona open meeting law requires public agencies to identify specific business items on their meeting agendas. OGCC appears to be taking steps to comply with these requirements for its next meeting.

6. The extent to which the Commission has been able to investigate and resolve complaints which are within its jurisdiction.

OGCC receives virtually no complaints from outside sources. Most problems are identified through the Commission's monitoring program. A.R.S. §27-524.C requires the Commission to take action on violations within 10 days of their discovery. In most cases OGCC resolves problems before they become major. Our audit work disclosed only one apparent violation out of 214 permits issued since 1975 that continued beyond the 10 days allowed by law.

7. The extent to which the Attorney General or other applicable agency of the state government has the authority to prosecute actions under enabling legislation.

Under A.R.S. §27-521 the Attorney General is the attorney for the Commission and has full authority to prosecute actions under its enabling legislation. In emergencies, the Commission may obtain additional counsel with the Attorney General's consent. The Attorney General has the authority to use local sheriff and superior court personnel when violations necessitate such action.

8. The extent to which the Commission has addressed deficiencies in the enabling statutes which prevent it from fulfilling its statutory mandate.

OGCC has addressed deficiencies in its enabling statutes that prevent it from fulfilling its duties. According to the executive director, in 1982 the Commission supported House Bill 2350, which gave OGCC full responsibility for regulating oil, gas, helium and geothermal wells by excluding these wells from Arizona's Groundwater Act. Senate Bill 1348, passed in 1981 with Commission support, authorized the Commission to appoint an executive director. OGCC staff do not currently forsee any need for additional statutory changes.

9. The extent to which changes are necessary in the laws of the Commission to adequately comply with factors listed in the subsection.

Our audit work did not identify any necessary changes in the Commission's enabling legislation.

10. Extent to which termination of the Commission would significantly harm the public health, safety or welfare.

Terminating the Oil and Gas Conservation Commission would jeopardize public health and safety by eliminating a necessary control over drilling operations in Arizona. Although federal agencies would continue to regulate such activity on Arizona land controlled by the federal government, terminating OGCC would leave state and private lands without adequate protection from the potential hazards of oil and gas operations and would eliminate a strong state voice in federal agency decisions. Other agencies, such as the Department of Health Services, Department of Water Resources or the Arizona Game and Fish Department, may be able to supply some of the oversight now provided by OGCC, but none of these agencies have sufficient expertise in oil and gas operations to ensure responsible development of Arizona's oil and gas resources.

11. The extent to which the level of regulation exercised by the Commission is appropriate and whether less or more stringent levels of regulation would be appropriate.

Although the overall level of OGCC regulation is appropriate, the regulation requiring surface casing to protect fresh water may not be appropriate. Usable fresh water is often located in deep aquifers (below 400 feet) in Arizona, and surface casing to protect this water may be prohibitively expensive compared with other methods. OGCC should review this regulation to determine if it is still valid (see page 28).

12. The extent to which the Commission has used private contractors in the performance of its duties and how effective use of private contractors could be accomplished.

OGCC has not used outside private consultants in recent years. The Commission does not usually hire private consultants in the performance of its duties. OGCC's executive director did not idenfity any cases in which consultants were used. Private petroleum engineers could be used part time if oil activity increased so that OGCC staff could no longer handle the work load. According to the executive director, OGCC's enabling statutes allow the Commission to hire outside consultants.

FINDING I

THE OIL AND GAS CONSERVATION COMMISSION DOES NOT OBTAIN NECESSARY INFORMATION BEFORE ISSUING DRILLING PERMITS

The Oil and Gas Conservation Commission (OGCC) does not obtain all the necessary information on proposed drilling operations and groundwater location from operators and the Department of Water Resources (DWR) before approving applications for permits to drill. The Commission does not require applicants to provide sufficient information on proposed operations, nor does it notify DWR of proposed drilling until after the permits have been issued. Lack of sufficient information on proposed drilling operations and groundwater location and quality may reduce OGCC's effectiveness in ensuring safety and protecting groundwater and other natural resources. Requiring operators to submit drilling programs and obtaining groundwater information from DWR before issuing permits would increase OGCC's regulatory effectiveness without discouraging exploratory drilling in Arizona.

One of OGCC's major functions is issuing permits to drill oil, gas, helium and geothermal wells. Any operator intending to drill in Arizona must submit an application for permit to drill to OGCC for approval. Each application identifies: 1) the type of well to be drilled, 2) location, 3) proposed depth, and 4) casing program. OGCC must determine if the proposed specifications, especially the casing program, are adequate to meet Arizona requirements for conservation, environmental and natural resource protection, ownership rights and safety at the specific location. If the proposal is not adequate, OGCC can add permit requirements to address any anticipated problems.

Information On Drilling Operations And Groundwater Is Limited

Ensuring safe operations and protecting groundwater are two of OGCC's primary objectives, but the Commission often lacks the information necessary to ensure that drilling operations meet these objectives.

Applicants are required to submit only minimal data on proposed drilling operations. In addition, OGCC does not allow the Department of Water Resources (DWR) sufficient time to review applications for permits to drill and provide groundwater information before permits are issued. As a result, OGCC may lack essential information about proposed drilling operations and groundwater location and quality.

Application Information Inadequate - OGCC currently receives only limited information on proposed drilling operations. The Commission does not require all operators to submit drilling programs that provide specific information. Without specific details on an operator's plans, it is difficult to fully assess the plan's adequacy. Obtaining this information would allow OGCC to more effectively set necessary stipulations before drilling begins.

OGCC only requires operators to provide the limited information requested on the application for permit to drill - well location, proposed depth, casing program, and drilling method. This information is usually sufficient in areas where previous drilling has taken place, because OGCC can use existing well records to evaluate drilling conditions and potential problems. However, most drilling in Arizona is exploratory and takes place in areas where limited or no records exist. As a result, assessing the adequacy of drilling proposals with the limited information on the applications is often difficult. This problem occurs only for exploratory wells drilled on state and private land, because all operators drilling on federal land must submit detailed drilling programs to the Bureau of Land Management, which forwards them to OGCC. Some operators also voluntarily submit detailed plans for operations on nonfederal land.*

* Drilling programs are prepared by operators and contain much greater detail on expected drilling conditions and proposed operations than applications for permits to drill. Although drilling programs vary in detail, each generally provides an analysis of wells within a specified radius of the proposed location and other information gathered from local sources. Drilling programs also provide diagrams of blowout prevention equipment. Diagrams are essential for evaluating the adequacy of this equipment. The equipment is generally categorized by class but the different classes are not standardized.

Without requiring detailed drilling programs from operators OGCC may lack the information needed to ensure safety and resource protection during drilling. OGCC does not always receive from operators important information typically contained in drilling programs, such as analyses of potential problems, how the operator will attempt to mitigate these problems, and proposed weight and content of drilling fluids. OGCC has some information in its files, yet requiring the information from operators would guarantee all known pertinent information is examined. For example, OGCC needs to obtain a list of the drilling fluids so the chemicals in the fluid can be anlayzed. OGCC should carefully review applications for permits to drill with fluids that contain asbestos, chromates or other potentially toxic materials.*

Groundwater Information Not Requested - Although OGCC declares protection of groundwater to be a primary regulatory goal, it does not obtain needed groundwater information from DWR before issuing permits. OGCC has some information on groundwater location and quality, but has not allowed DWR sufficient time to comment on proposals and provide groundwater information before issuing permits for exploratory wells. Information on groundwater location and quality is crucial for effective protection of this vital resource during exploratory drilling. Groundwater information is also helpful in ensuring safety and can aid the operator during drilling operations.

Protecting groundwater is very important in Arizona's desert climate. Approximately 60 percent of the state's drinking water comes from groundwater, and in many areas groundwater is the sole source of drinking water. However, water location is often difficult to estimate because major freshwater aquifers are not at uniform depths throughout the state. Knowledge of water location, geology and quality prior to drilling

* DWR prohibits chrome and asbestos additives in fluids used for drilling water wells in Arizona. Washington, Oregon and some counties in California also prohibit the use of toxic substances by oil well drillers.

would allow OGCC to ensure that an operator's drilling plan is sufficient to prevent contamination of important freshwater aquifers.

OGCC issues permits to drill before DWR has an opportunity to review and comment on the proposals. As Arizona's lead agency for water management, DWR has information on groundwater location and quality for more than 85 percent of the state's land area. OGCC sends copies of all applications for permits to drill to DWR, but does not wait for DWR input before issuing drilling permits. Instead, OGCC obtains most of its information from its previous experience and other sources. OGCC records show that some drillers have found water unexpectedly. In contrast, all eight western states surveyed and the federal government obtain groundwater information from the appropriate state agency before approving permits for exploratory wells in areas where groundwater location is not firmly established.

Without accurate information on groundwater location and quality, OGCC cannot assess the adequacy of a proposed surface casing program. Determining proper surface casing depth is one of the most important decisions OGCC staff makes during the application review process. Adequate surface casing is important because it prevents contamination of fresh water, oil and gas during and after drilling, and anchors the well's safety equipment. The depth of surface casing necessarily varies with area conditions, especially groundwater location.

Surface casing protects groundwater by preventing substances from different geologic formations from commingling through the well bore. Any fluids, such as water, located in formations above the lowest level of the surface casing will be effectively and permanently sealed off. All fresh water can be protected by requiring surface casing to be deeper than the water. Without surface casing or other preventive measures, poor quality water in deep aquifers can be forced up the well bore under high pressures and contaminate shallower freshwater aquifers.

Lack Of Information May Limit Regulatory Effectiveness

Limited information on drilling operations and groundwater location may hinder OGCC's ability to effectively regulate oil and gas activity within Arizona. Without complete, accurate information OGCC cannot adequately review applications for permits to drill or identify and rectify potential problems before issuing permits. OGCC's inability to establish adequate preventive measures may also reduce the effectiveness of recent improvements in its monitoring program. Although no major drilling problems have occurred in Arizona due to oil and gas operations, current activity is relatively low and future expansion would significantly increase the need for comprehensive review before permits are issued.

Lack of Effective Preventive Measures - Without accurate, complete information OGCC cannot effectively establish specific standards to prevent major problems. Preventive measures provide more effective protection to natural resources and drilling crews than actions taken after the fact. However, Arizona laws and regulations do not specify preventive requirements and drilling conditions are too varied to permit OGCC to establish general or statewide preventive requirements.

The seriousness of potential problems and the high cost of drilling operations indicate that it is more effective to address potential problems with preventive regulation than to respond to emergencies or problems as they occur. Damage to natural resources or the environment caused by improper drilling procedures may be undetected for many years and may be irreversible. Other potential drilling problems, such as blowouts, can be disastrous and costly. In addition, preventive regulations allow drillers to more accurately assess their costs before beginning operations.

Arizona's oil and gas statutes, rules and regulations are very broad to allow OGCC to tailor drilling requirements for each location's specific conditions. Drilling requirements cannot apply statewide because conditions vary greatly throughout Arizona. To ensure effective regulation, OGCC must review each drilling proposal individually and assess the adequacy of the specifications based on available information about area conditions and the proposed operation. OGCC approves exact specifications for various drilling requirements such as surface casing, blowout prevention equipment and well closure. In addition, the Commission may establish requirements for site restoration, plugging, drilling fluid content and viscosity, and drilling methods.

Obtaining and evaluating information from all sources is also important because Arizona is an exploratory state without an established information base or complete well record information. Therefore, thorough review of all information available from the operator and other governmental and local sources is more critical than in producing states where most permit requests are for known fields. In these states the application review is routine, since area conditions such as water location and pressures can be calculated with much greater certainty and general standards can be developed. In exploratory states such as Arizona, the application review process is more complex and crucial since conditions are unknown and must be evaluated separately for most wells.

Impact on Monitoring - Failure to obtain drilling programs and groundwater information may reduce the effectiveness of OGCC's monitoring program improvements. OGCC monitors surface casing and plugging operations (both crucial to groundwater protection) and has recently begun issuing reports on proposed operations to operators. However, lack of sufficient information may reduce the overall effectiveness of both actions in preventing groundwater contamination and ensuring safety.

Monitoring casing and plugging of all wells drilled in Arizona is critical to protecting groundwater. However, if OGCC does not obtain adequate groundwater information before issuing permits and does not know water location, the effectiveness of monitoring is greatly reduced. For example, if surface casing were approved to a depth of 300 feet but fresh water extended to 500 feet, ensuring that 300 feet of casing were laid would not protect groundwater. The same is true for plugging operations. Each step in regulation builds upon the previous steps. Compliance with incorrect stipulations based on faulty information limits effective regulation.

OGCC recently began issuing a report on proposed operations along with each drilling permit. This report states the conditions upon which the permit has been issued, and can increase OGCC's regulatory capability. This report allows OGCC to impose any additional stipulations it deems necessary for each operation. However, the worth of these reports has been limited by the incomplete information evaluated during permit application review. Thus far, the stipulations of the reports have been very general. For example, operators are instructed to use ". . . heavy and sufficient drilling mud." Without all available information on groundwater and proposed operations OGCC cannot establish more specific conditions to properly regulate each well drilled in the state.

Additional Requirements Would Not Burden Industry

Requiring operators to submit drilling programs and lengthening the permit review process to obtain groundwater information would improve regulatory effectiveness without deterring exploratory drilling in Arizona. Drilling programs are now required by the federal government and many states. Although obtaining groundwater information may lengthen permit review, the additional review time would not burden applicants because OGCC's current review time is exceptionally short. In addition, increased information may aid the industry by helping operators better plan drilling activities.

Requiring operators to submit drilling programs is not a burden to the oil and gas industry. Approximately half the states and the federal government require some type of drilling program. Most operators must already prepare drilling programs so out-of-state drilling contractors who are unfamiliar with Arizona's geology will know what drilling specifications and procedures to follow. Most companies surveyed that recently drilled in Arizona do not feel that preparing drilling programs is a deterrent to exploratory activity.

Increasing the permit review time to allow DWR to comment on proposals and provide information on groundwater location would not discourage exploratory drilling. OGCC currently issues most drilling permits within 1 day. However, many western states and the federal government have longer permit review periods, which do not appear to impede drilling. All the eight western states surveyed and the federal government obtain water information before issuing permits, to ensure that permit requirements are adequate. Much drilling in Arizona is done on federal land, where operators must wait up to 30 days for permits. Increasing OGCC's permit review time would not increase industry drilling costs as long as drillers were aware of the review period before submitting applications.

In addition, knowledge of water location can aid the operators. Fluid viscosity must be increased if major water aquifers are encountered during drilling. If water location is unknown, operators use heavier fluids to prevent uncontrolled flows if water is suddenly found. If operators are aware of the depth at which water will be encountered they can use lighter drilling fluids and still protect groundwater. Drilling with heavy fluid is more expensive, more time consuming, and can cause loss of circulation and increase drilling costs.

CONCLUSION

OGCC has issued drilling permits before obtaining complete drilling programs from operators or receiving groundwater information from DWR. This information is necessary to help OGCC develop adequate requirements to ensure groundwater protection and safety during drilling. Failure to review this information before issuing permits may reduce the effectiveness of OGCC's monitoring program. Obtaining groundwater information from DWR and drilling programs from operators would increase OGCC's regulatory effectiveness and would not be a deterrent to exploratory drilling in Arizona.

RECOMMENDATIONS

1. OGCC should require all operators applying for permits to drill exploratory wells to submit drilling programs, which should include at minimum:
   - review of nearby wells,
   - potential drilling problems in the proposal area and how these will be addressed,
   - drilling fluids program,
   - casing program, and
   - blowout prevention equipment specifications and method of installation, including a diagram.

2. OGCC should coordinate with DWR to devise a procedure whereby OGCC can obtain and review information on water location and quality before issuing any permits to drill exploratory wells.

FINDING II

POLICIES FOR PROTECTING GROUNDWATER ARE NOT WELL DEFINED

Oil and Gas Conservation Commission (OGCC) rules and procedures do not provide clear guidelines for decisions on requirements to protect groundwater during oil and gas operations. Although Commission regulations specify use of surface casing to protect groundwater, OGCC does not always enforce this requirement. Instead, the Commission relies on other methods, which may not be equally effective in protecting vital groundwater resources. OGCC needs to review its regulations to determine what constitutes adequate groundwater protection.

OGCC Does Not Consistently Enforce Casing Requirements

OGCC does not always require drillers to case wells in accordance with its regulations. Commission regulations specify that drillers must use surface casing to protect groundwater. However, the Commission allowed three operators to drill through major freshwater aquifers in recent years without the required casing. According to OGCC, the casing regulation is overly broad and would deter oil exploration by unnecessarily increasing drilling costs.*

Casing Requirement - Both Commission regulations and the conditions included with the drilling permits specify that surface casing be used to ensure safety and protect groundwater. When operators file applications for permits to drill they must specify the depth to which they will cement the surface casing pipe. The amount of casing needed to ensure safety and protect groundwater depends on the characteristics of the drill site. As stated in OGCC regulation R 12-7-110:

* See page 16 for an explanation of surface casing.

> "In areas where pressures and formations are unknown, sufficient surface casing shall be run to reach a depth below all known or reasonably estimated fresh water levels to prevent blowouts or uncontrolled flows . . . In areas where subsurface conditions have been established by drilling experience, surface casing . . . shall be set and cemented . . . at a depth sufficient to protect all fresh water and to insure against blowouts and uncontrolled flows." (emphasis added)

OGCC also includes a general casing requirement in the report on proposed operations issued with each drilling permit. The report sets forth the conditions under which OGCC authorizes the drilling to take place and states (in part) that "the proposal is approved provided the well is cased and cemented . . . in such a manner as to protect all zones that contain oil, gas, or fresh water, and to provide well control during operations." (emphasis added)

Requirement Not Always Enforced - Although OGCC has consistently required enough surface casing to ensure safe drilling operations, the Commission has not required all operators to case wells to the depth needed to protect fresh water. In exploratory areas where drilling conditions and water levels are unknown, the casing regulation ensures safety during drilling operations. Surface casing anchors the well's safety equipment and ensures that subsurface pressure encountered during drilling does not result in dangerous and costly blowouts. OGCC usually requires operators to surface case 10 percent of the well's proposed total depth to ensure safe operations. This policy seems effective. No major oil and gas related accidents have occurred in Arizona since OGCC's inception.

However, OGCC does not always require operators to set enough casing to protect freshwater aquifers. OGCC allowed three operators to drill exploratory wells between 1981 and 1983 without setting enough casing to protect fresh water. Two of these wells passed through the Coconino aquifer, which is more than 1,000 feet deep. Because the area's shallower groundwater sources have been polluted by septic tank discharges, the Coconino aquifer is and will continue to be a major supplier of the area's drinking water.

When OGCC issued the first of the permits to drill through the Coconino aquifer, the Commission approved the application based on safety requirements and called for only 200 feet of surface casing. Upon receiving a copy of the application, the Department of Water Resources (DWR) informed OGCC of the aquifer's location and importance and requested the Commission to require sufficient casing to ensure water protection. Although OGCC told DWR that it informed the operators that 1,500 feet of surface casing might be required, the Commission did not formally change the casing requirement. Consequently, the operator drilled to 2,132 feet but only cased 330 feet of the well, despite the fact that fresh water was known to exist below 1,000 feet.*

Reasons For Nonenforcement - OGCC cites two reasons for not enforcing its casing regulation. According to OGCC, the surface casing regulation is overly broad and increases drilling costs. OGCC does not always enforce the regulation because it would mean protecting all fresh groundwater, regardless of its importance. OGCC also feels that requiring surface casing to protect all water is an unnecessary expense because advanced drilling technology allows drillers to protect groundwater effectively with less costly methods.

OGCC does not enforce its surface casing requirement because it feels the regulation does not clearly define what water should be protected. OGCC appears correct in its belief that requiring surface casing sufficient to protect all fresh water can be unnecessarily expensive. Some fresh water may not be usable, for example, because of its remote location, extreme depth, poor aquifer permeability, limited quantity or poor quality. Requiring operators to set surface casing to protect these aquifers would be unnecessarily burdensome. On the other hand, DWR also appears correct in insisting that defined water supplies that are critical for current or future use be fully protected during oil and gas operations.

* The well found no oil and was fully plugged with cement at the end of drilling operations.

Unlike federal and other states' agencies, OGCC does not define what water should be protected. The federal government and many states define fresh water more specifically, based on its actual or potential use. For example, the federal government only requires protection of fresh water that is not too saline and therefore economically accessible. Other states specify that certain water quality levels must be maintained or require only the top fresh water aquifer in an area to be surface cased. Adopting more precise criteria for protecting fresh water in Arizona would be helpful, but widely varying groundwater conditions throughout the state necessitate flexible standards to meet local conditions.

According to OGCC, deep surface casing is unnecessary because other, less expensive methods are available to protect groundwater.* The primary alternative method is using heavy drilling fluids, which act as a barrier to keep substances confined to their respective strata during drilling. Other methods include using production casing if oil is found and plugging water-bearing zones when wells are abandoned. By requiring operators to use these other techniques, OGCC feels that it can adequately protect groundwater while minimizing the costs of drilling for oil and gas in Arizona.

Alternatives To Surface Casing May Not Be Adequate

Although OGCC has relied on alternative methods to protect groundwater, these methods may not be as effective as surface casing. Professionals in hydrology and exploration engineering disagree on the need for casing and the effectiveness of alternatives to surface casing. Even if the alternatives to casing were universally accepted as effective, OGCC would often lack the criterion and information needed to ensure their effective implementation.

* Surface casing costs vary with the economy, drilling location and the type of casing used, but generally are thousands of dollars. For example, at $7 per foot, 1,500 feet of surface casing will cost $10,500 for the pipe alone. Other costs include labor, equipment and cement. This additional expense may impede exploratory drilling because few exploratory wells produce profitable quantities of oil.

No Agreement on Effectiveness - Professionals in oil and gas exploration and water management disagree on how to balance the need for water protection against drilling costs. While surface casing is recognized as the most effective means of ensuring full protection, OGCC staff contends that it is not needed below the depth required for well safety during drilling. The Commission feels that drilling technology has advanced enough so that other, less expensive methods can effectively protect groundwater. DWR hydrologists also feel that alternate methods are often adequate, and agree with the vast majority of OGCC casing decisions. However, DWR feels that sufficient surface casing should be used (as required by OGCC's current regulation) when wells are drilled through well-defined, major aquifers, such as the Coconino, which provide or will provide much of an area's drinking water.

OGCC has not followed consistent criteria for determining which methods of groundwater protection should be used to protect different categories of water. Although OGCC claims its current regulation is unnecessarily expensive to drillers, the Commission has never determined the amount of surface casing that can be reasonably required based on aquifer importance, drilling costs, site location, or other critical factors. The 10 percent rule that OGCC uses to ensure safety does not ensure groundwater protection because many major aquifers in Arizona are very deep. OGCC has not used economic accessibility of groundwater as the criterion for determining surface casing depth. This criterion would have required approximately 1,500 feet of surface casing to protect the Coconino aquifer. OGCC claims that requiring this much surface casing could deter drilling, but it has not designated how much casing an operator can reasonably be expected to set when drilling an exploratory well. OGCC claims that it would require 400 feet of casing on a 1,500 foot well (27 percent) to protect known groundwater, but no criteria exist for ensuring that casing requirements are consistent between permits. Although OGCC feels that 1,500 feet of casing would be excessive, some wells drilled in Arizona have had more than 1,000 feet of surface casing.

Lack of Critical Information and Requirements - Even if alternatives to surface casing, such as use of heavy drilling fluids, were considered equally effective in protecting groundwater, OGCC cannot ensure their effective implementation. As noted in Finding I (page 13), OGCC does not always obtain sufficient information on groundwater and drilling specifications. In addition, OGCC does not establish specific standards to ensure that operators use drilling fluids correctly, in a way most conducive to groundwater protection.

New Regulations May Be Needed To Ensure Groundwater Protection

OGCC needs to review its regulations and policies on groundwater protection during oil and gas operations. If current regulations are overly broad and impose unnecessarily high costs on drillers, OGCC should revise the regulations to define the extent to which groundwater must be protected and the appropriate procedures for doing so. Although professionals do not agree on all the technical questions involved, OGCC could solicit input from the various parties and establish criteria for ensuring adequate groundwater protection in each case. The Commission should then develop: 1) a definition of fresh water based on its importance and use in Arizona, 2) appropriate procedures for protecting water for current and future use, and 3) criteria for determining what means are appropriate to protect the various categories of groundwater.

CONCLUSION

OGCC's policies for protecting groundwater during oil and gas operations are not well defined. OGCC does not consistently enforce its current water protection regulations, and relies on alternative methods of protection that may not be as effective as surface casing. The Commission needs to review its regulation requiring surface casing and either enforce it consistently or revise it based on clear definitions of fresh water and consistent criteria for evaluating alternative means of protection.

RECOMMENDATIONS

1. OGCC should review its current regulation (R 12-7-110) requiring surface casing to protect groundwater, to determine if it is unnecessarily expensive compared with alternative methods. As part of its review, OGCC should consult with other public agencies that share responsibility for protecting groundwater, and representatives of the oil and gas industry.

2. If OGCC determines that regulation R 12-7-110 is no longer appropriate, the Commission should promulgate new regulations that: 1) clearly define fresh water to be protected, 2) identify the most effective procedures for ensuring protection, and 3) specify the criteria for selecting the appropriate procedures.

3. If OGCC determines that regulation R 12-7-110 is appropriate, the Commission should obtain the information recommended in Finding I to determine the amount of casing needed to protect fresh water and include the specific depth of casing required in each operator's report on proposed operations.

FINDING III

BOND REQUIREMENTS FOR SINGLE OIL AND GAS WELLS IN ARIZONA ARE INADEQUATE

Arizona's bond requirement for single oil and gas well are not adequate to ensure that wells are properly closed off when operations cease. Wells drilled for exploration and production can pose significant harm to groundwater, minerals and other natural resources if wells are not properly closed off and the area around the well site not restored. Current bond amounts in Arizona do not cover the costs of closing off wells and restoring deserted drill sites.

State law requires owners to close off or plug and abandon wells at the end of operations. A well owner must plug the well hole and abandon the well site after drilling or production. Plugging a well consists of filling the well hole with cement and other very heavy materials to prevent pollution of subsurface resources. To ensure that plugging occurs, Oil and Gas Conservation Commission (OGCC) rules and regulations and Arizona statutes require all companies to submit bonds before drilling wells in Arizona. OGCC regulations require a bond of $5,000 for each individual oil, gas, or helium well or a $25,000 blanket bond to cover all such wells a company drills in Arizona. Arizona Revised Statutes (A.R.S.) §27-654 also requires individual well bonds of at least $5,000 or blanket bonds of at least $25,000 for all geothermal wells.

Bonding Is Necessary To Protect Natural Resources

Requiring drillers to post bonds before drilling oil, gas or geothermal wells in Arizona is intended to ensure that OGCC will be able to protect natural resources. Well owners must properly close off and plug wells to prevent contamination of subsurface resources. However, proper plugging is expensive and the oil industry in Arizona is highly speculative. As a result, well owners may lack the funds to plug their wells.

Proper Plugging Necessary - Contamination of groundwater, oil, gas and other natural resources can result if wells are left unplugged. When a well is drilled it passes through various geological layers. Water, minerals, oil or gas may be located at different layers under the surface. If a well is not properly plugged, substances can move among layers. For example, poor quality water or small amounts of oil and gas may travel through a well hole under pressure and contaminate resources, particularly fresh water.

States with histories of oil and gas production such as California, Texas and New York have experienced problems with older wells. The problems result partly from the lack of knowledge about groundwater location in the early 1900s, and partly from poor plugging. Consequently, some older wells in these states now leak. According to officials who have worked in California, the state has had to demolish houses to stop contamination from wells located under these properties. Texas and New York have also had problems with resources from older wells leaking into groundwater. For example, in New York gas from old, shallow wells is leaking into shallow groundwater aquifers. Both states have established emergency funds to plug these wells.

Bonds Needed to Ensure Plugging - Bonds are necessary to prevent pollution problems. Because oil exploration is speculative, a company may go bankrupt before closing off a well. Unless the state can immediately plug a well, the well may remain a potential hazard during administrative or court proceedings to obtain needed funds.

Oil and gas exploration is a speculative business, especially in Arizona where few known oil fields exist. Companies can spend hundreds of thousands of dollars to drill wells and discover no oil or gas. For smaller companies the costs of drilling may result in severe monetary problems or bankruptcy, leaving them with no funds to properly close the well. Even in states with substantial oil production, companies may encounter serious financial difficulties. For example, in 1983, 80 percent of the 1,465 bankruptcies in Oklahoma were oil and gas related

companies. Although most drillers plug wells immediately after completing operations, at least one Arizona well owner is currently out of money and therefore cannot afford to plug a well. According to OGCC staff, the well poses no immediate danger so the Commission has not invoked the owner's bond to plug the well.

Bonding is particularly important on state and private land in Arizona. The federal government requires its own bonds on federal lands in addition to OGCC bonds. Thus, funds would be available for closing wells on federal lands even if Arizona required no bond. On state and private lands, however, the OGCC bond is the only funding available if a driller fails to properly plug and abandon a well.

Current Bond Levels For Single Wells Are Too Low

The cost of plugging the average well in Arizona is more than the current state requirement for an individual well bond. Although companies are required to post a bond of $5,000 for each individual well, plugging an average well in Arizona may cost considerably more. Arizona bond requirements are among the lowest in the United States. Arizona could increase the individual bond requirements to meet plugging costs without discouraging most prospective drillers.

Bonds Not Adequate to Meet Plugging Cost - The $5,000 bond requirement for individual wells is less than the cost to plug the average well in Arizona. The current amount was set in 1965, but OGCC staff estimated in 1981 that the cost to plug an average well (5,000 feet deep) was approximately $10,000. However a 5,865 foot well in Apache County recently cost over $20,000 to plug and abandon. Thus, the $5,000 bond available to OGCC may not be adequate to close off a well and restore the site if the owner fails to do so.

Other Bonds Higher - The federal government and several other states require higher bonds than Arizona. The federal government has variable bond rates for individual wells depending on depth. The variable rate for

a typical well is between $5,000 and $10,000. The federal government usually requires the maximum bond of $10,000. Bond requirements in about half the Interstate Oil Compact Commission* states are also higher than Arizona's requirement for single wells. Many states also have an emergency fund, derived either from some form of production tax on oil operators or money received from the state. This money is used to plug wells that would otherwise be left unplugged.

TABLE 4

BONDING REQUIREMENTS FOR

OIL AND GAS WELLS IN SELECTED STATES

	Bond Requirement		
State	Single Well	Statewide Bond	Emergency Fund
Arizona	$ 5,000	$ 25,000	No
Arkansas	15,000	none	Yes
California	10,000 - 25,000 (1)	100,000	Yes
Colorado	5,000	30,000	No
Louisiana	none	200,000 maximum	No
Nevada	10,000	50,000	No
New Mexico	5,000 - 12,500 (1)	50,000	Yes
New York	2,000	8,000 (1)	Yes
Oklahoma	none	25,000	Yes
Oregon	100,000	100,000	No
Texas	none	none	Yes
Utah	10,000	50,000	No
Washington	50,000	250,000	No

(1) Officials contacted indicated that this requirement is not adequate.

Source: Auditor General state survey

* The Interstate Oil Compact Commission was created in 1935 to improve the conservation of domestic oil and gas. The Commission advises its 36 member states on oil and gas matters taking place at both the federal and state levels.

All the states surveyed by Auditor General staff offered a greater degree of protection than Arizona. All 12 of the states surveyed have higher individual or blanket bond requirements, or have established an emergency fund.*

Six of the 12 states surveyed require individual well bonds that exceed Arizona's requirement. Of the remaining six, one state requires a variable bond between $5,000 and $12,500, two states rely on statewide rather than individual well bonds, and one state relies on an emergency fund. Only two states, New York and Colorado, have bonds lower than or equal to Arizona's. However, New York has an emergency fund and Colorado requires a higher statewide bond than Arizona.

Higher Bond Will Not Discourage Exploration - Increasing the individual well bond to a minimum of $10,000 is necessary to meet plugging costs. Since the cost of obtaining a higher bond is small, increasing the bond would not have an adverse effect on oil exploration in Arizona.

Because drilling an oil or gas well in Arizona is very expensive, the minimal additional cost of the $10,000 bond is not likely to discourage most drillers. One company spent over $400,000 to drill a well in Arizona. Another company spent $30,000,000 on all of its drilling activity in Arizona. In contrast, the additional bonding cost to most companies surveyed by Auditor General staff would be only a few hundred dollars.

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* Auditor General staff contacted officials responsible for oil and gas regulation in 12 states. States were selected to represent different levels and histories of drilling and production, and varying geography, geology, and regulation.

Higher bond requirements have not discouraged drilling on the Navajo Indian Reservation, where most drilling in Arizona takes place. Owners are required to pay for an OGCC bond, a federal bond of at least $10,000, as well as pay permit fees to both the federal government and OGCC. The higher cost of drilling on the Navajo Indian Reservation has not curtailed drilling operations. Therefore, a reasonable increase in the state bond requirement would not hamper exploratory drilling.

CONCLUSION

Bond levels in Arizona for oil, gas, helium and geothermal wells are inadequate. Unplugged wells can pollute groundwater, minerals and other resources. Failure to restore a well site may cause erosion. Current bond requirements for individual wells do not ensure that OGCC will have sufficient funds, if necessary, to close wells and protect natural resources from contamination. Increasing the individual bond requirement to $10,000 would ensure adequate funds to close wells but would not discourage exploratory drilling in Arizona.

RECOMMENDATIONS

1. OGCC should revise its rules and regulations to increase individual well bonds for all wells under its jurisdiction to $10,000.

2. OGCC should periodically review its bond requirements to ensure that bonds are adequate to cover the costs of closing wells.

OTHER PERTINENT INFORMATION

OIL AND GAS CONSERVATION COMMISSION PROFESSIONAL SALARIES

The salaries offered to professional staff at the Oil and Gas Conservation Commission (OGCC) may not be adequate to attract and retain qualified personnel. Salaries appear low compared with other states and the private sector. Such conditions could preclude Arizona from attracting qualified people in the future.

The Auditor General staff conducted a survey of 12 oil producing states in 1984 and found that most of those states pay oil and gas employees higher salaries than Arizona offers. Of the ten states that provided salary information, eight pay their supervisory staff and directors more than Arizona pays OGCC personnel. Only two states surveyed, Oklahoma and Oregon, pay their state oil and gas personnel less than Arizona.

California pays its supervisory field inspectors up to $15,000 more than Arizona. Louisiana and New Mexico pay their supervisory staff up to $10,000 more than Arizona pays its enforcement director. Nevada and Texas pay their executive directors approximately $8,000 more than Arizona offers, while New York, Colorado and Utah pay their directors $14,000 more than Arizona pays its executive director.

Arizona OGCC salaries are also less than those offered for comparable experience in the private sector. In 1982 the Interstate Oil Compact Commission conducted a salary survey of five states, and found substantial differences in 1981 salaries between the public and private sectors for oil and gas professionals. For example, starting salaries for state personnel were between $18,000 and $29,000 for recent college graduates, and private industry salaries began at $29,000. After 5 years of employment, state salaries ranged from $22,000 to $34,000, while private companies offered an average of $42,000. The private sector paid professionals with 20 years of experience average salaries of $69,000. In

contrast, OGCC salaries for both its professionals, each with more than 20 years of experience, are less than $38,000.

Currently the staff at OGCC consists of two knowledgeable individuals with many years of oil industry experience. However, attracting these qualified personnel was difficult. OGCC had only two applicants for its executive director's position when it became vacant in 1981. The position of enforcement director remained open for 9 months before being filled. Both OGCC staff members assumed their current positions after retiring from other employment.

Should a need arise, OGCC may have difficulty replacing its professional staff. Furthermore, if oil and gas related activity increases significantly in Arizona, OGCC may need additional staff to handle the additional work load. Should a surge in drilling ventures increase nationwide, OGCC may be competing with private industry for the needed personnel. Since Arizona's OGCC salaries are considerably less than private industry salaries, OGCC may not be able to attract the necessary qualified personnel.

AREAS FOR FURTHER AUDIT WORK

During the course of the audit we identified one potential issue that we were unable to complete due to time constraints. This issue is an area for further audit work.

- Are drilling permit fees adequate?
  The Oil and Gas Conservation Commission (OGCC) charges a $25 permit fee for each application for permit to drill. Our preliminary audit work indicates that the $25 fee, which has not changed since 1952, may not always cover all costs of monitoring a well as it is drilled. Of the 36 states that are members of the Interstate Oil Compact Commission, 25 have higher permit fees than Arizona. Further audit work is needed to fully document the costs of OGCC's monitoring activities and compare these costs to receipts from permit fees.

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SEP 18 84
AUDITOR GENERAL

September 17, 1984

TO: Auditor General

FROM: A. K. Doss
Executive Director

SUBJECT: Audit of the Oil and Gas Conservation Commission

Please find enclosed copies of the Oil and Gas Conservation Commission's responses to the Auditor General's second draft report on the audit of the Oil and Gas Conservation Commission.

A. K. Doss
Executive Director

/kb

Enclosures

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September 17, 1984

RESPONSE TO AUDITOR GENERAL'S DRAFT #2

Refer to the first paragraph of the letter of transmittal, second sentence. "Our understanding of changes agreed to" did not get changed all that much. In many instances, the changes were only a rearrangement of words in a sentence and no change in substance. The second draft still failed to address many of the points filed in the initial response and except for those several deletions and changes in substance, the initial response still stands.

In the opinion of the executive director, most of those persons who will read this report will be impressed mostly on three points: (1) the reports being overrepetitious; (2) the excessive references to the Department of Water Resources; (3) that the mud laden fluids used in drilling oil and gas exploration wells will invade aquifers for great distances, perhaps even miles. What do the auditors think? Thus, this lack of knowledge and the manner in which the report treats the pollution or contamination potential will create an erroneous impression for those readers also not knowledgeable in the business. There are numerous technical articles on the subject of invasion by drilling fluids which cite that invasion is probably no more than a few inches even in porous and permeable formations.

It is of interest to note that no response was made to the last paragraph of the initial OGCC's reply.

Perhaps one of the biggest problems connected with an audit of this kind involving a highly technical industry is the Auditor General's inability to obtain the services of knowledgeable personnel with a background in the industry. Thus the first problem, but surely not the only one, is communication or not being able to "speak the language".

A. K. DOSS

R. A. YBARRA

The purpose of these additional comments is to make sure that the audit team and other readers of the audit report understand more clearly the basic function of a drilling mud system used in well drilling operations and therefore, better understand our (OGCC) position on alternative methods of protecting groundwaters.

When a well is drilled through reservoirs (or aquifers), oil- or water-bearing, the equilibrium in the reservoir in the immediate vicinity of the bore hole is upset. The bore hole represents an artificial pressure low and fluids in the formation will flow in the direction of this low pressure. To neutralize this flow a circulating medium (drilling mud) of sufficient strength (hydrostatic pressure) is used, and once the hydrostatic pressure of the drilling mud equals that of the formation, no fluid movement in either direction can take place. However, as a safety precaution while drilling through unknown subsurface conditions, the driller will condition the mud with proper additives calculated to exert more pressure than that in the formation. The action of the drilling mud, which is composed in part of many micro-sized sand grains and other sediments, causes bridging (plugging) of the numerous pores and passageways in the walls of the bore hole, and when the bridging action is completed, an impervious filter cake (2-3 inches thick) is formed on the walls of the bore hole. The fluid expelled from the filter cake forming process is forced ahead into the formation a few inches. This small penetration is especially true in saturated oil- or water-bearing reservoirs because of the incompressible characteristic of these fluids. This action in itself protects against contamination in all but an extremely small radius measured radially from the bore hole.

Reference: Society of Petroleum Engineers, Petroleum Transactions Series No. 5

To my knowledge there is no documentation, even in the large producing states, of water contamination as the result of drilling operations using a drilling mud system.

R. A. YBARRA

A. K. DOSS