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**GEOTHERMAL DEVELOPMENT ON FEDERAL
LANDS—THE IMPEDIMENTS AND POTENTIAL
SOLUTIONS**

Final Report, September 6, 1977—January 13, 1978

By
Gene V. Beeland
Dennis J. Sebian
D. Keith Whitenight

January 1978

Work Performed Under Contract No. EG-77-C-01-4114

Wapora, Incorporated
Washington, D. C.

MASTER

U. S. DEPARTMENT OF ENERGY
Geothermal Energy

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THE IMPEDIMENTS AND POTENTIAL SOLUTIONS

FINAL REPORT
FOR THE PERIOD
6 SEPTEMBER 1977 - 13 JANUARY 1978

GENE V. BEELAND
DENNIS J. SEBIAN
D. KEITH WHITENIGHT

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JANUARY 1978

WORK PERFORMED UNDER CONTRACT EG-77-C-01-4114

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Figure 1. The effect of the concentration of the *Agrobacterium* suspension on the transformation efficiency of *Agrobacterium* strains.

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Randall C. Stephens, Chief, Policy Research Branch, Division of Geothermal Energy, Department of Energy, served as Project Manager for this study. Expert evaluation of alternatives and guidance in developing final recommendations were provided by David B. Boies and Dr. Robert N. Rickles of WAPORA, Inc. and Dr. James A. Schmid of Jack McCormick and Associates, a WAPORA subsidiary. The authors gratefully acknowledge their contributions.

ABSTRACT

This study found that the regulatory program devised by the Bureau of Land Management and the U.S. Geological Survey to implement the Geothermal Steam Act of 1970 has been ineffective thus far in encouraging private enterprise to invest in and develop this resource. After seven years, there is still no commercial production or utilization of the geothermal resource underlying federal lands.

There are a number of factors -- such as the unknown character of the resource and the less-than-perfect technologies for utilizing it and disposing of the resulting wastes -- which are retarding the growth of a geothermal industry. However, would-be developers point to the complexity of the federal geothermal leasing and post-lease requirements as the major impediment, and, specifically, the repetitive environmental review procedures involved.

A fundamental fault in the regulatory process is that there is no provision for identification of the resource before a lease is issued. Identification of its characteristics is mandatory before the use to be made of it can be determined, if indeed it is found to be adequate and economic for any use. A very large percentage of the exploratory holes drilled will be abandoned as non-productive of a usable resource, in which case there is no need for the long term commitment of a lease.

A streamlined regulatory process was designed to overcome these and other problems. If adopted, it would provide for orderly development of the resource and adequately protect the public interest and the environment.

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SECTION I

INTRODUCTION

Although the Geothermal Steam Act of 1970 (P.L. 91-581) was passed nearly seven years ago to authorize the Secretary of the Interior to issue leases for the development and utilization of this energy resource on the federal domain, there is no commercial production or utilization of the resource on federal lands today. Many factors appear to contribute to this unsatisfactory circumstance although perhaps the great majority of potential developers point to the federal geothermal regulatory program as the major deterrent to the development of this resource. One utility spokesman described the program as "a bumpy, pit-filled road." While his characterization is more colorful than most, it accurately represents the widely held view.

If the regulatory program is in fact the primary single impediment, or even one among many, the implementation of the Geothermal Steam Act is in direct conflict with the intent of Congress. The intent, as stated by the then Senate Committee on Interior and Insular Affairs, was "to give as much encouragement as possible to potential developers, and...that the administrative agencies should keep this basic purpose in mind." (Senate Rept. No. 1160, 91st Congress, 1970). It also contradicts this country's policy of achieving early energy independence as enunciated in Public Law 95-91, the Department of Energy Organization Act.

The President indicated his concurrence that remedial measures are necessary to foster development when he stated in his Energy Program sent to the Congress in April 1977 that: "The Department of the Interior and Agriculture will streamline their leasing and environmental review procedures to remove unnecessary barriers to development of geothermal resources."

Earlier, the National Research Council's Committee on Nuclear and Alternative Energy Systems found that: "Geothermal energy systems are highly capital intensive and the period between initial investment and return is long, and, under present circumstances, very uncertain. Considering only prudent engineering and construction, about five years should normally be required between the discovery of a reasonably high-grade reservoir and the production of electricity from it. However, obtaining the approvals, licenses, and certifications required at various stages of development is likely to extend this period by an additional two to five years or more." While this assertion is generally supported by potential producers and users, there is at present no way to document it since, as noted above, there is still no commercial production or use on federal lands to supply even one full case history.

The study which is the basis for this report documented, however, that

the federal regulatory process is indeed cumbersome, repetitive, and an irritant to would-be developers. Whether it constitutes the paramount obstacle to development, however, is a conclusion which is difficult to reach at this time. This is because there is evidence that other retardants are at work, the effects of which cannot be fully and accurately assessed so long as the artificial inhibiting influence of the regulatory process clouds the rate of development on federal lands.

The presence of other influences can most readily be observed in the fact that there has been no significant geothermal activity on private or state-owned land, except at The Geysers, even in those states which do not have an environmental impact review statute and which are hungry for development. The Geysers is the exception because it is a known field of relatively pure "dry" steam which has been used to generate electricity since long before the Geothermal Steam Act was passed. The technology for utilizing this steam is well developed, and the field is located within economic transmission distance of large markets for electric power.

To the contrary, the lack of geothermal development in less proven, chemically less pure hydrothermal fields can be explained to some extent by the unknowns of the resource and the less-than-perfect technologies for utilizing and disposing of it. These problems in turn generate another impeding factor in utility reluctance to base long-term investment decisions on the unproven resource. In addition, potential suppliers want to sell the geothermal energy on an equal price basis as for oil which potential utility buyers do not find an economic incentive; particularly since the resource is typically located far from their load center. One large utility spokesman summed up his company's position by stating: "There is certainly no incentive (for our using it) except from other people, including the Arabs."

A tax structure for geothermal resources which will provide equity with the advantages enjoyed by the other mineral extraction industries is currently pending in Congress. If the depletion allowance, intangible drilling cost, and investment credit provisions are enacted, drilling may increase substantially. If they are not, the unequal tax burden adds still another to the above impediments.

Thus, it is felt that it is only after the retarding influence of the federal regulatory program is removed, and the technological/economic/environmental forces are allowed to dictate the rate of development that the relative strength of each of these barriers will become apparent. However, in view of the need for new energy sources, it matters little whether federal regulation is the chief deterrent to its development or whether it shares this dubious honor with other factors. National policy and the statutory responsibilities of the involved agencies appear to dictate that regulatory procedures should not erect any more roadblocks than are necessary to insure orderly development of the resource and to protect the public interest and the environment.

This study, contracted by the Division of Geothermal Energy, undertook to determine whether the regulatory procedures are exceeding these bounds, and, if so, how the system can be modified to meet these responsibilities and simultaneously "give as much encouragement as possible to potential

developers" to make this energy source a reality.

The Department of Energy's authority to study and recommend remedial action in response to the above Presidential mandate derives from the Department of Energy Organization Act cited above. A stated purpose of the legislation is:

"To achieve, through the Department, effective management of energy functions of the Federal Government, including consultation with the heads of other Federal departments and agencies in order to encourage them to establish and observe policies consistent with a coordinated energy policy..."

The methodology of the study included:

1. Evaluation of the provisions of pertinent legislation, regulations, and internal documents of the Bureau of Land Management (BLM) and the U.S. Geological Survey (USGS) in the Department of the Interior and the Forest Service (FS) in the Department of Agriculture.
2. Analysis of past and present implementation of the geothermal regulatory programs of these agencies.
3. Documentation where possible of the timeframes involved in the various steps of the leasing and permitting process.
4. Discussions with agency personnel at the headquarters and field office levels; with lessees and applicants; and with a representative of the Sierra Club, an environmental group active in the public participation aspects of the geothermal program.
5. Roundtable discussion of alternatives among contractor experts. The remedial actions considered included amendment to the Geothermal Steam Act, the modification of the implementing regulations, changes in internal procedures, and budgetary solutions.

The geothermal community will perhaps find that the presentation of the background leading to the current situation is more detailed than the industry would require in order to put the conclusions reached and recommendations put forward in the proper context. The detail is supplied, however, for the benefit of those who were not party to the long debate on the Geothermal Steam Act and to subsequent events which have shaped the present.

Data are presented which represent the current status of geothermal leasing on federal lands in Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Washington, Utah, and Wyoming. No leases have been issued in Alaska -- competitive or non-competitive -- and no applications are pending. However, Alaska is a "geothermal" state in that it embraces two KGRA's and other potentially promising geothermal areas.

SECTION II

LEGISLATIVE/REGULATORY FRAMEWORK OF FEDERAL GEOTHERMAL LEASING PROGRAM

This section briefly describes the statutory and regulatory authority which forms the basis of the federal geothermal leasing program. The elements of the program itself are also introduced and will be discussed in greater detail in subsequent sections.

GEOTHERMAL STEAM ACT OF 1970

The Geothermal Steam Act became law on December 24, 1970. It authorizes the Secretary of the Interior to issue leases for the development and utilization of geothermal steam and associated resources. (The term "Secretary" means the Secretary of the Interior throughout this report unless otherwise indicated.) Lands which may be leased under the Act include, among others:

1. Public, withdrawn, or acquired lands administered by the Secretary of the Interior.
2. National Forests and other lands administered by the National Forest Service. Leases on these lands may only be issued with Forest Service consent and under terms and conditions prescribed by the Service.
3. Lands which have passed from federal ownership subject to a reservation to the U.S. of subsurface mineral resources. The cloud on the ownership of geothermal resources underlying such lands -- specifically those patented under the Stock Raising Homestead Act -- was recently removed by the Supreme Court when it upheld the Ninth Circuit Court of Appeals view that these resources are a "mineral." If they had been legally defined as "water," they would have been the property of the surface owner.

Lands such as national recreation areas, National Park Service lands, fish hatcheries, wildlife refuges and ranges, and other similarly protected areas are exempt from leasing under the Geothermal Steam Act as are Indian lands. Leases on Indian lands may be obtained, however, under the separate leasing authority of the Bureau of Indian Affairs.

The Act contains a "grandfather" provision which conferred the right to convert mineral leases or mining claims effective on September 7, 1976, under existing law to geothermal leases, provided that the lessee or claimant could show that he had expended substantial sums for the exploration, development, or production of geothermal steam on the lands in question or on adjoining, adjacent, or nearby federal or non-federal lands. Application for conversion was required within six months from the effective date of the Act.

The amount of land which may be held under geothermal lease by any person, association, or corporation in any one state is limited to 20,480 acres. The Secretary may, 15 years after passage of the Act, increase the maximum allowable holding in any one state to 51,200 acres.

The other major provisions of the Act are inherent in the regulations adopted to implement it which are discussed below.

TITLE 43 CFR, GROUP 3200, and 30 CFR, PARTS 270 AND 271

The first major delay which occurred in the geothermal leasing program resulted from the fact that the regulations to implement the legislation were not promulgated until December 1973, becoming effective on January 1, 1974, over four years after the Act was passed.

There are two sets of applicable regulations because the Geothermal Steam Act divides the authority to administer the geothermal leasing program between the Bureau of Land Management and the U.S. Geological Survey, an approach patterned after the Mineral Leasing Act which governs the leasing of federal lands for oil and gas, coal, oil shale, etc. The BLM is responsible for issuing the lease, administering it, and supervising surface activities outside the area of operations. USGS is the engineering supervisor of operations on the lease and the policeman in terms of enforcing applicable regulations or shutting down operations if required in the public interest. Bureau of Land Management activities are covered in Code of Federal Regulations Title 43, Public Lands: Interior; and the program of the U.S. Geological Survey is subject to CFR Title 30, Mineral Resources.

In accord with the legislated division of authority, Group 3200 of Title 43 establishes the leasing procedures for competitive and non-competitive leases, lands available for leasing, qualifications of lessees, leasing terms, surface management requirements, rentals and royalties, and rules for exploration operations. Part 270, Title 30, establishes the jurisdiction and function of the geothermal Supervisor, engineering requirements for operators designed to promote safety and to minimize waste and environmental damage, pollution control measures required external to the well itself, methodology for computing royalties, reports to be filed by lessees, and enforcement procedures. Title 271, 30 CFR, establishes the general procedures to be followed and the requirements to be met by lessees who enter into a cooperative or unit plan for collectively developing a geothermal field.

Section 3200.0-5 of 43 CFR also provides for the designation of "known geothermal resource areas" (KGRA's) which are areas "in which the geology, nearby discoveries, competitive interests, or other indicia" indicate that the geothermal resource prospects are good enough to warrant expenditures of money for its extraction. "Competitive interest" occurs when the lands covered by any two non-competitive lease applications filed in the same filing period overlap by 50 percent or more. In this situation, a KGRA designation is mandatory, and lands within a KGRA must be leased competitively. The KGRA concept parallels the Known Geologic Structure (KGS) approach in oil and gas leasing but is much broader since designation of a field as a KGS requires a producing well.

Section 3200.0-6(a) of 43 CFR directs the BLM Director, "When an area is initially considered for geothermal leasing or when the need arises," to report on the resources contained in the area and the potential effect of geothermal operations upon the resources of the area and its total environment. If the Director determines that the issuance of leases in an area would be a "major federal action significantly affecting the quality of the human environment," he may not issue leases in the area until an environmental impact statement has been prepared pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA). This unquantified provision is applicable across the board to any federal legislation, programs, or separate, individual actions which are deemed by the appropriate agency officials to fall within the definition.

Prior to the final selection of tracts for leasing, Section 3200.0-6(b) requires the Director, or the head of another surface management agency if he so elects, to, when appropriate (emphasis added), evaluate the effect of a geothermal leasing program on the total environment of the entire area during exploratory, developmental, and operational phases (emphasis added).

If it is decided to lease the land, the Director, or other surface management agency head, must develop special terms and conditions, commonly called stipulations, as required to protect the environment and other natural resources and to permit multiple use. When lands are offered for competitive leasing, the stipulations will apply to all leases finally issued in the area.

A lessee is given the right to use as much of the surface of the leased land as is necessary for the production, conservation, and utilization of the resource including a power generation plant or a commercial or industrial facility. However, use of the leased lands for such facilities must be authorized under a separate permit issued by the appropriate agency. Public Law 92-579, Federal Land Policy and Management Act of 1976, gives the Secretary of the Interior authority, on public lands, and the Secretary of Agriculture, on National Forest lands, to grant rights-of-way for the generation, transmission, and distribution of electric energy provided the lessee complies with the applicable regulations of the Federal Energy Regulatory Commission (formerly the Federal Power Commission). It is understood that draft regulations on power plant siting on federal lands have been under consideration in the Solicitor's office of the Department of the Interior for over a year, but no estimate was received on anticipated promulgation.*

GRO ORDERS

Geothermal resources operations (GRO) orders are formal enforceable orders issued by USGS to supplement the general regulations found in 30 CFR 270 by detailing the procedures lessees must follow in a given area or region. The purpose of this arrangement is to allow consideration of more area-specific operating and environmental conditions.

The USGS has prepared seven GRO's. They are:

* Note: Subsequent to completion of this report, 30 CFR Part 270 was revised to permit the construction and operation of geothermal power plants on federal lands. (Federal Register, Feb. 1, 1978)

- o GRO Order No. 1 - Exploratory Operations
- o GRO Order No. 2 - Drilling, Completion, and Spacing of Geothermal Wells
- o GRO Order No. 3 - Plugging and Abandonment of Wells
- o GRO Order No. 4 - General Environmental Protection Requirements
- o GRO Order No. 5 - Reports and Forms (In draft form only)
- o GRO Order No. 6 - Pipelines and Surface Production Facilities
- o GRO Order No. 7 - Production and Royalty Measurement, Equipment and Testing Procedures

FOREST SERVICE MANUAL, CHAPTER 2820

The first Forest Service directive under a new Section 2827 of the above chapter, dated March 10, 1975, confers on Regional Foresters authority to act on applications for geothermal leases on National Forest system lands. It points out that the Forest Service may elect to act as the lead agency in preparation of "environmental impact statements" (emphasis added) which "may be necessary" under 43 CFR 3200.0-6(b), discussed above. It also notes that power generation plants or other commercial or industrial facilities on National Forest system lands will be covered by separate authorizing documents issued by the Forest Service. The Directive concludes with a requirement that important functions of policy be referred to the Chief Forester.

MEMORANDUM OF UNDERSTANDING FOR THE GEOTHERMAL PROGRAM (MOU)

This memorandum, which is shown in its entirety in Appendix A, is an agreement to which BLM, USGS, and the Fish and Wildlife Service are signatory. It formalizes the environmental impact review procedures used by these agencies in the geothermal leasing program. Fish and Wildlife is a review and comment participant because of its statutory authority under the Fish and Wildlife Coordination Act, NEPA, and the Rare and Endangered Species Act. An amended agreement dated January 7, 1977, incorporating the Forest Service into the formalized procedures was drafted, but, according to a Forest Service spokesman, has never been signed. In general, the amendment would serve to formalize 1) the interchange between BLM and FS when Forest lands are involved in a competitive lease sale or a non-competitive lease application; and 2) the functions which BLM serves on public lands but which FS assumes on Forest lands.

EXISTING GEOTHERMAL REGULATORY PROGRAM

Figures 1 and 2 illustrate respectively the pre-lease and post-lease activities involved in the BLM/USGS leasing program on public and acquired lands and lands patented with a mineral reservation to the U.S. The role of the Forest Service when lands under its jurisdiction are involved is delineated in the foregoing discussion.

These detailed, step-by-step illustrations are based on the Act, the BLM/

USGS regulations, and the Memorandum of Understanding. They show timeframes required by the regulations and the Memorandum where applicable, but it is important to note that few time limitations are applied by either one.

The illustrations also include all of the routine steps such as notifications and review and comment. The importance of these seemingly routine procedures in the overall timeframe should not be minimized. Taking into account the typical bureaucratic delays in obtaining even the most routine comments, approvals, and signatures, it becomes evident that, singly or cumulatively, they may engender significant log jams, and utilize considerable manpower.

However, since the complexity of the total process obscures the principal events in the leasing system, and some variations in the sequence do occur, Figures 3 and 4 were prepared in order to identify major activities more clearly. These simplified drawings do not, it is emphasized, reflect actual practice nor do the following thumbnail sketches reveal the problems which are the subject of this report. It is felt that the problems will be more clearly understood if the simple mechanics as required by law and regulation are first identified.

Pre-Lease Exploration

Under Section 3209.0-1 of 43 CFR, a permit may be obtained as shown in Figure 3 to conduct exploratory operations on public, unleased land. Exploratory operations are defined as:

"Any activity relating to the search for evidence of geothermal resources which requires physical presence upon public lands and which may result in damage (emphasis added) to public lands or resources thereon. It includes, but is not limited to geophysical operations, drilling of shallow temperature gradient wells, construction of roads and trails, and cross-country transit by vehicle over public lands."

The permit, commonly called an "NOI" because the application for it is entitled "Notice of Intent to Conduct Geothermal Resource Exploration Operations," does not authorize core drilling for subsurface geologic information or drilling for geothermal resources, activities which may be conducted only under a geothermal lease. Slim deep-hole drilling for stratigraphic or temperature tests may be permitted on public, acquired, or mineral-reserved lands in those states where BLM finds this practice acceptable and USGS concurs. It is doubtful that all BLM state offices or the Forest Service share this interpretation of the Act.

Contrary to other procedures in the leasing program, a time limit -- 30 days -- is placed upon approval or denial of the NOI. BLM, according to its spokesman, conducts a brief environmental evaluation of the site covered by the application which may include a walk-through by appropriate personnel.

The NOI permittee is subject to the comprehensive terms and conditions set forth on his approved application, shown in Appendix B, as well as to

FIG. 1 GEOHERMAL REGULATORY PROCESS

PRE-LEASE ACTIVITIES

(COMPILED FROM GEOTHERMAL STEAM ACT OF 1970, FEDERAL RULES AND REGULATIONS 43 CFR PART 3000 AND 30 CFR PARTS 270 & 271, AND MEMORANDUM OF UNDERSTANDING FOR THE GEOTHERMAL PROGRAM - USGS, BLM, FWS)

ABBREVIATIONS

- BLM - Bureau of Land Management
- BLM-DO - Bureau of Land Management District Office
- BLM-SO - Bureau of Land Management State Office
- GS - U.S. Geological Survey
- GS-RCM - U.S. Geological Survey, Regional Conservation Manager
- AGS - Area Geothermal Supervisor
- GS-AC - U.S. Geological Survey Area Geologist
- GS-DC - U.S. Geological Survey District Geologist
- FWS - Fish and Wildlife Service
- FWS-RO - Fish and Wildlife Service Regional Office
- FWS-AO - Fish and Wildlife Service Area Office
- EAR - Environmental Analysis Record (prepared by BLM)
- EA - Environmental Analysis (prepared by GS)
- GEAP - Geothermal Environmental Advisory Panel
- R/C - Agency Review and Comment
- DOE - Department of Energy

FIG. 2
GEOTHERMAL REGULATORY PROCESS (continued)

POST-LEASE ACTIVITIES

FIG. 3

EXISTING
GEOTHERMAL REGULATORY PROCESS
Principal Pre-Lease Activities

COMPETITIVE LEASING

NONCOMPETITIVE LEASING

PRE-LEASE EXPLORATION

FIG. 4

EXISTING GEOTHERMAL REGULATORY PROCESS

Principal Post-Lease Activities

special stipulations which may be added. For example, as the result of the environmental review, he may be advised to avoid certain activities within specific critical habitat areas or to avoid the activity in that area during given seasons of the year.

One does not need even an NOI to engage in "casual use" of public lands which means practices which do not ordinarily lead to any appreciable disturbance or damage to lands, resources, and improvements. Surface exploration which does not involve heavy equipment, explosives, or vehicle movement except over established roads falls into this category.

Competitive Leases

The competitive lease process begins with selection of acreage to be leased in a scheduled lease sale. Selections may be made by BLM state offices on their own motion, on recommendation by USGS, or through nominations from industry. Before the lands are finally selected for sale, however, an environmental assessment report (EAR) is prepared on the KGRA, and the MOU directs that the EAR embrace the maximum number of non-competitive lease applications in the vicinity of the KGRA.

The EAR is undertaken by BLM or the Forest Service, as the case may be, or it may be a joint undertaking. It constitutes the basis upon which the determination is made as to whether the lease sale is "a significant federal action..." requiring a full environmental impact statement (EIS). To date, BLM has not yet prepared an EIS although the Forest Service has gone this route a number of times.

Determination of the priority of scheduling lease sales is generally based, according to the MOU, on the geothermal potential of the area, its environmental sensitivity, and industry interest. The status of BLM or Forest Service planning in an area is also an influencing factor. Terms and conditions to be attached to leases issued on lands offered in a sale are determined by BLM in consultation with USGS and FWS.

The sale is advertised in a newspaper local to the KGRA and by mail to all parties who have indicated an interest in geothermal lease sales. Sealed bids accompanied by one-half of the bonus bid are received, and leases are awarded to the highest qualified bidders. Within 30 days after receiving copies of the lease, the successful bidder must execute them and return them with the balance of the bonus bid, the first year's rental, and a plan of operation and file a required bond. It was observed from BLM files that this plan of operation is nothing more than a formality which only nominally complies with the regulations. It is a general one- or two-page document, usually the same for all leases, which merely quotes back the language of the regulations. BLM spokesmen agreed with this observation. On the face of it, achieving a competitive lease seems a very cut-and-dried procedure.

Non-Competitive Leases

The Act states that "the qualified person first making application for a lease shall be entitled to a lease" on lands not within a KGRA. Applications may be filed in any 30-day filing period (from the first working day

of each month to the close of business on the last working day of the month). Applications for a filing period are all opened at once and are assigned priority according to the date of filing.

Before a lease is issued, an EAR must be prepared if it cannot be determined that the lands are covered in an existing EAR. The steps shown in Figure 1 are followed. In addition, it must be determined from existing maps and land descriptions whether any of the lands are included in a KGRA and whether there is competitive overlap with another lease or leases filed during the filing period. The regulations also call for a second KGRA clearing by USGS just before the signed lease is issued.

The applicant has 30 days in which to execute his lease and file a plan of operation. It is virtually always the perfunctory type of plan described above.

Again, it can be seen that when the basic steps involved in obtaining a non-competitive lease are examined as they are set forth in the regulations and in Figure 3, they do not, standing alone, appear on casual inspection to be unnecessarily duplicative.

Post-Lease Approvals

USGS operates under a very strict interpretation of Sections 270.34 and 270.35, 30 CFR, which set forth the requirements for the submission of plans of operation. Until or unless an amendment proposed recently (Federal Register, Sept. 27, 1977) is promulgated, a plan of operation is required prior to commencing any (emphasis added) operation except casual use. The proposed amendment would exempt exploration operations as defined above and subsequent well operations such as redrilling, repairing, casing tests, production stimulation, abandonment, reinjection, etc., in some instances. (The exclusion of exploration operations is designed to eliminate the inequities in treatment of lessees and non-lessees. Present USGS operating regulations impose more restrictions on lessees than the BLM leasing regulations impose on non-lessees in obtaining approval to conduct similar exploration operations on both leased and unleased lands.)

Otherwise, plans of operation are required for each succeeding activity. Even though a basic plan of operation covering all phases of operation through production has been filed, subsequent plans may be required to supply specific details not covered in the basic plan. All plans require preparation of an environmental analysis (EA), a more site-specific document than the EAR, although the analyses may vary in level of detail, and an EIS may be called for at any juncture. Thus, the plan of operation, EA, and approval/rejection constitute a revolving process, which will be repeated many times over where there is serious activity on a lease proceeding through development, production, and injection.

Before a plan of operation covering production can be approved, the applicant must collect at least one year of baseline environmental data. The data are to quantify existing air and water quality, noise levels, seismic and land subsidence activities, and the local ecological system. This information is site-specific and much more detailed than the data available in the BLM or Forest Service planning documents.

SECTION III

OVERVIEW OF THE PROBLEMS

The word "problem" as it is used here means a requirement, occurrence, or circumstance which tends to delay the pace of geothermal development in this country. It is recognized that problem areas are defined at the risk that there are individuals who do not consider them problems and see them instead as desirable and/or necessary facets of the geothermal leasing program. It is also possible that in some instances conclusions reached are based on incomplete, inaccurate, or misunderstood information. It is felt, however, that the potential net result of either or both such situations can be salutary -- in demonstrating where a closer meeting of the minds is necessary in the first case, and in producing more definitive information in the second. This statement itself points up two of the most fundamental problems surrounding the leasing program.

The problems, as defined here, fall into two overlapping groups -- i.e., those which are traceable to the legislative/regulatory framework and those which derive from implementation of the Act and regulations. A clearer line of distinction can perhaps be drawn by first discussing the problems involved in the environmental impact review process utilized in the leasing system and then those which are not. This division for discussion is especially appropriate since the primary blame for delay is directed toward the former by potential developers and some government spokesmen and is also recognized as such by some involved environmental groups.

There is one fundamental problem, however, which precedes the procedural problems in any category. This is the fact that there is no provision for identifying the resource which varies in nature from reservoir to reservoir and from one site to another within the same reservoir before the leasing process begins. This identification is mandatory in order to determine the use or uses to which it can be put, if indeed it is found suitable or economic for any use.

LEASE ISSUANCE PRIOR TO RESOURCE IDENTIFICATION

The most significant difference in geothermal deposits is whether the resource occurs as natural steam in a vapor-dominated reservoir or whether it is in the form of hot water in a liquid-dominated field. In some cases, it is a two-phase system of both steam and water.

The most probable use of the highly desirable naturally-occurring steam in today's energy situation is electric power generation, although it could also replace energy from other sources in industrial application. There is no technology today, however, for generating electricity through the direct use of hot water, but the liquid resource can be used indirectly for this

purpose if its temperature and pressure are sufficiently high, and the total heat content of the reservoir can satisfy power utility commitments for a predetermined period, probably 30 years or more.

On the other hand, the temperature, pressure, and size requirements for direct or non-electric uses of geothermal resources -- space heating, hot water supply, greenhouses, etc. -- are much less demanding. However, some direct uses obviously necessitate a much more chemically pure resource in terms of entrained noncondensable gas and heavy metal contamination, for example, than can be tolerated in power production.

In order to determine such properties, it is necessary to drill deep enough to penetrate into the reservoir itself. Surface geological and geophysical exploration techniques and shallow holes cannot provide the information essential in planning for the use of the resource or rejecting it for use altogether.

In turn, the type and degree of environmental impact will vary with the use, the number of wells required, and the production rates needed to supply the use. In general, the potential impacts from power production or industrial use may be expected to be more severe than those associated with domestic or agricultural use. They will involve permanent structures, air pollution potential, and the disposal of large quantities of wastewater, features which will be minimal by comparison or non-existent in the latter types of use.

However, since the existing system requires a lease before drilling to produce the resource can occur, the pre-lease EAR is undertaken before it is known whether a usable resource exists and what its character is if one is there. Postulating the end use at this point and its impact is, according to a BLM spokesman, "an exercise in futility, wasting the taxpayers' time, dollars, and resources."

As far as the potential developers are concerned, they do not need a lease if there is no usable resource. And, they point out, a very large majority of exploratory wells drilled -- 19 out of 20 or 24 out of 25 are suggested -- will not be productive and will be abandoned.

ENVIRONMENTAL IMPACT REVIEW PROCESS

Perhaps the direct causes for delay inherent in the environmental review scheme of the geothermal leasing program can be best understood when placed in the context of the indirect causes and the climate which brought them about. One basic important fact to remember is that the then newly-enacted geothermal program was the first major new program established in the Department of the Interior subsequent to passage of the National Environmental Policy Act. This is the Act, as discussed above, which applied for the first time the concept of reviewing each federal action from the standpoint of the character and extent of its effect on the environment.

Ironically, the delays encountered due to the review process as it was designed within the Interior Department have indirect roots in the Geothermal Steam Act itself, although delays were certainly not envisioned at the time

of its passage, as indicated by the Senate committee language quoted in the Introduction to this report. This situation stems in part from the fact that the legislation emerged as a single-purpose measure although the original intent had been to simply extend coverage of the Mineral Leasing Act of 1920 to include geothermal resources. After a decade of debate, the decision was made to handle geothermal resources in a separate piece of legislation.

In so doing, regulation of the geothermal resource industry -- if that term can be applied -- was separated from the treatment of the more entrenched industries subject to the Mineral Leasing Act -- oil, gas, and coal, for example. Standing alone, it was thus left more vulnerable to a very stringent interpretation of NEPA requirements.

Such an interpretation is just what occurred and appears to be the cornerstone of the present implementation difficulties. A "model" environmental review process or a "pilot program" was established by BLM and USGS for processing geothermal leases and post-lease approvals. According to spokesmen for these agencies, it was their intent to test the program on geothermal leases and, after perfecting it in practice, to apply it to other industries.

Again according to agency personnel, this has never been done, and it is applied solely to the geothermal program. A number of reasons are advanced for this circumstance. They include the fact that oil and gas are well understood resources, while the nature of individual geothermal reservoirs is not. "Oil and gas technology is routine -- well known with no environmental problems," an Interior Department environmental spokesman stated. He added that geothermal operations are different and "require more tin-ware on the ground." A BLM state director carried this contention a step further by asserting that he feels strip mining is preferable to geothermal development because the land can be restored, but geothermal operations remain on the landscape. One must assume that he was referring to power plant structures since geothermal wells supplying a non-electric or direct thermal use should be no more intrusive than pumping oil wells.

As another reason for "plugging more environmental factors" into geothermal leasing than into the oil and gas leasing program, it is contended by the same Departmental spokesman, that the overwhelming majority of oil and gas leases issued per year are extensions, and that most are speculative and handled by brokers. A computerized history of geothermal leases indicates that a great many of them are also in the hands of speculators.

Differences in treatment between geothermal and oil and gas leases were confirmed by a senior official of a major oil company which is also a geothermal lessee. He added that he hoped the distinction continues for the sake of their oil and gas operations.

In sum, an industry which is not yet "off the ground" was selected for trial of a program which would be burdensome, though more tolerable, even to secure industries with traditional markets for vitally needed and sought after products. Primary consideration appears to have been given only to where the model program could be applied with the least resistance. Obviously, such factors as to where equity would suggest it should be tested, or even if it should be tried at all, did not prevail.

A Forest Service spokesman stated that oil and gas and geothermal leases are all given the same treatment in that Agency. Data to support this contention are needed.

An opportunity for overlap with resulting delay in the regulatory program also derives from the Act's division of authority between BLM and USGS, as described previously. A similar approach has, according to most accounts, worked relatively smoothly in the oil and gas leasing program.

Now, however, with the advent of NEPA, each of these two agencies views each of its functions in the leasing and post-lease process as a separate action subject to environmental study. In addition, the Forest Service is exercising its authority as a surface land management agency. Given the traditional reluctance of federal agencies to cede to another any of their program prerogatives, it can be readily seen that there is a built-in potential for overlap in the division of authority which was not originally designed with the implementation of NEPA in mind. It is to the credit of the agencies involved that this potential has been avoided to some extent through cooperation and use of data developed by others.

Another contributor to environmental review "over-kill," if this term accurately describes current practice, is the fear of an untoward environmental event which could be traceable to what the public or the courts might consider as inadequate consideration of proposed actions. As one Fish and Wildlife Service official expressed the situation, he is not anxious to be accused of reducing a threatened or endangered species to an extinct species. Certainly no responsible federal employee wants to be held accountable for such an occurrence, and his desire to bend over backward to avoid it is a predictable reaction.

Added to this whole maze of interaction is the range of extremes in personal viewpoint toward development vis-a-vis environmental protection. Variations in opinion are reflected in the official actions of cognizant agency personnel and appear to be a direct cause of program acceleration or extended delay.

It has to be recognized, of course, that these viewpoints can be and are influenced by outside factors. For example, federal officials assigned to states where the population is extremely environmentally conscious, and where a state NEPA-type law exists, risk litigation and an injunctive halt to their program altogether if they attempt to give the green light to development faster than the norm for the state. Their job is far more complex than that of their counterparts in less environmentally sensitive states.

In turn, state attitudes, and legislation, largely reflect the difference between the "haves" and "have-nots" -- i.e., those with sensitive and scenic environments which are felt to deserve the ultimate in protection for uses other than industrial development and those with more limited natural beauty or other resources in which almost any type of economic development would be considered a benefit. These two extremes are readily observed in California and Nevada respectively.

Another and more concrete motivation toward environmental caution was probably engendered by the fact that the Geothermal Steam Act was the first federal statute designed to permit the exploitation of a resource on federal lands which included a blanket environmental protection provision. This is

incorporated in the unlimited authority of the Secretary of the Interior to protect water quality and other environmental qualities in prescribing rules and regulations to implement the Act. To the contrary of necessitating the environmental review procedure which evolved, however, this provision is viewed later in this report as a principal support for reducing the complexity of the procedure.

Direct Causes for Delay

Complexity of Environmental Review Process

Without exception, potential developers pointed to the complex nature of the environmental review process as the chief procedural cause for delay. The comment of one seemed to express the feelings of all: "We file a piece of paper, it apparently goes into a black box somewhere, for an indefinite period of time. We don't know where it is, who is doing what with it, or when it will come out."

The flow sheets of pre- and post-lease activities shown in Figures 1 and 2 testify that the system is complex and offers every opportunity for time slippage as an application for a lease or permit moves through the process. The reaction of those to whom the illustrations were shown during the study was one of incredulity. Even some of those involved in implementing the process seemed taken aback with the visual impact of the total process.

There are two readily apparent flaws in the system, apart from its general complexity. One is that virtually all of the activities in the regulatory process are sequential, and that there are only a limited number of parallel activities. This is best seen by noting the step-by-step environmental review process that is set up to respond only to the applicant's or lessee's next initiative. Undoubtedly, industry spends part of the time in which lease applications or proposed plans are undergoing agency review formulating future activities. Yet since the environmental review process is unaffected by such activity, and since there is much uncertainty as to the response industry can expect from federal review agencies, there is little practical benefit from this. There are supporters of the sequential process, however, who contend that it avoids waste in manpower and time on areas that "down the road" would be found unacceptable for leasing.

A second defect in the system is the virtual absence of mandatory schedules for specified actions. While government does not necessarily adhere to time limitations in all cases, their presence at least provides more impetus to timely action and a basis for formal complaint if it does not occur.

The major results of the complexity are that 1) very long delays have commonly occurred, with a wide variation in elapsed time, and that 2) relatively few leases have been issued when compared with the number of non-competitive applications filed. There have been even fewer competitive leases issued, a subject which is dealt with at greater length later in this section.

The total number of leases issued is broken down by state and by land management agency in Table 1. The table indicates that just over 1200 leases have been issued in 10 states since the regulatory program became effective

Table 1
GEOTHERMAL LEASES ISSUED

State	Land Mgt. Agency	Noncompetitive		Leases Issued	Competitive	Total
		No. of Applications			Leases Issued	Leases Issued
Arizona	BLM	54		4	0	
	FS	35		1	0	
	Total	89		5	0	5
California	BLM	767		10	26	
	FS	366		0	0	
	Total	1133		10	26	36
Colorado	BLM	103		42	3	
	FS	62		0	0	
	Total	165		42	3	45
Idaho	BLM	494		115	12	
	FS	247		1	0	
	Total	741		116	12	128
Montana	BLM	42		6	0	
	FS	49		0	0	
	Total	91		6	0	6
Nevada	BLM	1344		390	62	
	FS	28		3	0	
	Total	1372		393	62	455
New Mexico	BLM	421		84	18	
	FS	58		0	11	
	Total	479		84	29	113
Oregon	BLM	362		74	35	
	FS	552		1	0	
	Total	914		75	35	110
Utah	BLM	456		207	77	
	FS	120		14	4	
	Total	576		221	81	302
Washington	BLM	0		0	0	
	FS	118		0	0	
	Total	118		0	0	0
Wyoming	BLM	9		0	0	
	FS	83		4	0	
	Total	92		4	0	4
Totals		5770		956	248	1204

Source: USGS data files of 10/10/77, Menlo Park, California.

on January 1, 1974. By far the greatest number are located on BLM lands; Forest Service leases account for only two percent of the total non-competitive and six percent of the competitive. Leases on Indian lands, which total less than a dozen, are omitted.

In several of the states only a handful of leases have been issued: Wyoming, 4; Arizona, 5; and Montana, 6. The states of Nevada and Utah, on the other hand, together account for 63 percent of all leases issued, with 455 and 302 leases, respectively. In between these extremes are California, 36; Colorado, 45; Oregon, 110; New Mexico, 113; and Idaho, 128.

The percentage of non-competitive leases issued by BLM and the Forest Service is shown in Tables 2 and 3 respectively. These tables also show that there is no correlation between percentage of leases issued and number of applications filed. In Nevada, for example, where by far the greatest number (1344) of BLM lease applications have been filed, 27 percent have resulted in leases. BLM in California has received the next highest number of applications (767) and has issued leases on less than one percent of them. Out of 494 applications in Idaho and 456 in Utah, BLM has issued nearly one-fourth and one-half respectively. At the bottom of the scale, BLM in Wyoming has issued no leases on nine applications filed. There were no BLM applications in Washington State when this table was compiled.

The primary function of Table 3 is to illustrate the meager percentage of Forest Service leases issued in any state. Oregon, California, and Idaho account for more than twice as many applications as all of the other states combined, but for only a total of two leases, one in Oregon and one in Idaho. The highest percentages of issuance, on the other hand, represent only 14 leases in Utah, three in Nevada, and four in Wyoming because of the relatively small number of Forest Service applications in those states. As can be seen in Tables 1 and 3, there are no Forest Service leases in five of the 11 states.

(Since the number of leases varies from day to day due to additions and terminations, the totals used in various tabulations in this report may not be exactly the same. In speaking of leases issued, those issued but subsequently terminated were included.)

Figures 5, 6, 7, 8, and 9 illustrate the long delays common in getting a non-competitive lease and the non-uniformity involved. The data presented -- i.e., time lapse from the month of application to the month of lease issuance -- are from the files of the USGS Area Geothermal Supervisor's office in Menlo Park, California, and are current to October 17, 1977. The median times from application to lease issuance are noted for those states in which there are more than a few leases. Median values are used as a measure of the central tendency of the data rather than averages because in most cases the greatest number of lease issue periods cluster around the median.

In Idaho, Utah, Nevada, and New Mexico, the median time is 17 months for the leases which have been issued, and in Colorado and Oregon the median values are 23 and 28 months, respectively. This comparison is somewhat surprising since more leases have been issued in each of the four states with the shorter timeframe than in either Colorado or Oregon. In Wyoming, Arizona,

Table 2

PERCENTAGE OF NON-COMPETITIVE
BLM LEASES ISSUED

	<u>No. of Applications</u>	<u>Percent Issued</u> (Rounded)
Nevada	1344	29
California	767	1
Idaho	494	23
Utah	456	45
New Mexico	421	20
Oregon	362	20
Colorado	103	41
Arizona	54	7
Montana	42	14
Wyoming	9	0
Washington	0	0

Total non-competitive leases issued (BLM) 956
Percent of applications 17

Table 3

PERCENTAGE OF NON-COMPETITIVE
FOREST SERVICE LEASES ISSUED

	<u>No. of Applications</u>	<u>Percent Issued (Rounded)</u>
Oregon	552	<1
California	366	0
Idaho	247	<1
Utah	120	12
Washington	118	0
Wyoming	83	5
Colorado	62	0
New Mexico	58	0
Montana	49	0
Arizona	35	<1
Nevada	28	11

FIG. 5

TIME LAPSE BY MONTH FROM NON-COMPETITIVE LEASE
APPLICATION TO LEASE ISSUANCE

FIG. 6

TIME LAPSE BY MONTH FROM NON-COMPETITIVE LEASE
APPLICATION TO LEASE ISSUANCE

FIG. 7

TIME LAPSE BY MONTH FROM NON-COMPETITIVE LEASE
APPLICATION TO LEASE ISSUANCE

FIG. 8

TIME LAPSE BY MONTH FROM NON-COMPETITIVE LEASE
APPLICATION TO LEASE ISSUANCE

FIG. 9

TIME LAPSE BY MONTH FROM NON-COMPETITIVE LEASE
APPLICATION TO LEASE ISSUANCE

Montana, and California, insufficient leases have been issued to permit generalizations about the data. In all cases, the time lapse statistics are influenced to some extent by the initial surge of applications in 1974 and the backlog built up before the mechanics for issuing leases were well established.

Non-uniformity -- both among states and within the same state -- is illustrated in the graphs in the wide range of timeframes for processing and approving non-competitive lease applications. Processing times of well over three years have occurred in some cases while in others applications are reported as being processed in only one to two months. The phrase "one to two months" cannot be more precisely quantified since the data only indicate the month of application and the month of lease issuance. While a handful of recent leases may have emerged in this brief a period, USGS suggests that a period of less than four months is suspect -- i.e., that the computerized data are probably erroneous. The minimum, average, and maximum time lapses are shown in Table 4 along with another important feature of the data illustrated in the graphs -- i.e., the large number of lease applications which have been pending longer than the maximum number of months required to obtain a lease. It should be noted, however, that BLM performance is improving in some areas, a BLM claim which is also supported by industry spokesmen. To some extent, this is traceable to the kinds of individual motivations discussed above rather than to basic changes in the system which would insure improvement in all areas.

While there appears to be similar non-uniformity in time periods involved in post-lease approvals, no general data to support this observation could be generated. USGS as the responsible post-lease approval agency has not compiled data on the in/out time elements involved in approval of plans of operation or drilling permits.

The fragmentary information which is available is somewhat controversial, not so much as to whether the information surrounding certain approvals is accurate but rather as to whether it represents normal or unusual situations. Without attempting to judge whether delays of up to nine to 12 months as claimed by developer spokesmen were excessive or were reasonable under the particular circumstances, it can be concluded that approval periods have not been uniform.

And, non-uniformity in timeframes surrounding each action taken by the various agencies is more unsettling to industry in some cases than the amount of time itself. Uncertainty as to when a lease will be issued casts a cloud on company decisions as to what tracts to hold in terms of the acreage limitation in any given state. This is perhaps best illustrated by a recent paradox when a lease was issued too quickly to suit the developer's schedule. The company filed a non-competitive lease application in the expectation that it would not be approved in under two years. To its surprise, the Nevada BLM office issued the lease in the record time of two months. The company was then required to relinquish other acreage without the study it had planned to conduct while the lease was being processed in order to stay within its limitation in Nevada.

While this position may in the long run prove uneconomic to the developer if an incorrect decision was made due to inadequate study, the costs of

Table 4

COMPARISON OF NON-COMPETITIVE
LEASE PROCESSING TIMEFRAMES

	No. of Months for Lease Issuance			No. of Applications Pending Longer than Max.
	Min.	Av.	Max.	
Arizona	17	18	19	39
California	10	26	36	248
Colorado	18	22	30	38
Idaho	6	17	45	80
Montana	30	30	30	20
Nevada	1-2 ^a	16	31	149
New Mexico	1-2 ^b	23	41	62
Oregon	5	26	44	233
Utah	0 ^c	18	45	126
Wyoming	26	29	33	2

^a As data were interpreted; known to be 2 months.

^b Data cannot be interpreted more precisely.

^c Obviously a data error.

uncertainty as to when the drilling permits will be approved can be immediate and direct when delay occurs. Moving a drill rig is expensive -- costs are in the thousands of dollars -- but with the frequent scarcity of drill rigs today, it is not feasible to leave one idle awaiting a permit. Although availability fluctuates widely with demand, one developer spokesman estimated that at present unless one pays a \$200,000 premium, the use of a rig could not be scheduled within 30 days. In peak periods, the drilling contractors will not even bid on jobs, he said, though there are times when demand is low, when they are highly competitive for the few jobs available. This situation is only further complexed by the uncertainties surrounding approval of drilling permits.

Delays at this stage of exploration -- and at development and production stages when the program reaches that point -- can also engender other costs. This can be illustrated by the Union Oil Co. experience in the Cove Fort-Sulphurdale KGRA which is outlined in Appendix C. Although there are some gaps in the record, the information available adequately illustrates the sequence.

In summary, nine months elapsed between the filing of Union's plan of operation in February 1977 and receipt of its permit late in October, even though USGS had conducted an on-site inspection of the area in the fall of 1976. This meant, first, that Union had to release the drilling rig it had scheduled for early summer operation, planned on the basis of the February filing. Second, the delay entailed a choice between two alternatives, both unattractive. Either drilling had to be delayed further until the spring of 1978, or the rig had to be winterized in order to proceed. Union elected to winterize at a cost of \$150,000. When an estimated \$50,000 in inflationary costs are added, the total cost of the delay is \$200,000.

The company was further caught in a Catch 22 situation on the use of the rig. This came about because Union had entered into a unit agreement with Phillips Petroleum Co. to develop the Cove Fort-Sulphurdale field, and such an agreement requires that a well be drilled within six months of the date of unit approval. In this case, the company's unit plan with Phillips was approved in June, but for several months it could not get a permit to meet the drilling requirement. In addition, rigs were so scarce that had Union not found a friendly company which allowed a rig to be taken for one well, the commitment could not have been met, a company spokesman said.

Since under the present environmental review procedures, USGS has to approve each drill site which has not previously been approved, developers are beginning to include multiple sites in their plans of operation. Normally, they have no intention of drilling them all. The purpose of this approach is to give them flexibility in making final site selection without going through a lengthy and costly delay. However, this practice, too, has a price -- estimated at \$1000 per site by Union. The company applied for 23 sites at Cove Fort-Sulphurdale which entailed an estimated additional \$22,000 expenditure. Another company, however, says it now considers it standard procedure to apply for drilling permits at multiple sites and describes the costs as minimal.

Duplication in Environmental Review

While duplicative environmental reviews are certainly an aspect of the overall complexity of the regulatory process, a separate analysis of the objectives, timing, and technical scope of a representative sample of environmental reviews involved in this controversial issue is considered critical to this discussion. A "look and see" approach was taken in order to verify or put to rest the allegation that repetitive review is inhibiting and unnecessary.

After only a cursory review, one perceives that the system was designed with the intent of making it fail-safe with seemingly little real concern for the resultant expense, both directly in cost and time and, more significantly, in terms of energy production. Conceivably, environmental review of the types indicated could occur at all of the following stages:

1. Pre-lease areawide environmental review (BLM* - Draft and Final EAR)
2. Pre-lease environmental review of Plan of Operation (BLM* - USGS) (limited, according to USGS, to geophysical survey activities including thermal gradient hole drilling)
3. Pre-lease areawide Draft and Final EIS (BLM* - based on review of Final EAR)
4. Post-lease environmental review of Plan of Operation (exploration) (USGS - Draft and Final EA)
5. Post-lease Draft and Final EIS on Plan of Operation (exploration) (USGS - based on review of first EA)
6. Post-lease environmental review of Plan of Operation for initial exploratory drilling (USGS - EA)
7. Post-lease environmental review for subsequent (one or more) exploratory drilling permits (applicant submits additional plan(s) of operation for new drill sites and USGS prepares one or more EA's). Proposed changes in the USGS regulations will limit review at this stage to subsequent operations requiring new surface disturbance. (See Pg. 14). The EIS option is always open, based on review of each EA.
8. Post-lease Draft and Final EIS for proposed power plant.

In actuality, this list sets forth the "worst case," and in practice environmental review rarely occurs at all of these stages, and except at the pre-lease stage on National Forest lands, the reviews have not taken the form of full EIS's.

* and/or Forest Service.

In fact, the staged process as practiced by BLM and USGS works well by times, a BLM spokesman states, except when the process becomes "snarled." And due to the nature of geothermal development on federal lands -- i.e., public interest vs. private exploitation -- it would be difficult to argue the logic of a staged system.

However, it is felt that the process could be simplified considerably without significantly increasing the risk or incidence of environmental damage. This conclusion, discussed more fully in Section IV, is supported by an analysis of a random sample of environmental reviews prepared by the appropriate lead agencies. They include the following:

Pre-lease Environmental Analysis Reports (BLM):

1. Geothermal leasing in Monroe-Joseph KGRA, Utah.
2. Regional oil and gas/geothermal leasing in the Blue Wing, Sonoma, Paradise, and Denio Planning Units, Winnemucca District, Nevada.
3. Geothermal leasing in the Tonopah Resource Area, Battle Mountain District, Nevada.
4. Geothermal/oil and gas leasing in Pine Nut-Walker Area, Carson City District, Nevada.
5. Oil, gas, and geothermal leasing covering the Caliente and Virgin Valley Planning Units, Clark and Lincoln Counties, Nevada.
6. Proposed geothermal leasing in the Upper Pit River Area, California (jointly prepared BLM/USFS).
7. Proposed geothermal leasing, Randsburg, Spangler Hills, South Searles Lake, California.

Pre-lease Environmental Impact Statements (based on review of EAR's) (USFS):

1. DEIS, Geothermal leasing in Gila National Forest, Southwest Region, Albuquerque, New Mexico.
2. DEIS Progress Report, Island Park, Idaho.
3. DEIS, Geothermal development in the Breitenbush Area, Willamette National Forest and Mt. Hood National Forest, Oregon.

Post-lease Environmental Analysis (USGS):

1. EA #68, Multiple well drill site E on Lease CA-949, Lake County, California.
2. EA #37, Multiple well drill site D on Lease CA-949, Lake and Sonoma Counties, California.

3. EA #33, Sixteen deep test wells in Roosevelt Hot Springs Unit, Utah.
4. EA #59, Six 3,000 ± m(10,000±feet) deep, geothermal test wells in Roosevelt Hot Springs Unit, Beaver County, Utah.
5. EA #12, Geothermal leases CA-1903 and CA-966, East Mesa KGRA, California.
6. EA #3, Five deep test wells in Soda Lake Unit, Churchill County, Nevada.
7. EA #55, Seven 5,500 foot exploratory wells in the Beowawe, Unit, Lander County, Nevada.
8. EA #79, Six 8,000 ± foot exploratory wells in Brady-Hazen KGRA, Churchill County, Nevada.

Related Environmental Impact Statements (USFS):

1. FEIS, Land Use Plan, Woods Planning Unit, Coconino National Forest, New Mexico.
2. FEIS, An Impact Analysis, Trapper-Siouxon Planning Unit, Gifford Pinchot National Forest, Skamania County, Washington.
3. FEIS, Land Use Plan for Markagunt Plateau Planning Unit, Dixie National Forest, Utah.
4. DEIS, Land Management Plan for the Metolius, Bachelor, Odell, and Newberry Planning Units, Deschutes National Forest, Oregon.

In order to analyze the series of reports systematically they are addressed separately -- i.e., (1) Environmental Analysis Reports (EAR's), (2) Environmental Analyses (EA's), (3) Environmental Impact Statements (EIS's) on geothermal leases, and (4) Other related environmental documents (EIS's on USFS Management Plans). The reports are analyzed with an "eye" for three basic aspects: intent and objectives(s) of the reports; scope and content of the reports; and their relationship to other reports.

Environmental Analysis Reports (EAR's) -- The intent of an EAR is to ensure BLM and USFS consideration of environmental values at all levels of planning and decision-making. This is in response to the provision of NEPA which directs federal agencies to use a systematic, interdisciplinary approach integrating the use of natural and social sciences and the design arts along with economic and technical considerations in planning and decision-making that affect the environment.

The objectives of environmental analysis reports are to provide a framework for:

1. Conducting a systematic and analytical assessment of the environ-

mental impacts of proposed actions (issuance of geothermal leases) including ways to minimize adverse impacts.

2. Determining whether an environmental impact statement is necessary.
3. Documenting the environmental analysis of individual actions, or the aggregate of related actions within a particular area (KGRA and/or non-competitive lease lands).

The intensity of the analysis is to be commensurate with the anticipated impact of the action on the environment. The associated impacts can be difficult to project accurately at this early stage, because, as discussed above, under present procedure, the nature of the resource is not determined prior to issuance of a lease. Thus, the question immediately arises as to how meaningful are formal pre-lease environmental reviews?

Seven EAR's from three states -- Utah (1), Nevada (4), and California (2) -- were reviewed. The basis for this selection was only that these particular EAR's were provided by the BLM offices where representative samples were requested.

It was found that all EAR's followed the same basic report outline, although the manner in which the information was presented and its quality differed considerably from state to state. The Utah EAR, for example, was composed largely of "boiler plate" information, and did not appear comprehensive. Some sections of the text were abbreviated significantly, and it provided minimal information leading to the identification of sensitive environmental areas.

The EAR's prepared in California were somewhat more sophisticated in their methodology. A matrix approach was used to evaluate expected impacts on various environmental parameters at different stages of development (see examples in Appendix D). There was, however, little emphasis placed on graphical presentation of information, particularly mapping of sensitive areas, although the California EAR's contained a more elaborate discussion and analysis of terrestrial biota.

Contrary to the rather consistent quality of the individual EAR's in California, the quality of EAR's in Nevada varied somewhat depending on the BLM District. Generally, however, there was a noticeable trend in Nevada to place more emphasis on critical area identification. The EAR's contained maps of critical habitats in order of importance as well as of other sensitive areas that were recommended for exclusion from the lease. The Nevada EAR's also utilized an environmental analysis worksheet matrix to indicate the degree of anticipated impact on different environmental factors during the various stages of geothermal development (see example of worksheet in Appendix E). The function of the worksheet is to "catalog" and summarize potential impacts and to provide a convenient visual reference to their inter-relationships.

The usefulness of such worksheets is subject to diverse opinion. USGS has recently abandoned a similar system in its EA's because it felt that the

worksheet matrix:

1. Only summarizes the findings;
2. Leaves unclear whether it rates residual or potential impacts, and
3. Does not present standards and criteria for the categories of the rating system.

In summary, the EAR's from the three states probably share more similarities than differences. The former include:

1. Same basic objective.
2. Broad rather than site-specific scope (large study areas).
3. Basic underlying concern for identifying sensitive environmental areas.
4. Matrix approach to cataloging and evaluating potential impacts.
5. Dependence on existing resource information.

Data compiled by BLM on the length of time involved in preparing 70 EAR's are summarized in Table 5. Number of months may be slightly inexact in that actual dates within the start and end months are not given. The briefest period indicated is one to two months and the longest is 36 months. The median is seven months and the average is about nine months. It should be noted, however, that the acreage studied varies, but the size of the acreage does not correlate well with the length of time involved. It must also be remembered that some of the EAR's were not started for many months -- some almost two years -- after a lease application was filed.

The timeframes in California are consistently longer than those in other states, yet the peak occurred in Nevada. The reason for this, according to BLM, is the large federal acreages in Nevada vis-a-vis scheduling of EAR's on complete resource areas or districts with a limited number of personnel who also had other programs to manage. By contrast, California EAR's cover relatively small areas.

Environmental Analyses (EA's) -- The purpose of the EA is: (1) to determine whether or not implementation of specific plan(s) of operation will significantly affect the quality of the environment and thus warrant the preparation of an EIS; and (2) to identify measures which may be taken to mitigate adverse impacts and to provide data upon which subsequent monitoring and surveillance efforts are based.

Review indicates that the EA's prepared for plans of operation vary in detail depending upon the nature of the operation, the scope of the operation, and the sensitivity of the area, as permitted by 30 CFR and as indicated by the following:

Table 5

TIME REQUIRED FOR EAR's
(BLM Data)

<u>Location</u>	<u>No. of Months</u>	<u>Acres Studied</u>
<u>Arizona</u>		
Clifton KGRA	6	870
San Jose Wash/Slick Rock Basin	3	4,600
Gila Box-San Francisco River	3	22,900
Gila/Gillard Hot Springs	Incomplete	16,400
Palo Verde Mountains	12	780
Vulture	2	740
San Francisco Peaks	In Progress*	56,000
Vulture Extension	DO*	8,300
Burro Creek	DO*	12,360
<u>California</u>		
Surprise-Warner Valley	15	61,500
Geyser Expansion	25	13,443
Upper Pit River	23	57,509
Randsburg	19	86,020
Honey Lake	17	10,324
<u>Colorado</u>		
San Luis Valley & Upper Arkansas Valley	2	61,516
Montrose	5	--
<u>Idaho</u>		
Bruneau-Granview & Bennett Mountain	5	300,000 + -
Crane Creek	4	31,000
Boise Front	2	485
Cassia County	4	47,200
Lidy	3	1,246
Freedom	4	172
Heise	9	5,611
Magic	2	50,779
Clover Creek	2	17,406

*Started 10/77; scheduled for completion 3/78, Forest Service.

Table 5 - Cont'd.

<u>Location</u>	<u>No. of Months</u>	<u>Acres Studied</u>
<u>Montana</u>		
Barkels-Biltmore South West Montana	3	10,687
Boulder Hot Springs	6	7,143
Chico Hot Springs	Discontinued after application withdrawn	14,200
Cort�x, Inc. Broad Water Co.	Lease denied	22,400
Corwin Hot Springs	Incomplete	6,330
Hunters Hot Springs	Discontinued after application withdrawn	440
Marysville Area	?	13,792
West Yellowstone County	Incomplete	--
<u>Nevada</u>		
Jakes Valley-Sunnyside	12	1,420,366
Stateline	36	3,847,711
Brady Hazen	4	128,600
Cherry Creek	24	2,149,900
Baker	12	1,591,900
Esmerelda	3	3,105,160
Elko	9	10,850,902
Shoshone	5	2,677,800
Ft. Churchill/Clan Alpine	9	3,320,000
Buffalo Hills	11	1,481,000
Tonopah	8	4,000,000
Pyramid	13	927,000
Mina	6	1,300,000
Eureka	10	2,100,000
Fairview	5	2,250,000
Caliente Virgin Valley	11	6,700,000
Winnemucca	11	6,700,000
<u>New Mexico</u>		
Kilborne Hole	12	400,000
Lighting Dock	16	447,000
Cabazon San Ysidro/Santa Ana Mesa Co.	7	250,000

Table 5 - Cont'd.

<u>Location</u>	<u>No. of Months</u>	<u>Acres Studied</u>
<u>New Mexico - Cont'd.</u>		
Santa Fe National Forest	24	500,000
Radium Springs	7	1,000,000
Socorro Peak Area	9	365,000
<u>Oregon</u>		
Vale	9	1,347
Alvord	7	106,000
Warner Valley	11	315,000
Vale Addition	8	46,000
Klamath Basin	9	185,000
Bully Creek	11	43,000
Summer Lake Basin	8	137,000
Glass Butte	25	96,500
Cow Creek	19	265,000
Burns Area/Burn Butte	12	47,700
<u>Utah</u>		
Juab Co.	5	1,350,000
Monroe-Joseph	6	27,400
Cove Fort-Sulphurdale	5	46,600 (BLM) 32,148 (USFS)
Sevier Lake	3	3,050,000
Roosevelt Hot Springs	5	48,000
Escalante Desert (Lund)	4	330,000
Thermo Hot Springs	5	96,000
Minersville	3	425,000
New Castle	4	80,000

1. EA's on Geophysical Survey or Shallow Temperature Gradient Holes - The EA's for these plans of operation are reviewed internally only and the content is based on the P00, on observations made during the joint field inspection, on subsequent comments from interested parties, and on examination of the EAR previously prepared by the surface land management agency of the area. A typical outline of the content of an EA is contained in Appendix F. Current proposed regulations are designed to streamline these requirements and will be reflected in new USGS EA guidelines and procedures.

EA's are not required for "casual use," as defined in Section II, but "borderline" cases where there is doubt as to their potential for surface disturbance or potential adverse environmental effects, an environmental analysis is to be prepared.

2. EA's on Initial Proposal to Drill Deep Test Well(s) - Although the current regulations require the operator to submit a plan of operation for each subsequent deep exploratory well on the same lease, the intent is to prepare the most detailed EA when the first deep test well is proposed. It is also at this point that interagency review of the EA takes place as shown in Figure 2. In actual practice, based on review of eight different EA's, the baseline environmental information of the first EA is comparable to the level of detail in the pre-lease EAR, although potential impacts and mitigation measures are more site-specific, tailored to the lease area or area of the proposed operations only.

The eight EA's analyzed were on lease sites distributed among three states: Nevada (3), California (3), and Utah (2). Three of these (all in Nevada) represented the first Environmental Analysis performed on the lease. The time required to prepare them ranged from four to 11 months with no discernible difference in quality, scope, or detail. The baseline inventory data are broad in scope, and certain sections are taken directly from other sources (e.g., in one EA the climatology and socio-economic profiles were excerpted from the FEIS on the U.S. Coast Guard's West Coast/Gulf of Alaska Loran-C Chain and in another the geological section is based on the FEIS for the Geothermal Leasing Program, Department of the Interior, 1973). This suggests that there is nothing unique about these data and, in point of fact, there is little change in this information in terms of specificity and scope from the pre-lease stage to development. If this conclusion based on eight EA's is correct, it would appear that the intent of the geothermal regulations is being violated.

However, USGS advises that the statement is correct only when the pre-lease EAR is very detailed and comprehensive or when USGS is unable to develop additional site-specific information because of lack of data and time constraints. "This is the exception, rather than a normal situation," the spokesman added. "As exploration progresses, additional data are obtained (e.g., from geothermal wells), and the impact evaluation becomes clearer and more specific."

In this light, it can only be assumed that the small sample of EA's analyzed due to the short timeframe established for this study were not representative "across the board."

3. EA's on Subsequent Proposal to Drill Deep Exploratory Well(s) - The

procedures for the preparation of succeeding EA's do not change except that the EA's are only reviewed internally by USGS whereas the initial EA undergoes interagency review as shown in Figure 2. Analysis showed no time-saving as a result of this type of arrangement. However, the sample size was small, and in no case were all of the EA's prepared on successive proposed operations in a common lease area made available for review, although full sequences were requested. It is recommended that EA analysis be continued in more detail to ascertain the appropriateness of these sequential documents.

The specific EA's reviewed were at least the fourth prepared for activities in the same lease area, and, in one instance, 10 separate EA's had been prepared previously. The baseline inventory data remained broad in scope in all the EA's, and many of the proposed mitigation measures were generic in nature. Basically, however, the identification and evaluation of potential impacts were tailored as required to the specific drill site and the immediate surrounding area.

Although the whole train of EA's for specific leaseholds were not reviewed, a trend was recognizable. Generally, as more EA's were prepared in a designated lease area, the more abridged they became and many cross-references were made to earlier EA's. Interestingly, no corresponding reduction in the time needed to prepare the later EA's was observed.

Environmental Impact Statements (EIS's) -- The requirements of NEPA became effective in January, 1970 and, as noted previously, the BLM's geothermal steam leasing program was one of the first major federal actions to which they applied. As the programmatic EIS was being prepared, a number of court cases set new standards on the content of such reports. Partially as a result of the rules set down by the courts and partially because of varying policies within BLM on the scope and content of the EIS, the statement itself was redrafted a number of times. After two and one-half years of gestation, the EIS finally evolved. It was hoped that subsequent environmental impact statements on less extensive lease sale areas would be prepared more expeditiously. In point of fact, while BLM has not yet determined the necessity for a full EIS, the difficulties in producing adequate related documents have not disappeared in all areas. Some of the timeframes shown in Table 5 support this conclusion as do the statistics shown in Table 1 on the number of leases issued.

Three draft Forest Service EIS's were reviewed from a "compare and contrast" viewpoint relative to other environmental review documents. One observation is that the EIS's are more concise and understandable to the lay individual, and that they were prepared directly from the final pre-lease EAR, which was also the basis in each case for the EIS determination. The outline of the EIS document (see Appendix G) is almost identical to the EAR, and the two documents are similar in technical scope.

Based on the available information, it was difficult to determine the time consumed in preparing a draft and final EIS. Preliminary conclusions indicate that at a minimum one to two years elapse and sometimes more than two years pass before a final decision is made on issuance of the lease. The case history of the EIS preparation on the Island Park KGRA shown in Appendix H confirms this.

Other Related Environmental Documentation -- Three environmental impact

statements prepared by the Forest Service on their forest management plans also were reviewed to determine their relationship to the series of reports required under the geothermal regulatory scheme.

The objective of these management plans is to:

1. Determine the best use of National Forest lands within the designated planning unit in the context of a multiple land use approach.
2. Establish Forest Service management objectives.
3. Document management direction, management decisions, and necessary coordination between resource uses and activities.
4. Provide requirements for the protection, use, and development of the various resources within the planning unit.

Unit Management Plans normally are prepared based on resource inventory data, applicable research studies, public involvement, participation from other agencies, and missions and goals for the planning unit under consideration. Alternative courses of action are formulated and analyzed, and a preferred alternative approach is selected which provides the basis for the management proposed in the plan.

The characteristics and current management situations concerning the various resources, uses, and activities usually are described. Basic assumptions regarding projected future public needs are presented and management objectives for the planning unit are listed in the form of statements of what is intended to be achieved through management.

Often, the planning unit is divided into separate management areas. Each management area has its own capabilities, potentials, and demands for use. These areas are evaluated separately with management direction and land allocations prescribed. Each management area can be further subdivided into management units. Each management unit is then discussed with specific management decisions outlined.

In essence, the purpose of these plans is to develop National Forest management guidelines. The particular EIS's reviewed placed the emphasis almost entirely on timber management. Little attention was given to geothermal and other subsurface resources. However, the Forest Service advises that subsurface features are prominent in the plans where they are the key issues and reports that future plans will, where applicable, take into account potential geothermal leasing activities.

Lack of "On-the-Shelf" Background Data

The environmental statutes and their respective guidelines for report preparation all require certain fundamental resources information -- geology, soils, hydrology, biota, and socioeconomic. When this information has not been collected previously, obtaining qualified experts to develop the necessary data can be very time consuming and costly. And, frequently, identical information is collected on two adjacent parcels of land for which applications

for some type of permit are filed at disparate times. Both kinds of situations can be avoided by coordinated and broad-scale collections of baseline information.

The value of having this information "on the shelf" for application in planning competitive geothermal lease sales or in responding to non-competitive applications is readily discernible. In fact, it is almost unanimously believed that before geothermal leasing and subsequent development can move on with the speed acceptable to industry and with the safeguards satisfactory to environmentalists, that studies of this type must be completed and kept up-to-date which:

1. Inventory existing land uses and resource values.
2. Provide the basis for orderly land use planning consistent with highest and best use and multiple use concepts.
3. Identify areas where development will be consistent with these concepts.
4. Identify areas of environmental sensitivity which would permit development only with stipulated limitations on location, timing, and other factors.
5. Identify areas of particular environmental sensitivity which should be closed to all development or specific kinds of development.

There is ample legislative authority and directive to conduct such studies in both the Federal Land Policy and Management Act and the National Forest Management Act, previously cited. In addition, both BLM and the Forest Service had already undertaken such programs which were, in effect, simply formalized in these Acts.

However, the studies are nowhere near completion overall, although this point is being realized in some areas. For example, BLM regional offices in Nevada have nearly completed their Unit Resource Analyses and Management Framework Plans, which together constitute the BLM planning process, and the Forest Service Region VI office covering Oregon and Washington has completed its forest land management plans for those states. One Region VI spokesman said, "We are finally getting in the position now of being ready for the geothermal people... We can say to BLM -- now bring on the lease applications. We know what areas are OK for geothermal activity, what areas to stay away from, and what stipulations we want." Another Region VI official feels the program has not quite reached this point in area identification.

The studies in most other states are reportedly moving along. A spokesman for the California BLM office stated, however, in response to inquiry, that it has no plan or estimated budget for completing the studies in that state.

Budget/Manpower Constraints

The contention by most parties is that inadequate budgets and manpower

are responsible for the slow rate of completion of the background studies, the EAR's, EA's, and Forest Service EIS's in the geothermal program. Although this contention is a reasonable one, it is not possible to document it here. No relevant budget figures or projections were made available by BLM or USGS, and the Forest Service EAR/EIS completion schedule shown in Table 6 carries no budget requirements. A Forest Service spokesman stated that assistance funding (\$700,000) for this program was requested from ERDA in 1976 with no response to date.

The Fish and Wildlife Service, which has statutory review authority over development on federal lands, feels that it has a strong capability for carrying out biologic studies necessary to prevent or minimize the adverse impacts of geothermal development on fish and wildlife. Such studies would develop a large portion of the types of environmental data required. This work would be in support of the programs of other involved agencies, however, and FWS feels that the costs incurred should be reimbursed by these agencies. At present, FWS is carrying out its overseer role with a \$200,000 line item budget.

The Service published a Geothermal Five-Year Plan in 1976 which sets forth six program elements which would permit FWS to meet its perceived role in DOE's projected geothermal energy program to develop 10,000 - 15,000 MW of electric and thermal power by 1985.

Program Element IV -- Research, Development, and Demonstration -- includes an inventory of sensitive and critical fish and wildlife habitats on potential geothermal development sites on a biome or physiographic basis. The total effort estimated for the Element is as follows:

	1977	1978	1979	1980	1981	Total
Man-years	10	10	10-20	12-24	15-30	54-94
Cost*	600	600	600- 1,200	720- 1,440	900- 1,800	3,420- 5,640

However, the Element includes a number of other functions and, upon inquiry, a spokesman said the total cannot be broken down by function, so the figures still do not provide a "handle" on the cost of the needed studies or of specific geothermal environmental reviews. The Plan has not been funded.

Table 7 shows the effort estimated to be required to explore and define the geothermal resource in 50,000 acres in Inyo National Forest. The same budget, it was noted, would be required, for each of two years.

The Intermountain Forest Service Region estimated that the average cost of its EIS's in 1976 was \$236,000. These were not, however, on geothermal development.

One of the most important observations which can be made about the budget/background study/EAR/EA/EIS interface is that Congress did not anticipate the cost of such comprehensive environmental studies when it passed the Geothermal Steam Act in 1970 although this action was preceded by passage of

* Costs are in thousand dollars.

Table 6

FOREST SERVICE PROJECTION FOR COMPLETING
GEOTHERMAL EAR's/EIS's

<u>KGRA</u>	<u>State</u>	<u>EAR/EIS</u>	<u>MW Electricity Production</u>	<u>Scheduled Year for Elec. Prod.</u>
Mono-Long	California	1978	2000	1985
Cove Fort- Sulphurdale	Utah	Completed	500-1000	1985
Glass Mt.	California	1978	50-2000	1990
Larsen	California	1979	150-1000	1987
Island Park	Idaho	1979	None	--
Cascades	Oregon	1978	None	--
Valdes Caldera	New Mexico	Completed	1500	1983

Table 7

MANPOWER REQUIRED FOR BACKGROUND STUDY OF
50,000 ACRES OF NATIONAL FOREST LAND^a
(for each of 2 years)

			<u>Rounded</u>
GS-12	Geothermal Specialist		\$22,000
GS-11	Technician ^b		18,000
GS-11	Architect	3 months	4,500
GS-11	Soil Scientist	3 months	4,500
GS-11	Hydrologist	2 months	3,000
GS-12	Engineer	2 months	3,000
GS-11	Wildlife Biologist	3 months	4,500
GS-11	Archaeology	2 months	3,000
	Experiment Station	6 months	15,000
	Clerk		10,000
	Overhead		<u>27,000</u>
			\$114,500

^a The original estimates have been adjusted to the 1977 Civil Service scale as follows:

GS-11	\$18,258 - \$23,739
GS-12	\$21,883 - \$28,444

Figures shown are the lowest rate within the grade. Depending on actual personnel employed they could range much higher.

^b 1/2 man year to be combined with 1/2 man year for non-competitive lease work load.

NEPA by nearly a year. "Enactment of (the bill) will not require any appreciable increase in appropriation of Federal funds," the Senate Interior Committee stated. "The only costs would be the minor ones of administration, including surveys and determinations of the Geological Survey of geothermal structures." (S. Rept. No. 1160, 91st Congress, 1970)

The second observation is that it appears that with or without documenting evidence, the lack of adequate funds for environmental review programs -- resulting from the low level of priority given to the funding -- can be established as a root cause for delay. This problem is, of course, badly compounded by the amount of review required under present practice.

OTHER INHIBITIONS IN THE FEDERAL GEOTHERMAL PROGRAM

There appear to be a number of other problem areas in the geothermal regulatory program which may be contributing to the overall delay in the development of this resource. While more information is needed to quantify the extent of the delay, a delaying effect can be inferred.

Effect of KGRA Designation Based on Competitive Interest

The Memorandum of Understanding states that the determination of priority for scheduling lease sales will be based on industry interest along with geothermal potential and environmental sensitivity. However, industry contends that a major deterrent in planning and moving ahead with their geothermal programs is that lands which they consider most promising for early development are not being offered for competitive lease. Since competitive leasing is only required for lands in KGRA's, at least some of which by definition should be more desirable than non-KGRA lands, this assertion merits serious consideration. Some degree of validity emerges from the following analysis.

First, the pace of competitive leasing is far behind that of non-competitive in both total number of leases issued and total acreage involved. Recent totals are as follows:

<u>Non-Competitive</u>	
<u>Leases Issued</u>	<u>Acres</u>
970	1,645,394
<u>Competitive</u>	
<u>Leases Issued</u>	<u>Acres</u>
232	427,859

California is the only state in which more competitive leases -- 26 -- have been issued than non-competitive. However, since BLM in that state has issued only 10 non-competitive leases on less than one percent of the applications filed, and the Forest Service has issued none, it is not a representative situation.

The history of 93 competitive lease sales on 55 separate KGRA's is

summarized in Table 8. It is taken from the USGS computer printout "Bidding History of the Competitive Geothermal Lease Sales on Federal Land" of October, 1977.

Perhaps the most significant feature of the table is the relatively low number of tracts on which bids were received compared to the total tracts offered -- 241 and 516 respectively, or less than half. The lack of interest indicated by these figures tends to support industry's contention that lease sales are not being held in the areas it considers most promising. While the bidding history indicates that interest in some tracts offered increases with time -- i.e., they receive no bids when first offered but are taken the second or third time offered -- this circumstance appears to be an anomaly.

The printout shows that 26 of the lease sales, or 30 percent, produced no bids at all. The number of tracts offered ranged from one to 15. In other cases, the interest was centered on a small number of the total tracts offered with no bids on the others. For example, there were 10 bids at the Mono-Long Valley sale, but they were all on only three of the seven tracts offered. At a Brady-Hazen sale, six bids represented interest in only six of the 20 tracts offered. At Stillwater-Soda Lake, seven bids were received on six out of 21 tracts. Many other examples could be cited, but these are sufficient to establish the limited interest in a large bulk of the lands offered for lease sale.

It is difficult to assess, however, whether there was no interest or no interest at the cost of competitive bidding which is much higher than the \$1/acre/year initial rental required for non-competitive leases. The USGS recommends a minimum per acre bonus bid for individual tracts offered in competitive lease sales, and while the large bulk of these are "nominal" or \$1-2/acre, they have ranged up to \$3737/acre for a tract at The Geysers.

The bidders, however, do not know in advance what the USGS assessment is before entering their bids on specific tracts. They utilize their own knowledge of what the tract is worth which often includes proprietary data gained from adjoining private or state lands or from an NOI which are not available to USGS.

There is usually a range in bids for the same tract -- sometimes a very wide range -- but even bids on "nominal" tracts are often a great deal higher in order to compete as successful high bidder. For example, to pick a random case, at the Radium Springs KGRA sale in New Mexico, all tracts were offered at nominal bids. The bids received ranged from \$5.70/acre or \$6606.75 for 1158.9 acres to \$30.50/acre or \$30,604.01 for 1003.41 acres. Many are much higher.

Thus, level of interest and costs both emerge as considerations in the established fact that lease sales have not resulted in the leasing of as much land as non-competitive lease applications. This is especially important since a reverse situation might well have been expected since the KGRA's are are least theoretically more interesting.

The first 44 of the existing 106 KGRA's were designated on the basis of geology soon after the Act was passed, and a few more have subsequently come into being through the same route. The balance of the KGRA's -- and a

Table 8

SUMMARY OF COMPETITIVE GEOTHERMAL LEASE SALES

State	No. of KGRA Lease Sale	Offered		Received Bids		Total Bids	Accepted Bids	
		Acres	Tracts	Acres	Tracts		Acres	Tracts
Arizona	1	780	1	0	0	0	0	0
California	7	39,448	30	40,234	30	77	39,448	28
Colorado	7	17,507	13	5,037	3	3	5,036	3
Idaho	7	41,644	21	24,904	12	26	24,904	12
Montana	1	1,608	1	0	0	0	0	0
Nevada	33	354,236	175	141,027	69	99	138,465	68
New Mexico	9	96,415	58	61,811	37	61	61,811	37
Oregon	13	191,324	117	83,153	44	76	68,874	38
Utah	15	128,083	67	89,320	46	94	89,320	46
TOTAL	93	943,506	516	445,485	241	436	427,859	232

knowledgeable guess is that it is about half -- have been designated as a result of "competitive interest," or 50 percent overlap between lease applications filed in the same filing period. A precise figure on this breakdown was requested from USGS but was not forthcoming in time for this report. Thus, it can be assumed that in some cases lands which sparked competitive interest while they were in the non-KGRA status ceased to be of interest in the competitive bid situation.

This assumption can only be proven, however, by identifying the means for the KGRA designation for each of these areas where a lease sale has been held. If the estimate that approximately 50 percent derived from competitive interest is reasonably correct, it would tend to indicate that the assumption must be valid to an extent because of the widespread disinterest across the lease sales held. On the other hand, lease sales have been held in little more than half the existing KGRA's, and this group of 55 could conceivably coincide with the half that have been established on the basis of geology.

This point -- i.e., whether or not lands which attracted non-competitive applications were not attractive under competitive conditions -- is one which the Department of the Interior may want to check more thoroughly in considering whether or not to amend Section 3200.0-5(k)(3) of CFR 43, the provision for KGRA designation on 50 percent overlap. An amendment is under consideration which would provide for removing the KGRA status from acreage so designated after it has been unsuccessfully subjected to two lease sales.

This will reduce the number of KGRA's deriving from the competitive interest route. USGS is not expected to designate a great many more on the basis of geology unless there is a technological breakthrough which would make the lower temperature reservoirs desirable. Thus, it appears that the situation may in time resolve itself to some degree.

Readjustment of Terms and Conditions

Both the Geothermal Steam Act and the BLM regulations provide for readjustment of lease terms and conditions by an authorized officer "at not less than 10-year intervals beginning 10 years after the date geothermal steam is produced." If agreement cannot be reached on objections of the lessee to the readjustments imposed, he may terminate his lease or appeal to the Board of Land Appeals. There is no commensurate provision in oil and gas leasing.

It is understood that this unknown quantity in geothermal leasing which could engender unpredictable availability or cost of the resource makes at least one utility -- and the most important one since it is the only one utilizing geothermal steam for commercial power generation at this time -- nervous about long-term commitment to this resource on federal lands. Whether this factor outweighs other utility doubts at present is not known. However, if other problems which may be overriding now are resolved, it could become a final deterrent to commitment.

Nominations

The BLM regulations provide for receipt of nominations, or public expressions of interest in leasing certain described areas, either on an individual voluntary basis or upon the Secretary's call for nominations to lease.

This provision has never been implemented in that BLM has neither prepared an approved form (43 CFR, 3220.2) for receiving nominations nor issued calls for nominations (3220.1), and it does not propose to do so now. It has instead treated non-competitive lease applications as nominations and has entertained requests for lease sales through letter correspondence or verbal communications. It is understood that industry has been further inhibited from volunteering nominations by its fear that this would tend to trigger KGRA designation.

No information was found which permits evaluation as to whether or not these factors have influenced the course of past lease sales. However, industry recommends that 1) competitive lease sales be held only through nomination and 2) that the identity of the nominator be held confidential. Both aspects of this proposal would be precedent-setting in public lands leasing for mineral development to an extent, although the latter has been partially addressed in the coal and OCS leasing programs.

The exclusivity of such a relationship between the nomination and the lease sale offering conflicts first with the Secretary's mandatory and discretionary authority to exclude certain types of lands from leasing. This approach would require amendment to the Geothermal Steam Act which industry avowedly does not want. In addition, it conflicts with the implied authority in the Memorandum of Understanding for BLM to "on its own motion, on recommendation from GS, or through nominations from industry, select areas for and schedule competitive lease sales in Known Geothermal Resource Areas." It would also exclude government from this aspect of the land use planning process and its NEPA authority to select among alternatives.

It appears that Subpart 3220.2 of the BLM regulations would also require amendment in order to protect the nominator's identity since his name and address, statement of citizenship and qualifications, and identification of his interests in other federal geothermal leases in the same state are required to be filed in conjunction with the nomination. While the information supporting nominations has been kept confidential in the coal and OCS leasing programs and, in some cases, the names of the nominators have been kept separate from the tracts nominated, the Department, according to the Solicitor's office, would find difficulty in justifying that much secrecy under the existing geothermal regulations. However, this would not appear to be a particularly difficult change, providing it does not conflict with the Freedom of Information Act, and might be worthwhile if anonymity of the nominator would in fact encourage industry to nominate and BLM/USGS/FS to heed the nominations within their basic authority to select lands -- or perhaps more importantly, to select out lands for lease.

Tracts Offered for Competitive Leasing

Another related factor put forward by industry as still another reason for delay is that all contiguous tracts in a KGRA are not offered for lease at the same sale. This practice inhibits bidding, it is claimed, when one or more tracts of the most interest to potential developers are not offered. In this situation, a bid on the adjacent parcels which are offered "tips the hand" of the bidder at a time when he is not sure that he will ever be able to obtain access to the tract he really considers most promising. Further, a higher bid than he feels is justified under such an uncertain circumstance

will likely be necessary in order to win the bid and protect his possible future interest in the several contiguous tracts if the choice site is made available at some later sale.

There are many reasons why the surface management agency and USGS may elect to choose non-contiguous sites for sale. First, geothermal leasing is precluded by the Act on certain types of land such as national parks and wildlife refuges, and is permitted in certain others such as those withdrawn for purposes of other agencies only under specified conditions. In addition, under the BLM regulations (Subpart 3201), the Secretary is directed not to issue geothermal leases on lands which he:

1. Determines are necessary for the performance of federal functions with which in his judgment geothermal development would interfere.
2. Finds that geothermal leasing would be contrary to the public interest.

Certainly, environmentally sensitive areas which would not be amenable to impact mitigation or areas which are determined to be more valuable for other resources would fall into the latter category.

The application of these exclusions can be illustrated by the lease sale held for the Baca, New Mexico, KGRA since a combination of these factors appears to have motivated the Forest Service to except certain lands from leasing in this area. The mechanism for establishing the exceptions was the EIS on the proposal to lease National Forest lands in the Jemez Mountains division of the Santa Fe National Forest which accepted as the preferred course of action an alternative which would:

"Make available for geothermal leasing only those land areas which are outside heavy recreation use, scenic, and inventoried roadless areas...This alternative reduces the land available for leasing from an estimated 406,950 acres to 204,160 acres. This action would greatly reduce the impact on recreation use, fisheries habitat, and natural beauty. It would also permit the inventoried roadless areas to remain in a pristine condition leaving future management options open for later decisions."
(Lands already set apart because of mineral reservations, withdrawals, or administrative division were also excluded.)

If this language of the EIS can be accepted at face value, and there is nothing to indicate otherwise, the decision appears to be within the prerogatives of the Forest Service. The Secretary of the Interior, as noted previously, is permitted to lease Forest Service lands only with its consent and subject to its terms and conditions.

However, it could be argued -- and apparently some such arguments were put forth by developer companies in the Baca situation -- that such a decision is based on the personal choices and priorities of those who made it. Due to the operator complaints, the Area Geothermal Supervisor requested the Forest Service to review its reasons and affirm them or to reconsider the action to

see if some of the excepted lands can be leased. All of this, he points out, takes time, and, in the meantime, the status remains quo, with no indication of which way the issue will be resolved.

The complaints were limited to just that -- i.e., informal complaints rather than formal appeals to the Board of Land Appeals (43 CFR, Part 4). The AGS has stated that a Board decision might be helpful and "at least get the record well established."

One spokesman suggested that a practice utilized in selecting tracts in the Outer Continental Shelf for oil and gas lease sales might be applied in geothermal leasing. This is the practice of picking and choosing tracts for lease at a given sale on the basis of the best financial advantage to the government in terms of rentals and royalties. While there is admitted risk in holding back some areas for future sales if no discoveries are made in adjacent tracts, the value of those tracts close to successful discoveries will be greatly increased. While this approach greatly benefits the taxpayer in the OCS program where the payments are vastly larger than in the geothermal program, such an inhibition on leasing would appear to have no rightful place in the infant geothermal program.

"Grandfather" Provision

The "grandfather" provision of the Geothermal Steam Act, described in Section II, is still a very localized inhibitor in leasing about 15,000 acres in the Mono-Long Valley KGRA in California. BLM reports that only two leases are still affected by this factor out of 47 such applications filed. Apparently, some applicants withdrew portions of their applications embracing "grandfather" lands after they were suspended pending very lengthy adjudication in Washington. BLM asserts that this source of delay will be cleared away very soon.

Patented Lands

At least one other of the problems which has had a delaying effect on geothermal leasing in some areas appears amenable to solution very soon. This derived from the cloud cast by Section 21 (b) of the Geothermal Steam Act on geothermal development and production on lands in which the surface ownership has passed from federal ownership, but in which the minerals have been reserved to the United States. Lands patented under the Stock-Raising Homestead Act are a prime example.

The question was, in effect, whether geothermal resources are a mineral or water. If defined as a mineral, they were owned by the federal government and subject to leasing under the Act. If legally declared to be water, they would then be the property of the surface owner.

As the Act envisioned, litigation was necessary to resolve this issue. A lower court defined the resource as water, the 9th Circuit Court of Appeals overturned this decision, and the Supreme Court recently upheld the appellate court by refusing to review its opinion.

During the litigation, industry had repeatedly tried unsuccessfully to lease lands in the category with the understanding that BLM would hold the

bonus rental fees in escrow until the cloud of title was cleared. Now, however, armed with the "mineral" definition, BLM is free to issue leases on these lands and, it is understood, will move immediately to do so.

Forest Service Role

Table 1 shows that only a small number of geothermal leases have been issued on National Forest lands, a fact which has been emphasized throughout this report. There appear to be several interrelated reasons for this.

Perhaps the most important of these is that many Forest Service field personnel feel that their superiors -- specifically in Washington headquarters -- have not given them the "green light" to pursue geothermal leasing diligently. In fact, the matter has been given very low priority, a fact which some field staff attribute to a fear on the part of their supervisors that geothermal development would constitute too great an impact on Forest lands. While it is understood that this attitude is slowly changing, few results are yet apparent.

According to the field Forest Service personnel interviewed, another major motivation appears to be their concern as to whether they have veto power over the issuance of leases and subsequent development on Forest lands. The Act and the regulations appear to be rather specific on the former point in that both provide for the "consent" of the Secretary of Agriculture before lands "withdrawn...in aid of functions of the Secretary of Agriculture" may be leased.

However, there is a great deal of insecurity expressed as to the degree of control which the Forest Service could exert over post-lease activities, the responsibility for which the regulations give to USGS. A major concern is the amount of control FS would be given over the construction of power plants in National Forests and the attendant pipelines and transmission lines.

The behavior of the Forest Service to date seems to reflect these policy-related concerns which translate into program delay. In addition to the small number of FS leases issued, delay is inherent in the FS policy to prepare EIS's on all EAR's on KGRA's in its jurisdiction as well as its recommendations for "no occupancy" stipulations to leases, a move opposed by USGS.

Forest Service correspondence from 1975 reviewed tends to indicate that up to that point there was considerable confusion in some areas as to the authority for spending funds on geothermal studies and certainly a low priority for same.

Lease Rejections Based on Procedural Reasons

Another delaying factor is the number of lease applications rejected. According to a recent BLM survey, many more leases are rejected for procedural reasons than because of environmental considerations. The comparative tally is shown in Table 9.

The common causes for procedural rejections are as follows:

Table 9

REASONS FOR LEASE REJECTIONS

<u>State</u>	<u>Rejected for Environmental Considerations</u>	<u>Rejected for Procedural Reasons</u>
Arizona	0	34
California	5	282
Colorado	2	56
Idaho	18	133
Montana	0	26
Nevada	56	255
New Mexico	0	61 <u>3/</u>
Oregon (Includes Washington <u>1/</u>)	0	307
Utah	3	334 <u>4/</u>
Montana	0	26
Wyoming	16	9

1/ All Washington are USFS lands.

2/ Rejection requested by other Federal Agency (USFS, USF&WS, etc.).

3/ 1 lease rejected at request of NASA-NMSU.

4/ 128 applications withdrawn prior to adjudication.

- Deficiency in legal description
- Competitive overlap (competitive KGRA)
- Failure to file proper fees
- Failure to file preliminary plan of operations
- KGRA determination by USGS
- Application made for lands previously filed on
- Failure to file information required under 43 CFR 3202.2 (qualifications of applicant)
- Failure to apply for all available lands (43 CFR 3210.2-1C)
- Application to lease lands in which the U.S. has no minerals interest
- Land applied for not available for lease (for example, lands in Yellowstone National Park or a military gunnery range)
- Application made for lands already under lease

SECTION IV

POTENTIAL REMEDIAL ACTION IN THE ENVIRONMENTAL REVIEW PROCESS

Any remedial action proposed for the purpose of streamlining the federal geothermal regulatory program must be weighed against a number of criteria. First, will the efficiency gained continue to offer adequate protection to the public interest and environment? Will the efficiency achieved be consistent with and supported by other land use planning goals? Does the proposed remedy extend to potential geothermal developers equity with other mineral leasing programs? Are the requirements it imposes on the developer competitively acceptable to him? Can the proposed remedy operate effectively without vastly increased agency budgets? And, finally, the paramount issue -- will it foster early geothermal development and result in an environmentally acceptable new energy industry?

Obviously, all of these are desirable considerations. Some of them are overriding in that a proposed solution which does not respond positively to them would be worse than existing practice. It is the purpose of this section to examine alternatives, delineate precedent for change where it exists, and to recommend a specific alternative for further consideration.

EXISTING SITUATION

It was concluded in the previous section of this report that the major immediate constraint on geothermal leasing on federal lands is the repetitive regulatory procedures -- predominantly those concerned with environmental review -- and that the most inhibiting long range factor is inadequate budgets and program priorities needed to complete background studies and resource inventories. Remedy of the latter constraint would to an extent relieve the time pressures on the regulatory process since up-to-date information would be "on the shelf" to support quick and sound decisions. However, even more generous funding for the studies and inventories will not make them happen overnight. They, too, are time-consuming and there are limitations on qualified manpower to perform them.

Thus, significant relief from this source will not be forthcoming in all areas in the immediate future. And, even when it comes, it will not obviate the necessity for performing the required regulatory steps as long as they remain "on the books," even if only in a pro forma way. Thus, it seems more prudent to change the process itself in the interim, and look to the day when completed studies will even further improve a new process.

ALTERNATIVES VIEWED THROUGH PAST HISTORY AND RECENT LEGISLATION

In considering alternatives for changing the process, the fundamental

starting point is: Can the most beneficial changes be made without amending the Geothermal Steam Act? Or, could more desirable changes be made through amending the Act?

The primary mechanism which most interested parties agree could be used to streamline the environmental review procedure with the least controversy challenges these questions directly. This mechanism is some procedure, by any nomenclature, which would permit developers to identify the resource -- i.e., conduct deep test well drilling -- without the commitment to development inferred by a lease and without the comprehensive environmental study a lease entails.

An approach incorporating these elements is favored for several reasons. They include:

1. Limited exploratory drilling for resource identification -- properly conducted -- can be permitted without irreparable ecological damage. Major potential developers indicate that they would prefer to pay for restoration of abandoned sites provided they have concomitant ability to explore other sites without delay.
2. Developers do not need the long term commitment for production and utilization on the large percentage of exploratory wells which will be abandoned.
3. Developers can find out more quickly what kind of a resource they are dealing with and where it is.
4. The funds and effort expended in EAR's on non-competitive lease applications for areas found to be non-productive can be conserved for more beneficial use.
5. Environmental protection is afforded by the safeguards set in motion when a productive area is discovered and plans for development and use proceed under a lease.
6. The interests of environmentalists are satisfied in that the commitment they feel a lease carries remains subject to intensive environmental impact review, all the way through final use which is possible once the resource is identified.

The alternatives for achieving this type of program appear to be limited by the Department of the Interior's interpretation that a lease on federal lands for mineral exploration is indeed a commitment to development and utilization. This construction was determined by the Department soon after passage of the Mineral Leasing Act in 1920. In other words, it is the Department's position that it does not have the statutory authority to separate exploration from development under any of the laws it administers in this area of legislation. A spokesman for the Solicitor's Office said that he does not know, however, whether this construction was ever adopted as a

formal written policy or whether its roots in 1921 "are lost in the mists."

It is embodied, however, in the Department's response to the State of California's request that five-year Outer Continental Shelf exploration leases be issued to be followed with five-year development leases. The Department replied that under Section 8(b) of the OCS Act it cannot separate leasing phases. The language of the Geothermal Steam Act seems equally as clear in Section 3 where the Secretary of the Interior is authorized to "issue leases for the development and utilization of geothermal steam and associated geothermal resources..."

The Solicitor's Office also points out that the commitment to development and use can also be derived from the rentals and royalties section of the Act (Section 5) where both are established as terms of the lease. Royalties are to accrue from "the amount or value of steam, or any other form of heat or energy derived from production under the lease and sold or utilized by the lessee..." Failure to pay timely rentals on leases on which "there is no well...capable of producing geothermal resources in commercial quantities..." triggers automatic termination of the lease.

This interpretation thus appears to rule out any alternative system to provide for resource identification in which "leases" are issued for exploration only and do not carry with them the development connotation. This difficulty is compounded in that there is no mechanism other than a lease in the existing regulations which permits the type of drilling required for resource identification.

The exploration permit obtained under a Notice of Intent application, although it precludes producing the resource, comes closest to providing a vehicle. So, it can be argued, why not amend this procedure to permit a limited number of deep exploratory holes? This potential solution is countered by the fact that it would not present an attractive alternative to the developer because the present NOI provides for neither an exclusive right to explore nor a preference right to a lease. Engaging in costly deep-well exploration under this circumstance would amount to economic Russian roulette for each of the developers involved on any given acreage.

Another major hazard is added in that in present practice a lease may not be issued at all because the particular area may be found to be too environmentally sensitive for development or the land may be assigned to what is considered to be a higher and better use under a prevailing land use plan. Or, alternatively, the lease may carry such stringent stipulations that further use of the site is not feasible or economic to the developer. For example, the Forest Service has on several occasions consented to a lease but with the stipulation of no surface occupancy. Up to now, the USGS Supervisor has tried to avoid leases with such a stipulation as unenforceable and undevelopable, but the possibility of similar stringency remains.

However, the exclusive right to explore and a preference right to a lease if a lease is issued would, developers say, offer sufficient incentive to deep-hole exploration even at the risk that a lease may not be issued or may be issued conditionally. This discretionary qualification would also differentiate such a program from the old prospecting permit system and avoid the problems it incurred.

Prospecting permits -- which were discontinued for oil and gas in the 1930's and very recently for coal by the new Federal Coal Leasing Amendments Act of 1975 -- were issued for lands not known to be valuable for the specific mineral involved, and were administered by BLM and its forerunner, the General Land Office. If a discovery was made, then the prospector was entitled to a preference-right development lease. The courts ruled, according to the Solicitor's Office of the Interior Department, that upon such a discovery, it was mandatory that the Secretary issue a lease. He could not refuse a lease on discretionary grounds such as environmental suitability. This would obviously be an unacceptable approach today and one incompatible with NEPA as demonstrated in recent litigation.

A major issue in the case -- National Resources Council vs. Hughes -- was the adequacy of DOI's programmatic environmental impact statement on its coal leasing program. The Council argued that a prospecting permit did not mandate a lease and won the point when the court ruled the EIS inadequate since it does not consider "no lease" as an alternative in the prospecting permit/discovery situation. It was held that Interior had assumed that leasing was going to take place, an assumption which the court felt was premature under NEPA, but an assumption which was in accord with the earlier court ruling.

To the contrary of the requirements of this now outmoded prospecting permit/preference right lease process, no matter how they are interpreted, issuing a lease through the normal competitive and non-competitive channels provided for today in the Geothermal Steam Act and the implementing regulations is recognized as a discretionary act on the part of the Secretary. And the NOI exploration permit is a product of the regulations only, not the Act. So it appears that so long as developers are willing to explore under the condition that they have a preference right to a lease only if one is issued, this could be accomplished by a modification of the regulations to extend the actions permitted under NOI's to a limited, but reasonably representative number, of deep exploratory holes.

Thus, up to this point, the streamlining objective as outlined above could probably be achieved without amendment of the Act itself. However, it appears that the purpose of the new non-competitive scheme would be totally thwarted without a minor amendment. This is because a discovery well would trigger the Known Geothermal Resource Area mechanism of Section 3(c) of the Act, and the discoverer would be denied a non-competitive lease under Section 4 because the acreage he wants, and has earned, is now a KGRA.

It would not be necessary to alter the KGRA concept, however, to overcome this situation. The desired change could be accomplished by adding the underlined language shown below to Section 4:

Sec. 4: If lands to be leased under this Act are within any known geothermal resources area, they shall be leased to the highest responsible qualified bidder by competitive bidding under regulations formulated by the Secretary. If the lands to be leased are not within any known geothermal resources area on the date of the application, the qualified person first making application for the lease shall be entitled to a lease of such lands without competitive bidding."

The effect of the amendment would be to prevent the designation of a KGRA on lands subject to existing lease applications. Amplification in the regulations would be needed to establish the conditions under which applications are no longer valid.

The amendment would appear to have a salutary effect on leasing generally, whether or not an NOI is involved, since it would tend to reduce KGRA designation. It has been demonstrated as discussed in Section III that leasing is moving more rapidly under the non-competitive program, and that the remunerative gain to the public of the competitive system is a minor consideration. It would also obviate the need for the KGRA clearlist procedure at any point in the process.

The fact is, however, that industry does not want the Geothermal Steam Act amended for any purpose. The Act itself, developers feel, is not the root of their troubles which they instead ascribe to the regulations. They fear the imposition of increased environmental requirements rather than less if the Act is opened to amendment. There are some in BLM who also adhere as strongly to this viewpoint and charge that Congress has been writing regulations in recent related mineral statutes, rather than legislation.

Their concern would appear to be justified by the legislative direction of Congress of several years standing. However, dual goals were incorporated in the Surface Mining Control and Reclamation Act of 1977 (P.L. 95-87) which appear to be completely analogous to the desired objectives in accelerating geothermal development -- i.e., the Act is designed both to: 1) assure that surface coal mining operations are conducted in a manner which will protect the environment, and 2) assure a coal supply essential to the Nation's energy requirements.

Congress further recognized that application of NEPA to all of the programs authorized by the Act would be unduly cumbersome and probably cause a serious delay in its implementation, thus impeding coal production. As a result, certain programs were exempt from NEPA authority. In addition, time limits are placed on the regulatory process and the onus for environmental compliance is placed on the operator, features which can be endorsed for the geothermal program.

It is not suggested, however, that any facets of the geothermal program would necessarily benefit from exemption from NEPA. The above action is brought out here only to illustrate that Congress has charted a new course in the energy/environment interface in responding to the need for energy self-sufficiency. In amending the Geothermal Act for the same purpose, Congress would not be confronted with the need to write "regulations" as it has seen fit to do in drafting the Surface Mining Act and other completely new legislation.

PROPOSED GEOTHERMAL REGULATORY PROCESS

Non-Competitive Leasing

In addressing means for streamlining the geothermal leasing regulatory program, the basic consideration was finding an efficient and environmentally-protective framework within which developers can be permitted to identify the

FIG. 10
PROPOSED
GEOTHERMAL REGULATORY PROCESS

NONCOMPETITIVE LEASING

Principal Activities

resource without triggering all of the regulatory responses which are only needed when a useful resource is discovered. It appeared from the outset that within the limitations discussed above a mechanism other than a lease -- conditional, limited, or exploratory -- is needed to accomplish this goal. At the same time, the environmentally-unacceptable mandate of the old prospecting permit system must be avoided, and the requirements of NEPA must be satisfied.

It is felt that the proposed regulatory process for non-competitive leasing developed and shown in Figure 10 is responsive to these objectives. It has advantages and disadvantages, but, on balance, its advantages appear to outweigh those of alternative schemes and it suffers fewer drawbacks. It is recommended for discussion among interested parties.

The process shown begins when the applicant simultaneously files an NOI, in the amended form described below, and a non-competitive lease application. It is when the NOI is approved as prescribed under Section 3209.1-2 of 43 CFR, that the most readily evident improvement in existing practice becomes a factor. This is the introduction of parallel agency/applicant activities in a single time elapse period which contrasts with steps now accomplished in sequential time periods.

The applicant would undertake his separate exploratory operations up through deep well drilling into the resource during a period of up to two years, and, during the same time lapse, gather his year of baseline environmental data, beginning on the date of his selection. If a cooperative venture is planned, all necessary arrangements would also be completed during this period. The two-year period is thrown out for dialogue in order to determine whether, with governmental requirements reduced, the applicant could telescope his discovery activities into this timeframe.

During this exploratory phase, the applicant would be subject to compliance with all the terms and conditions of the NOI, shown in Appendix B, to all the drilling and other engineering safeguards provided for in the USGS regulations and the series of Geothermal Resources Operations Orders, and with all federal, state, and local environmental standards. Other environmental protection features are provided by requiring the applicant to certify prior to deep drilling that his selected sites are not environmentally sensitive, corroboration of this fact by an agency walk-through, and subsequent supervision by USGS. Because of these features, issuance of the NOI would demonstrably not constitute a "significant action affecting the human environment."

Meantime, if the acreage covered by the application had not been subjected to an EAR, BLM would conduct its own broad background study which the applicant's data would supplement and up-date. The applicant's activity on the land and the financial risk he is undertaking would establish the area very clearly as a top priority area for the use of BLM (or Forest Service) funds and personnel for this purpose. At the end of two years, if that is the period decided upon, or any prior time, the applicant would submit his plan for development and production or withdraw his application. An added feature is that a lease would not be awarded if the plan is not received within the prescribed period unless the applicant could show reasonable cause why it was not.

The plan of development and production is to be accompanied by the baseline data and well test results. The latter are disclosed only to USGS. The plan would then become the focus of the one comprehensive environmental evaluation which would take place post-lease during the entire recommended process and would determine the necessity for a full environmental impact statement. It is felt that a negative declaration would be possible in most cases, as discussed below in the environmental justification of the recommended process. However, in the few instances where EIS's are required, the applicant's up-to-date data should serve to shorten the procedure significantly.

If the applicant is to use the produced resource himself, the use would be specified in his plan of development and production and the environmental review should be tailored to a permit for the category of use under Section 3200.0-8 of 43 CFR. If the applicant is not to be the user, the concept illustrated in Figure 10 assumes that the energy purchaser will file a use application simultaneously with the developer's plan of development and production.

If a lease is issued, the lessee would undertake his development and production operations according to his approved plan and under USGS supervision. The user, whether he is the lessee or another party, would operate under regulations yet to be developed.

Advantages/Disadvantages

The advantages of this proposal are that it permits identification of the resource before the lease is issued; it introduces parallel agency/applicant activities; it precludes repetitious environmental review and instead makes use of the Secretary's authority to enforce compliance with environmental standards.

Its primary disadvantage is that it requires more risk expenditure by the developer in requiring him to drill and develop baseline data without final assurance that he will get a lease and be able to proceed unimpeded to development and use. The situation created is analogous, however, to the permit provision utilized in several California counties in the vicinity of The Geysers which makes clear that the permit for test wells does not commit the county to future development of the geothermal field. This approval depends on a review of the test information, environmental considerations, and other factors as would be the case in this proposed process.

There is also a relevant analogy in other federal permitting programs in which permits have been denied after considerable expenditure by an applicant and complete restoration ordered.* The examples cited below resulted from

*Examples are:

U.S. District Court, Southern District of Florida. 1974. United States of America v. Frank Keevan and Son, Inc. [U.S. v. Keevan], No. 74-69-Civ WM, June 27, 1974.

U.S. District Court, Southern District of Florida. 1975. United States of America v. Sexton Cove Estates, Inc., Key Largo, Monroe County, Florida, and Ralph E. Osterle [U. S. v. Sexton Cove Estates], No. 74-1057-CIV-WM, February 6, 1975.

implementation of the Rivers and Harbors Act of 1899, but the opportunity for a similar situation exists under other statutes such as the National Pollutant Discharge Elimination System permit program of the Federal Water Pollution Control Act Amendments of 1972.

A few developers were questioned on the specific point of whether they would consider drilling before development rights are assured a sufficiently attractive competitive position. They stated that they would provided that they have the exclusive right to explore and preference right to a lease if a lease is issued. The issue of performing the baseline monitoring at this point was not raised.

Performing baseline studies "up front," however, is considered one of the more logical changes provided by the recommended flow of activities. In the existing procedure, all of the EAR's, EIS's, or EA's conducted prior to the applicant's monitoring will be outdated as soon as he submits his new data.

There is a partial mitigating feature in the proposed process in that the developer would not have to pay for a lease until after his exploratory work and data base expenditures are finished. On non-competitive leases, this is not a major factor, however.

Another disadvantage, depending on one's point of view, is that it would require the minor amendment to the Geothermal Steam Act discussed above to permit the issuance of a non-competitive lease after a discovery has been made. No way was found to accomplish this through modification of the regulations only.

However, the proposed process would also require amendment of both BLM and USGS regulations for other purposes, but the effort to accomplish this task would be offset by considerably reduced program requirements in the future. No attempt will be made here to spell out all of the substantive changes and clarifying amendments which would be necessary, but some examples can be given.

The first is, of course, that the NOI permit would be a new type of permit issued under an amended Section 3209.0-5, 43 CFR, which redefines "exploration operations" to include core drilling for subsurface geologic information and drilling for geothermal resources. It is anticipated that the term "drilling for geothermal resources" would be quantified by a limitation on the number of wells permitted within the definition of "exploration operations." And as noted above, the NOI would grant an exclusive right to explore and a preferential right to a lease if a lease is issued.

The process shown in Figure 10 also envisions amendment to Section 3209.1-1 to provide for staging of the information required by Subsections (3), (5), and (6) as follows:

"(3) a brief description of the type of operations which will be undertaken;"

(5) "a map or maps, available from State or federal sources, showing the lands to be entered or disturbed by the proposed

exploration operations; and

(6) "the approximate dates of the commencement and termination of exploration operations."

The applicant would provide the information in his initial NOI application up through shallow well drilling, but furnish information on subsequent deep-well drilling on the basis of knowledge gained from his shallow holes. In many cases, his activities on the acreage will cease with the shallow holes.

Some of the primary amendments required to 30 CFR would center on Sections 270.11, in the authority currently used by USGS to require Environmental Analyses, and Section 270.34 dealing with plans of operation. Specifically, revision to Subsection (k) of Section 270.34 is recommended so that the baseline data collected is tailored to the use to which the resource will be put -- i.e., the applicant will be required to monitor only those environmental parameters which will or may be affected by his specific operation. For example, costly air pollution studies will not be necessary on the use when a closed, recirculating system is to be employed in a space heating system or greenhouse operation, for example. The air pollution aspects of resource production to serve such a use will be governed by the lease terms and the Secretary's basic environmental control authority as expressed in the regulations and GRO Order No. 4, as will the disposal of the used resource.

Perhaps the most important and fundamental amendments required by the proposed process would involve some realignment of BLM (FS)/USGS program authority. The leasing and surface management responsibilities overlap and merge with supervision of subsurface operations to a greater extent than they do in existing practice, and it is not unlikely that a clear division of responsibility was one of the factors which shaped the system in the first place.

The contractor has concluded that the plan proposed in Figure 10 is environmentally sound and in conformance with NEPA. This conclusion is based on the following factors:

1. The applicant will certify and the administering agencies will confirm that drill sites are not on sensitive areas. If the applicant requires the services of an outside consultant in preparing his certification, there is ample precedent for this in the archaeological assessments applicants have previously been required to underwrite. It is understood that the Interior Department does not generally think too highly of the "third party" approach in environmental evaluation work -- i.e., contracted by the applicant but responsible to the agency -- although the archaeological studies paid for by the geothermal applicants fall within this category. If additional safeguards are felt to be needed, BLM could develop a list of certified contractors.
2. Operations complying with the terms and conditions of the NOI, shown in Appendix B, on certified sites are, as noted above, demonstrably not a "significant action."

3. The Secretary is given full authority in the Geothermal Steam Act to require compliance with all applicable federal, state, and local environmental control standards.
4. If the acreage applied for does not fall in an area which has been subjected to an EAR, the developer's activity will pinpoint it as a priority budget area.

Competitive Leasing

The recommended changes in the competitive leasing system are designed to employ much the same features as those recommended for the non-competitive procedure. The essential difference is that an EAR or other BLM/FS land management plan or resource inventory would still precede the lease sale rather than occurring concurrently with the exploration/data gathering period. The essential similarity is that the major and only post-lease environmental evaluation would not occur until the resource has been identified and the new data base obtained.

Once the applicant received his lease, he would file an NOI application under new USGS rules as proposed on September 27, 1977, and described in Section II of this report. Once the NOI were approved, the sequence would proceed as described in Figure 10.

A major incentive to this plan could be provided by deferring payment for the lease, often a considerable sum in competitive leasing, until exploration and monitoring are finished. Under this plan, the government could risk loss if the lessee does not make a discovery and wishes to cancel his lease. If, however, there is a serious desire to enjoy this new source of energy, this risk is small enough, especially in face of the extent of the developer's risk.

Similarly to the provision above in non-competitive leasing, the lessee's competitive lease would be terminated if he does not submit his development and production plan within the prescribed period.

MEMORANDUM OF UNDERSTANDING

This document, shown in Appendix A, undertakes to set forth the procedures to be followed cooperatively by BLM, USGS, Fish and Wildlife Service, and, probably soon, the Forest Service in the environmental impact review of geothermal exploration permits, leases, and post-lease activities. It is a poorly drafted document which the field people who are called upon to implement it find confusing and difficult to follow. So that interested readers who are unfamiliar with the MOU can judge for themselves its impact upon new field people, who are equally as unfamiliar with it, an orderly step-by-step explanation is deliberately avoided in this report except as shown in Figures 1 and 2. Even if the program it details is not modified, the Memorandum itself should be revised in its entirety.

REDUCTIONS IN ENVIRONMENTAL REVIEW IN EXISTING PROCESS

If the present regulatory process were redesigned along the lines recommended above, the duplication in the environmental review process would

largely disappear. Meantime, however, some reduction in the duplication in the existing procedure could be achieved. One avenue for reduction is suggested by the fact that the analysis conducted during this study indicates that preparation of both a pre-lease EAR and a pre-lease EIS, in their present form, seems unnecessary in most cases.

The only substantive difference between the two is the requirement for more extensive interagency review and public involvement in the EIS. This is strictly a procedural allowance which could be accommodated by placing additional emphasis on public review at the EAR stage. Unless there is significant public controversy and/or clearly identified significant adverse impacts, the EAR is sufficient from a legal and technical standpoint. In the event that significant public concern and/or adverse impacts appear to dictate preparation of an EIS, its content should be brief by comparison to the EAR and should focus entirely on key problem areas and issues of major concern. For the benefit of those parties interested in other facets of the action the EIS should cross reference the appropriate sections of the EAR. This procedure not only would satisfy all NEPA requirements and existing geothermal regulations, but it would result in more expeditious processing of lease applications.

Another area which offers a potential for reduction of duplicative effort is cooperatively planning for the background studies conducted pursuant to all of the various pieces of legislation discussed in this report. There appears to be no reason why a plan and/or inventory prepared with funds from one program should not be developed and constructed so that it serves the purposes of all the others. Why, for example, should forest land studies not include subsurface resources? Why should a BLM Management Framework Plan not be definitive enough to satisfy EAR requirements?

If all the program people involved were to sit down together and pool their resources, it is probable that a great deal more overlap could be avoided. There is nothing sacrosanct about the format of an EAR -- as there is with an EIS -- or with other background studies, plans, and inventories. Thus, a format could be developed which is responsive to all of the separate needs.

POTENTIAL CHANGE IN LEVEL OF REVIEW

The majority of those interviewed in all of the sectors interested in geothermal development seem to have reached a consensus that there are fewer problems among the adversary groups -- developers, government, and environmentalists -- when decisions are reached at the lowest possible local level. Everyone who addressed this point said that there is better understanding, less friction, and increased chances for agreement at this level.

One BLM regional office spokesman expressed it well when he said, "When there is early communication with the local people and environmental groups, we just don't seem to have a problem." An industry spokesman seemed to enunciate the reason for this when he pointed out: "The impact is local -- the decision to lease or not to lease or to develop or not to develop should therefore be a local decision." He espoused a "town meeting" type of approach in which the impacted citizens would make the decision in all but the most

sensitive, controversial cases. In his view, cases of this type are the only ones which justify consideration at the state level of BLM/USGS.

Another developer was even more specific in his recommendation that there should be local USGS presence on post-lease activities -- especially drilling permit approvals -- rather than leaving responsibility for all of these essentially field decisions for all geothermal activities in Menlo Park.

Another area of potential shift in approval authority is suggested by the fact that some of the geothermal states require state permits for shallow and/or deep well drilling even on federal land. State authority derives from specific geothermal statutes and regulations, from state water right law, or both. This type of authority is also supported by the fact that federal lessees are required to comply with all applicable local law, including environmental control standards. State permit requirements for exploratory shallow well and deep well drilling vary from none to all to state permits for any drilling activity, as shown in Table 10.

Water law related permit requirements for geothermal drilling are based principally on the state classification of geothermal resources as a water resource, carrying with it prior appropriation considerations regarding use of the resource. In addition, some states indicated that water law considerations dictate permitting and/or review of any activities in proximity to or affecting the resource. States where permits are required for drilling activities on federal land based on specific geothermal legislation generally have this permit authority on all lands in the state. If a water appropriation issue is involved, the application to drill would also be reviewed on this issue. Some delay may be added to the geothermal development program by the state permitting process -- for example, 120 days for public notification of proposed activities involving use of the resource in one case.

There is considerable precedent in delegating federal environmental control authority to the states -- this is the basic concept of the federal programs in air, water, and solid waste legislation -- provided state requirements meet at least the minimum federal requirements. Thus, it is recommended that study be given to the potential for extending drilling approval authority to state agencies where qualified programs exist.

RECOVERY OF COSTS

A means should be found to recover the costs of environmental studies necessitated by the geothermal leasing program since the minimal service charges provided for in the Geothermal Steam Act are processing charges only. Recovery could be accomplished through the bid price, the royalty based on economic worth of the resource, or through existing Interior Department authority (Section 304, P.L. 94-579, Federal Land Policy and Management Act of 1975) to "establish reasonable filing and service fees and reasonable charges and commissions with respect to applications and other documents..."

According to an official of the Energy Facilities Staff, the Department has implemented similar authority in Title I, Section 28 of the Mineral Leasing Act through a variable fee based on the extent of federal lands utilized. If the calculated non-returnable fee is less than \$10,000, then it is the

Table 10

STATE WELL DRILLING PERMIT PROGRAMS

<u>State</u>	<u>Permits Required on Federal Land</u>
Arizona	Separate permits are required for both shallow and deep well drilling. However, least status affects degree of state involvement.
California	Separate state drilling permits are not required on federal land.
Colorado	Separate state permits are required for drilling in Colorado. Can be 60-day delay review under water rights.
Idaho	(Waiting for response.)
Montana	State authorities not familiar with specific geothermal permits. Water rights law evidently requires permit for activities affecting water.
Nevada	State permits are required and come under water law. If appropriating water have five weeks notice and 30 days review time.
New Mexico	No separate state permits. Water rights issue still under question in state.
Oregon	Separate permits are required for both shallow and deep wells. Response time given as 15 days for shallow and 30 days for deep. This is in accord with specific geothermal legislation.
Utah	Separate permits are required on federal lands for drilling. No timeframe yet -- process still evolving. If water rights issue is involved, there can be a delay of 120 days.
Wyoming	Permits are required for any well drilling in the state pursuant to both a geothermal statute and water law.

total payable fee. If the fee is greater than \$10,000, the Department accepts segmented payments.

SECTION V

POTENTIAL REMEDIES FOR OTHER PERCEIVED PROBLEMS IN THE GEOTHERMAL REGULATORY PROGRAM

While there is considerable grumbling about problems in the geothermal regulatory process exclusive of complexity and environmental review duplication, it is much lower key. The relative severity of these problems is thus not as identifiable, and potential remedies are not as obvious. However, consideration of the problems indicates they may be amenable to remedy as discussed below.

KGRA DESIGNATION

Solutions to the inhibiting effect of a multiplicity of KGRA's already appear on the horizon. If USGS has now designated the bulk of those which will be created as a result of geology until low temperature areas become more attractive, the number of new KGRA's formed through this route will be reduced for the foreseeable future. And, if the Interior Department moves ahead with its proposal to amend the BLM regulations so as to remove competitive-interest KGRA's from this designation after they have been through two unsuccessful competitive lease sales, a reduction from this source also appears possible. Adoption of a plan similar to that presented in Section IV and amendment to the Geothermal Steam Act as suggested would also prevent KGRA designation on acreage subject to valid non-competitive lease applications.

READJUSTMENT OF TERMS AND CONDITIONS

When other inhibitions are removed from the geothermal program and some of the side issues can be viewed more clearly, Congress and the Interior Department may want to reevaluate Section 8 of the Geothermal Steam Act. The overriding consideration would be whether the long term protection offered by the provision for readjustment of terms and conditions is offset by a retarding effect on the growth of the geothermal power industry, and whether this is an appropriate trade-off.

NOMINATIONS

Industry's suggestions that nominations guide the location of competitive lease sales and that the identity of the nominator not be disclosed have merit provided they are placed within the context of Interior's statutory authority as discussed in Section III. The nomination procedure could also be used to support the background studies and to provide recent input on the relative suitability of lands for leasing by adopting a practice already used in oil, gas, and coal leasing. The assistance this could provide to the tract selection process is illustrated in the following excerpt from a Call for Nominations of and Comments on Areas for Oil and Gas Leasing (Southeastern Bering

Sea (OCS) (Federal Register, Dec. 17, 1974) illustrates this potential:

"In addition to requesting nominations of tracts for possible oil and gas leasing within the specified areas, this notice also requests particular geological, environmental, biological, archaeological, and economic or other information which might bear upon potential leasing and development within this general area -- that is, if information indicates that particular tracts should not be offered for lease, this information should be supplied. Information on these subjects will be used in the preliminary selection of tracts leading to a final selection by the Director pursuant to 43 CFR 3301.4. This information is requested from Federal, State and local governments; industry; universities; research institutes; environmental organizations; and members of the general public. Comments may be submitted on blocks or subdivisions thereof, as required for nominations, or on all areas or portions thereof as described above. They should be directed to specific factual matters which bear upon the Department's decision whether to make a preliminary selection of particular tracts within these areas and further environmental analysis pursuant to the National Environmental Policy Act of 1969 and possible leasing."

FOREST SERVICE ROLE

In order to give Forest Service personnel more confidence that they have not lost all right to be heard on proposed activities on leases, their role should be clearly defined in the regulations. It should be made clear, however, that the purpose of this action is to accelerate the FS pre-lease evaluation and not provide another vehicle for what many in the industry consider "foot dragging" on its part.

Geothermal activity should be given more visibility in the Forest Service programming and budgeting process as well as in planning. This appears to be necessary so that the organization needed to administer geothermal and other mineral activities will be available.

In addition, increased use should be made by the Forest Service of its environmental impact statements prepared as part of the broad area land management plans in considering geothermal lease applications. Supplemental EAR's could then refer back to the management direction developed.

OMISSION OF CONTIGUOUS TRACTS FROM LEASE SALES

Industry complaints described in Section III under "Tracts Offered for Competitive Leasing" might be alleviated to some extent if the BLM regulations were amended to require lease sale notices to:

1. Identify excepted lands by land description.
2. Set forth the mandatory or discretionary reasons for exception.
3. Identify the anticipated degree of permanence of the exception.

4. Advise interested parties of their right of appeal to the Board of Land Appeals with a decision mandatory before the sale may proceed.

The regulations should then impose a reasonable time constraint on the Board to render a decision.

SECTION VI

EPILOGUE

"The lack of development of the geothermal power potential of the United States can be attributable in large part to the absence of reliable statutory authority permitting its development on the public lands. Over the years the Department of the Interior has taken the position that it lacks authority to dispose of this resource on lands under its jurisdiction. This has limited most of the pioneering that has been done to private lands where the title to the resource is not in question. But a great deal of the Nation's known geothermal resources underlies the vast public domain in the West, and the lack of clear-cut authority for its disposition has seriously impeded development. Orderly development is essential in the public interest. In the Committee's judgment, S. 368 will provide the statutory framework needed to encourage private enterprise to invest in and develop this resource, while at the same time assuring effective protection of the public interest. Indeed, private investment to develop this resource is in the public interest. ...the bill will make possible the development of presently untapped natural resources of the publicly owned lands of the United States, resulting in new supplies of pollution-free power, relatively speaking, which will be the foundation of new industries, bringing new revenues to both the States and to the Federal Government."

Senate Committee on Interior and Insular
Affairs, September 4, 1970

APPENDIX A

MEMORANDUM OF UNDERSTANDING
FOR THE GEOTHERMAL PROGRAM

MEMORANDUM OF UNDERSTANDING
FOR THE GEOTHERMAL PROGRAM

U. S. GEOLOGICAL SURVEY - BUREAU OF LAND MANAGEMENT -
U. S. FISH AND WILDLIFE SERVICE

The following guidelines are for the mutual cooperative efforts of the U. S. Geological Survey, Bureau of Land Management, and U. S. Fish and Wildlife Service in implementing the Federal geothermal resources program pursuant to the Geothermal Steam Act of 1970.

Abbreviations used hereafter for the various agencies, offices, and reports are as follows:

BLM	-	Bureau of Land Management
BLM-DO	-	Bureau of Land Management District Office
BLM-SO	-	Bureau of Land Management State Office
GS	-	U. S. Geological Survey
GS-RCM	-	U. S. Geological Survey, Regional Conservation Manager
AGS	-	Area Geothermal Supervisor
GS-AG	-	U. S. Geological Survey Area Geologist
GS-DG	-	U. S. Geological Survey District Geologist
FWS	-	Fish and Wildlife Service
FWS-RO	-	Fish and Wildlife Service Regional Office
FWS-AO	-	Fish and Wildlife Service Area Office
EAR	-	Environmental Analysis Record (prepared by BLM)
EA	-	Environmental Analysis (prepared by GS)
GEAP	-	Geothermal Environmental Advisory Panel (Sec. Order 2962)

1. Priorities and Scheduling of Lease Sales and Non-Competitive Leasing. (Primary responsibility - BLM)

Primary contacts will be the AGS, the FWS-RO, the BLM-SO involved.

(a) Competitive Lease Sale Scheduling.

BLM-SO may on its own motion, on recommendation from GS, or through nominations from industry, select areas for and schedule competitive lease sales in Known Geothermal Resource Areas (KGRA's). The BLM-SO will consult with GS-RCM as to KGRA leasing priorities, recommendations for lease stipulations, total area to be covered by the EAR, and overall priority and scheduling of the EAR and the sale. The BLM-SO will consult with FWS-AO and RO concerning fish and wildlife resources and related habitat, and regarding recommended stipulations and mitigating measures to protect these resources.

Generally, the areas to be covered by the EAR, prepared by BLM-DO, should include the maximum number of non-competitive lease applications in the vicinity of the KGRA. Determination of priority of scheduling lease sales will generally be based upon the geothermal potential of the area, its environmental sensitivity, and industry interest. If nominations are either solicited or received from industry, BLM-SO will send an information copy of nominations to AGS, Menlo Park, and the FWS-AO.

(b) Scheduling for Non-Competitive Leasing.

Where non-competitive leasing only is involved, BLM-SO should consult with AGS and FWS-RO to determine area, priority and scheduling of EAR's. Where withdrawn lands are involved, the BLM-SO shall consult with the appropriate land management agencies with the basic authority to permit leasing. The criteria for scheduling of EAR's to be prepared by the BLM-DO should include geothermal potential of the area, its environmental sensitivity, and industry interest. AGS will furnish, upon request by BLM-SO, a priority listing of potential geothermal areas with copies to the FWS-RO.

2. Environmental Analysis Considerations

(a) Pre-Lease Environmental Analysis Record (EAR).
(Primary responsibility - (BLM))

(1) Upon initiation or revision of an EAR for either competitive or non-competitive leasing, BLM-DO will notify in writing the AGS and the FWS-AO of the area covered by the EAR. The AGS and FWS-AO will furnish BLM-DO with technical advice and information for consideration in the EAR, including recommended stipulations and mitigating measures. BLM-DO should specify deadline for such input with a minimum of 30 days advance notice. Maximum lead time should be provided.

(2) BLM-DO will furnish a copy of the draft EAR, with proposed special lease stipulations, to the AGS and FWS-AO and FWS-RO for review and comments prior to submission of EAR to BLM-SO.

(3) BLM-SO will furnish AGS the final BLM stipulations which are to be attached to non-competitive leases, or included in the notice of competitive lease sale, for the AGS review and concurrence with the stipulations. FWS-RO will be furnished a copy of the stipulations for review and comment.

(4) BLM-SO will furnish AGS and FWS-RO with two copies each of the final EAR.

(b) Post-Lease Environmental Analysis (EA).
(Primary responsibility - AGS)

(1) For each proposal which requires a Plan of Operations, an Environmental Analysis (EA) will be prepared by the AGS. The AGS will request the technical advice on fish and wildlife matters, surface management, and environmental expertise of the BLM-SO and FWS-AO. The FWS-AO and the BLM-SO will provide technical advice and information in their areas of expertise to AGS for consideration in the EA which will include the recommended surface protection and reclamation requirements.

(2) When the GEAP chooses to review the draft EA, BLM-DO and FWS-RO will also be sent copies of the AGS draft EA for its review and comment.

(3) In every case, BLM-SO and FWS-AO and GEAP will be provided with a copy of the final EA.

3. Competitive Lease Sales. (Primary responsibility - BLM)

In steps (a) through (h) below, the GS contact will be the AGS, and the FWS contact the appropriate FWS-AO. In step (d) below, the BLM contact will be the BLM-DO involved. For all other lease sale matters, the appropriate BLM-SO involved will be the primary contact.

(a) To facilitate the sale procedure BLM-SO shall notify AGS and FWS-AO in writing at least 90 calendar days prior to sale date concerning:

(1) Areas within KGRA to be considered for competitive lease sale.

(2) Problems as they may relate to parceling; i.e., grandfather rights, environmentally sensitive areas (described by legal subdivision), pending law suits or restraining orders, etc.

(3) Any identifiable proposed lease stipulations even though there may be subsequent additions to or modification thereof.

(4) Request GS-RCM recommendations for parceling of tracts or leasing units and for rental and royalty rates at least 60 days prior to scheduled sale date.

(b) It will be BLM-SO responsibility to establish priority of processing and scheduling with input from the GS-RCM and FWS-RO.

(c) GS-RCM will recommend rental and royalty rates and parceling into tracts or leasing units for the competitive sale, submitting such information within 30 calendar days from date of request, whenever possible, to BLM-SO.

(d) EAR preparation will be the responsibility of the BLM-SO as outlined in Section 2(a).

(e) Publication of Lease-Sale Notice will be the responsibility of the BLM-SO. AGS concurrence must be received prior to publication. The BLM-SO will send a copy of the lease sale notice and lease stipulations to the AGS and the FWS-AO for final review, allowing at least 10 working days for comment.

(f) GS-RCM will prepare a pre-sale geothermal resources economic evaluation for all tracts in the sale. Prior to the scheduled sale the GS-RCM or his designee shall be available to meet with the BLM-SO and present the technical evaluation of the offered tracts and be prepared to discuss the geologic, engineering, and economic factors upon which the evaluation has been prepared.

(g) Immediately after the sale, the GS-RCM evaluation committee will meet to study the results of the sale. The committee will review its geologic, geophysical, economic and engineering data on all tracts and identify those tracts recommended for acceptance and for rejection supporting the recommendations with appropriate technical information. Immediately following this evaluation, the BLM-SO and GS-RCM committee will meet jointly and the GS-RCM or his designee shall present the GS technical evaluation of and recommendations on each tract for which bids have been received. The GS-RCM will submit his recommendations in writing to the BLM-SO.

(h) BLM-SO will send two copies of the executed lease, including lease terms, to the AGS for his records.

4. Non-Competitive Lease Applications (Primary responsibility - BLM)

(a) Serial Register Page.

The BLM-SO receives applications for non-competitive leases, prepares Serial Register Pages, and processes applications (at end of filing period) to determine if acceptable

and if lands are available. Where an agency other than BLM administers withdrawn or acquired lands, BLM-SO will obtain a title report from that agency. The BLM-SO will send information copy of Serial REGISTER Page to BLM-DO, AGS, and the FWS-AO.

(b) Competitive Interest Overlaps.

After reviewing each month's applications BLM-SO will send GS two copies (one to AGS and one direct to the GS-AG or GS-DG listed below) of those applications which result in competitive interest overlap as defined by 43 CFR 3200.0-5(k) (3); a copy of the land status plat showing applications and overlaps will also be sent to the GS-AG or GS-DG listed below. GS-RCM will review competitive interest overlap as soon as practical after receipt from BLM-SO. GS-RCM will notify BLM-SO as soon as KGRA's have been defined.

<u>For Applications within States of:</u>	<u>Send Overlap Information to:</u>
Montana	GS-DG, Billings, Montana
Wyoming	GS-AG, Casper, Wyoming
Utah	GS-DG, Salt Lake City, Utah
Colorado	GS-AG, Denver, Colorado
New Mexico	GS-AG, Roswell, New Mexico
Alaska	GS-AG, Anchorage, Alaska
California, Oregon, Washington, Idaho, Nevada, Arizona	GS-AG, Menlo Park, California
Eastern States	GS-AG, Washington, D. C.

(c) Environmental Considerations.

BLM-DO will prepare an EAR requesting input and technical advice and information from the AGS, the FWS-AO and other agencies as necessary.

(d) KGRA Clear Listing - Issuance of Lease.

BLM-SO will prepare lease forms and develop lease stipulations in consultation with the AGS, which will be sent to the AGS for final review and concurrence. Upon receipt of AGS concurrence, BLM-SO will forward lease form for applicant's signature. Upon receipt of lease signed by applicant, BLM-SO will forward lease forms to the AGS for final clear listing. The AGS will forward lease forms to the appropriate GS-AG or GS-DG who will then submit a KGRA clear listing report and return the lease forms to the BLM-SO. The GS-AG or GS-DG will also provide the AGS with an informational copy of the clear listing report. The BLM-SO will then issue the lease providing the AGS with two copies, including the stipulations.

5. Pre-Lease Exploration Permit (Primary responsibility - BLM)

(a) Upon receipt of a Notice of Intent to Conduct Geothermal Resources Exploration Operations, the BLM-DO will forward a copy of the Notice of Intent and any attachments to the AGS and the FWS-AO. This may include appropriate stipulation or documents relating to access routes across BLM lands.

The AGS and FWS-AO will notify the BLM-DO within five working days of any recommended stipulations considered desirable. The BLM-DO will send the AGS a copy of the approved permit.

(b) It will be the responsibility of the BLM-DO to see that the operator conducts exploration in accordance with regulations and terms of the permit. AGS and FWS-AO personnel are available, on request, to assist in supervision of operations under such permit.

(c) The BLM-DO will send the AGS a copy of the Notice of Completion of Exploration Operations for his records (Form 3200-10).

6. Post-Lease Notice of Intent to Conduct Geothermal Resources Exploration Operations (Primary responsibility - GS)

(a) Upon receipt of a Notice of Intent to Conduct Geothermal Resource Exploration Operations from an operator on an existing lease (as required by 30 CFR 270.78), the AGS will immediately forward a copy of the Notice and the required Plan of Operation to the BLM-DO and FWS-AO. The BLM-DO and FWS-AO will recommend any additional surface protection, reclamation requirements, and fish and wildlife protection measures including mitigations within their area of expertise.

(b) Upon receipt of the Notice of Intent and the required Plan of operation, an Environmental Analysis (EA) will be prepared by the AGS.

(c) It will be the responsibility of the AGS to see that exploratory operations on the lease concerned are conducted in accordance with regulations, GRO Orders, the approved Plan of Operation and Notice of Intent. The AGS will notify the BLM-DO in writing if the permittee does not comply with surface protection, fish and wildlife protection measures, reclamation requirements, and the corrective action taken or recommended. In cases of emergency, where serious surface or environmental damage occurs, or appears imminent, the BLM-DO may, if the AGS or his representative is not immediately available, issue a stop order to the lessee or his representative and then immediately notify the AGS.

7. Plan of Operation and Application for Permit to Drill (APD)
(Primary responsibility - GS)

(a) Upon receipt by the AGS of an Application for Permit to Drill, the AGS will immediately send a copy of the Plan of Operation (per 30 CFR 270.34) and APD (form 9-331C with proprietary information deleted as necessary) to the BLM-DO, the FWS-AO and the FWS-RO.

(b) For exploratory wells, and for all other drilling operations where GS, BLM, or FWS considers such necessary, the AGS will schedule with BLM-DO, FWS-AO, and the operator, a joint on-site inspection and discussion of the proposed operation and proposed access routes over BLM lands. The operator will normally be encouraged to discuss the proposed action and conduct the on-site inspection with the BLM-DO, AGS, and FWS-AO, prior to writing his drilling program and Plan of Operation.

(c) If BLM-DO, FWS-AO, or AGS consider that additional information is necessary in the Plan of Operation, the AGS shall request the operator to provide such input as deemed necessary.

(d) When such additional information is requested, the operator will submit a final Plan of Operation or supplements to the Plan of Operation to the AGS who will forward a copy of same to BLM-DO and the FWS-AO.

(e) The BLM-DO and the FWS-AO will notify the AGS in writing of any special conditions which are recommended for inclusion in the approved plan of Operation.

(f) Upon receipt of the Plan of Operation, an EA will be prepared by the AGS. The EA prepared for subsequent well operations or for the post-lease Notice of Intent to Conduct Geothermal Resource Exploration Operation may vary in level of detail depending on the nature of the operation, the sensitivity of the area, and other appropriate considerations.

(g) The AGS will prepare and sign a letter of approval of the Plan of Operation containing conditions of approval mutually agreeable to both the BLM-DO and the AGS, and send the signed letter to the BLM-DO for approval.

(h) BLM-DO will sign the letter to complete the joint approval of Plan of Operation and forward an approved copy to lessee and an executed copy to the AGS and FWS-AO. The BLM-DO also forwards other documents relating to access over BLM lands outside the leased area to the operator with an information copy to the AGS and FWS-AO.

(i) The AGS will then approve the Application for Permit to Drill (Form 9-331C) and furnish a copy to the BLM-DO and the FWS-AO.

(j) The AGS will be responsible for compliance inspections of all operations conducted under the Plan of Operation and Application to Drill in the Area of Operations. However, BLM-DO and FWS-AO may inspect operations to assure conditions of the approved Plan of Operation are being met and will notify AGS of any non-compliance observed. The AGS will seek and utilize BLM-DO and the FWS-AO on surface management reclamation and fish and wildlife matters, and will request inspection assistance when considered necessary within their areas of expertise. AGS is the sole contact with operators except in cases of emergency. BLM-DO may issue instructions, notices, or orders to the operator only under the following emergency circumstances and conditions: (1) emergency situation exists that clearly threatens immediate serious or irreparable damage to the environment and resources or to the health and safety of employees and/or the public; or (2) the AGS representative is not timely available to take the necessary immediate action. The BLM-DO may in such emergency situations order the immediate cessation or correction of activities responsible for the emergency situation and may order repair or correction of damages, such orders to be followed by prompt telephoned and documented notification to the AGS of the action taken. BLM-DO will be responsible for all activities outside the Area of Operation, within the leasehold.

(k) Any desired significant changes in a Plan of Operation must be jointly approved by both BLM-DO and AGS.

8. Plans of Operation for Surface Installations or Subsequent Well Work

A Plan of Operation as per 30 CFR 270.34 will be required for all surface construction operations and subsequent well work. Procedure for approval will be as per 7(a) through (h) above. Joint on-site inspections may not be required, unless specifically considered necessary by AGS, BLM-DO, or FWS-AO. The AGS will be responsible for compliance inspections in the Area of Operations. BLM will have the same option covered in 7(j).

9. Plans of Development, Injection, or Production

The operator will be required to submit (1) a Plan of Development prior to entering the development stage of its operation as determined by mutual agreement between the operator and the AGS, (2) a Plan of Injection where fluid injection is proposed, and (3) a Plan for Production prior to commencing production for commercial utilization of the geothermal resource. Procedure for joint BLM-DO and AGS approval will be essentially as per 7(a) through (h), described above for the Plan of Operation. The AGS will be responsible for compliance inspections in the Area of Operations.

10. Designation of Operator

The AGS will furnish BLM-DO a copy of any Designation of Operator received.

11. Filing and Termination of Bonds

(a) BLM-SO will routinely advise the AGS of the filing of any lease compliance (3206.1-1(b)) or protection bonds (3206.1-1(c)). The AGS will not permit operations on a lease until advised by BLM-SO that such bonds have been filed.

(b) The period of liability under any bond shall not be terminated by BLM until the AGS has advised the BLM-SO and FWS-AO that all terms and conditions, insofar as operations on the lease are concerned, have been fulfilled.

12. Relinquishments

BLM-SO will furnish the AGS a copy of any lease relinquishment filed. The AGS will furnish BLM-SO and the FWS-RO a report as to satisfactory restoration and abandonment of any affected portion of leased lands.

13. Annual Environmental Report

The AGS will furnish the BLM-DO a copy of the lessee's annual report of compliance with environmental protection requirements as required under 30 CFR 270.76. These reports will be available for inspection at either office for FWS-AO inspection.

14. Annual Report of Diligent Exploration

AGS will advise BLM-SO of the amount of expenditures considered qualified for diligent exploration pursuant to 43 CFR 3203.5.

15. Designation of Coordinating Offices for Purposes of the Memorandum

(a) For the U. S. Geological Survey, the office of the Assistant Division Chief of Operations, Conservation Division is designated as the coordinating office.

(b) For the Bureau of Land Management, the Division of Minerals Resources is designated as the coordinating office.

(c) For the U. S. Fish and Wildlife Service, the Office of Biological Services is designated as the coordinating office.

16. General Provisions

All assistance rendered under this Agreement will be carried out in full compliance with the objectives, policies, and responsibilities of the Department. Any unresolved matters concerning geothermal program where there is a mutual interest shall be referred for resolution to the next supervisory level involved.

The above cooperative procedures are in accord with S.O. 2948 between BLM and GS and supersede all other implementing cooperative procedures involving geothermal leasing, administration, and supervision.

The AGS, BLM-SO and FWS-RO will meet, as necessary, to surface internal problems which occur as a result of implementing the requirements of this Agreement and to develop strategies for mitigating those problems.

This Agreement shall become effective upon execution hereof by the Directors. At least three months prior to the first and subsequent anniversary dates hereof, the AGS, BLM-SO, and FWS-RO shall apprise their respective coordinating offices of any suggested modifications in this Agreement which would improve its workability, reduce duplication of effort, and enhance the ability of the Department to perform its assigned functions relating to the leasing of Federal lands for geothermal resources and approval of operations in a more timely manner.

/s/ GEORGE W. MILIAS
Acting Director, Fish and Wildlife Service

6/7/76
Date

/s/ GEORGE L. TURCOTT
Acting Director, Bureau of Land Management

5/28/76
Date

/s/ W. A. RADLINSKI
Acting Director, Geological Survey

6/1/76
Date

APPENDIX B

**NOTICE OF INTENT TO CONDUCT GEOTHERMAL
RESOURCE EXPLORATION OPERATIONS**

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Notice Number

NOTICE OF INTENT TO CONDUCT GEOTHERMAL RESOURCE
EXPLORATION OPERATIONS

Applicant(s)	Address (include zip code)
Operator	Address (include zip code)
Contractor(s)	Address (include zip code)

hereby apply for authorization to conduct exploration operations pursuant to the provisions of 43 CFR 3209 now or hereafter in force across and upon the following-described lands (give description of lands by township, attach map or maps showing lands to be entered or affected)

Type of operations to be conducted (give brief description)

Exploration operations will be conducted during the period (date) from _____ to _____

Attached ☐ \$ _____ Surety bond ☐ Rider to Nationwide bond ☐ Rider to Statewide bond ☐ Bond to be furnished

Upon completion of exploration operations the undersigned agrees to notify the Authorized Officer that authorized exploration operations have been completed in conformance with the general and special terms and stipulations of the notice.

The undersigned hereby agrees (1) that he will not enter upon the described land until he has been informed in writing whether there are special stipulations applicable to his Notice of Intent, as to either time or method of operation or otherwise, and, if there are such stipulations, what those stipulations are, (2) that he will comply with those special stipulations, if any; and (3) that he will not enter upon the described lands until his entry has been approved by the Authorized Officer.

The undersigned agrees to be bound by the terms and conditions of this notice to conduct exploration operations when approved by the Authorized Officer.

The undersigned agrees that the filing of this Notice under the regulations (43 CFR Subpart 3209) does not vest or confer any preference right to a geothermal resources lease.

The undersigned agrees further that all exploration operations shall be conducted pursuant to the following terms and conditions:

1. Exploration operations shall be conducted in compliance with all Federal, State, and local laws, ordinances, or regulations which are applicable to the area of operations including, but not limited to, those pertaining to fire, sanitation, conservation, water pollution, fish, and game. All operations hereunder shall be conducted in a prudent manner.
2. Due care shall be exercised in protecting the described lands from damage. All necessary precautions shall be taken to avoid any damage other than normal wear and tear to improvements on the land including, but not limited to, gates, bridges, roads, culverts, cattle guards, fences, dams, dikes, vegetative cover, improvements, stock watering, and other facilities.
3. All drill holes shall be capped when not in use and appropriate procedures shall be taken to protect against

hazards in order to protect the lives, safety, or property of other persons or of wildlife and livestock.

4. All vehicles shall be operated at a reasonable rate of speed and, in the operation of vehicles, due care shall be taken to safeguard livestock and wildlife in the vicinity of operations. Existing roads and trails shall be used wherever possible. If new roads and trails are to be constructed, the Authorized Officer must be consulted prior to construction as to location and specifications. Reclamation and/or reseeding of new roads and trails shall be made as requested by the Authorized Officer.
5. Upon expiration, conclusion, or abandonment of operations conducted pursuant to this Notice, all equipment shall be removed from the land, and the land shall be restored as nearly as practicable to its original condition by such measures as the Authorized Officer may specify. All geophysical holes shall be safely plugged. The Authorized Officer shall be furnished a Notice of Completion of Geothermal Resource Exploration Operations (Form 3200-3) immediately upon cessation of all such operations and shall be further informed of the completion of reclamation work as soon as possible.
6. Location and depth of water sands encountered shall be disclosed to the Authorized Officer.

7. Operator shall contact the Authorized Officer, prior to actual entry upon the land in order to be appraised of practices which shall be followed or avoided in the conduct of exploration operations pursuant to the terms of this *Notice* and applicable regulations. Operator will conduct no operations on the land unless the attached bond is in good standing.
8. Due care shall be exercised to avoid scarring or removal of ground vegetative cover.
9. All operations shall be conducted in such a manner to avoid (a) blockage of any drainage systems; (b) changing the character, or causing the pollution or siltation of rivers, streams, lakes, ponds, waterholes, seeps, and marshes; and (c) damaging fish and wildlife resources or habitat. Cuts or fills causing any of the above-mentioned problems will be repaired immediately in accordance with specifications of the Authorized Officer.
10. Vegetation shall not be disturbed within 300 feet of waters designated by the Authorized Officer, except at approved stream crossings.
11. Surface damage which induces soil movement and/or water pollution shall be subject to corrective action as required by the Authorized Officer.
12. Trails and campsites shall be kept clean. All garbage and foreign debris shall be eliminated as required by the Authorized Officer.
13. Operator shall protect all survey monuments, witness corners, reference monuments, and bearing trees against destruction, obliteration, or damage. He shall, at his expense reestablish damaged, destroyed, or obliterated monuments and corners, using a licensed surveyor, in accordance with Federal survey procedures. A record of the reestablishment shall be submitted to the Authorized Officer.
14. Operator shall make every reasonable effort to prevent, control, or suppress any fires started by the operator, and

to report, as soon as possible, to the Authorized Officer location and size of fires, and assistance needed to suppress such fires. Operator shall inform the Authorized Officer as soon as possible of all fires, regardless of location, noted, or suppressed by independent action.

15. No work shall be done within one-half mile of a developed recreation site without specific written authority from the Authorized Officer. Any travel within one-half mile of a recreation site shall be over existing roads or trails.
16. Use of explosives within one-half mile of designated waters is prohibited unless approved, in writing, by the Authorized Officer.
17. If operations conducted under the provisions of this *Notice* causes any damage to the surface of the national resource lands, such as, but not limited to, soil erosion, pollution of water, injury or destruction of livestock or wildlife, or littering, operator shall, within 48 hours, file with the Authorized Officer a map showing exact location of such damage and a written report containing operator's plans for correcting or minimizing damage, if possible.
18. Violation of, or failure to comply with any of these terms and conditions shall result in immediate shutdown of field operations until deficiency is corrected. Failure to correct deficiency within the time period allowed by the Authorized Officer shall result in forfeiture of bond.
19. The Bureau of Land Management reserves the right to close any area to operators in periods of fire danger or when irreparable damage to natural resources is imminent.
20. Contractor shall be liable for assuring compliance with all terms and conditions of this *Notice* and all actions of his designated operator, agents, and employees.
21. Where continuation of the operation will result in irreparable damage to the land and other natural resources this *Notice* will be immediately cancelled by the Authorized Officer.

22. Special Stipulations:

(Signature of Applicant)

(Date)

(Signature of Operator)

(Date)

We hereby agree to the special stipulations added and made a part of this *Notice* to conduct exploration operations.

(Signature of Holder of Notice)

(Date)

(Signature of Operator)

(Date)

I hereby approve this *Notice* to conduct exploration operations.

(Signature of Authorized Officer)

(Title)

(Date)

APPENDIX C

COVE FORT - SULPHURDALE KGRA LEASE SALE

Cove Fort - Sulphurdale KGRA
Utah (Fishlake National Forest)

Leases No.

Phillips: U-28947
 U-28948
 U-29215 A
Union: U-29553 to
 U-29558

Post-Lease

March 5, 1975	Lease sale
April 9, 1975	BLM receives Union Oil Plan of Exploration.
April 15, 1975	BLM requests FS to review Union POO.
April 16, 1975	Reg. Forester asks Fishlake National Forester to review Phillips Plan of Exploration.
April 30, 1975	FS at Fishlake tells Reg. Forester plans are OK.
May 14, 1975	Reg. Forester tells BLM exploration plans of Union Oil are OK.
September 21, 1976	AGS notifies all interested parties of Union and Phillips intent to submit a plan of operation. AGS also notifies interested parties of field inspection of lease sites set for October 5, 1976, to be coordinated by Mr. Ken Bull, GS District Geological Supervisor.
September 28-30, 1976	USGS, Conservation Division (AGS), Menlo Park, conducts field investigation and data gathering at site which is to be used for the Environmental Baseline Report (EBR).
October 5 - 7, 1976	USGS field investigation of proposed geothermal exploration well sites. Inspection log lists 35 persons in attendance representing government agencies, Phillips, Union, and Getty Oil.
October 15, 1976	Joint meeting on access road locations with Phillips, Union, USFS, and USGS.
December 22, 1976	AGS receives Phillips POO.
January 10, 1977	AGS forwards Phillips POO to all interested parties.
February 15, 1977	AGS forwards Union Oil POO to all interested parties. AGS also informs interested parties that Phillips has been requested to provide additional data.

February 24, 1977	Union submits to AGS supplementary information.
March 7, 1977	Deadline for submittal of reviews by interested parties on Phillips and Union POO's.
March 28, 1977	Phillips submits amendment to POO.
April 7, 1977	AGS transmits draft EA to all interested parties.
April 20-21, 1977	GEAP field investigation.
April 21, 1977	GEAP public meeting at Richfield, Utah.
June 21, 1977	AGS approves unit agreement #14-08-0001-15526, Cove Fort - Sulphurdale Unit Agreement, Beaver and Millar Counties, Utah.
June 22, 1977	AGS approves final EA.
July 6, 1977	GS Conservation Director signs EA.

(The continuing record was not available. However, Union was verbally notified on September 6, 1977 that the drilling permit for 23 well sites had been approved but the permit was not received until the end of October, 1977)

APPENDIX D

MATRIX APPROACH IN CALIFORNIA BLM EAR'S

LEASE APPLICATION NUMBER	Physio-Unit Soil	PRELIMINARY EXPLORATION			EXPLORATORY DRILLING				FIELD DEVELOPMENT					PRODUCTION OF ENERGY				CLOSE OUT		
		Air-borne	Off-Road (Foot)	Off-Road Vehicle	Road Const. & Use	Drill Site Dev.	Drilling	Well Test-ing	Int. Well Dev.	Well Vent-ing	Waste Dis-posal	Pipe-line Dev.	Power Plant Const.	Add'l Well Dev.	Const. Power Lines	Prod. & Use	Main.	Aban-don Wells	Remove Equip.	Surface Reclaim & Rehab.
1.	Escarp - F.H.																			
	I	L	L	M	M	M	L	L	M	L	M	M	M	M	M	L	L	L	L	L
	G	L	L	M	M	M	L	L	M	L	M	M	M	M	M	L	L	L	L	L
	Plateau L	L	L	L	M	M	L	L	L	L	M	M	M	M	M	L	L	L	L	L
2.	Upland - R.H.																			
	G	L	L	M	M	M	L	L	L	L	M	M	M	M	M	L	L	L	L	L
	Plateau L	L	L	L	M	M	L	L	L	L	M	M	M	M	M	L	L	L	L	L
	Escarp - F.H. G	L	L	M	M	M	L	L	M	L	M	M	M	M	M	L	L	L	L	L
3.	Escarp - F.H. G	L	L	M	M	M	L	L	M	L	M	M	M	M	M	L	L	L	L	L
	Plateau L	L	L	L	M	M	L	L	L	L	M	M	M	M	M	L	L	L	L	L
	Plateau J	L	L	L	M	M	L	L	L	L	M	M	M	M	M	L	L	L	L	L
5.	Escarp - F.H. G	L	L	M	M	M	L	L	M	L	M	M	M	M	M	L	L	L	L	L
	Plateau I	L	L	M	M	M	L	L	M	L	M	M	M	M	M	L	L	L	L	L
	Upland - R.H. I	L	L	M	M	M	L	L	L	L	M	M	M	M	M	L	L	L	L	L
	Plateau J	L	L	L	M	M	L	L	L	L	M	M	M	M	M	L	L	L	L	L
6.	Plateau L	L	L	L	M	M	L	L	L	L	M	M	M	M	M	L	L	L	L	L
	Plateau J	L	L	L	M	M	L	L	L	L	M	M	M	M	M	L	L	L	L	L
	Plateau L	L	L	L	M	M	L	L	L	L	M	M	M	M	M	L	L	L	L	L

LEGEND**Impact Ratings:**

U - Undetermined
L - Light
M - Medium
H - High

Soils:

G - Daphnedale- Delma-Ager
I - Casuse
J - Karcas-Minekar
D - Bieber-Barnard-Modoc

L - Devon-Puls
K - Packwood-Ditchcamp
H - McQuarrie-Lorella
F - Thoms-Exel

**SOILS
IMPACT MATRIX**
Individual Lease Applications

LEASE APPLICATION NUMBER	Critical Element	Parameter	PRELIMINARY EXPLORATION			EXPLORATORY DRILLING				FIELD DEVELOPMENT					PRODUCTION OF ENERGY				CLOSE OUT		
			Air-borne	Off-Road (Foot)	Off-Road Vehicle	Road Const. & Use	Drill Site Dev.	Drilling	Well Test-ing	Int. Well Dev.	Well Vent-ing	Waste Dis-posal	Pipe-line Dev.	Power Plant Const.	Add'l Well Dev.	Const. Power Lines	Prod. & Use	Main.	Aban-don Wells	Remove Equip.	Surface Reclaim & Rehab.
1.	Surface	Qual.	L	L	L	M	M	L	M	M	M	M	M	M	M	M	L	L	L	L	L
		Quan.	L	L	L	L	L	L	M	M	M	M	L	L	M	L	L	L	L	L	L
	Ground	Qual.	L	L	L	L	L	L	M	M	L	M	L	L	M	L	M	L	L	L	L
		Quan.	L	L	L	L	L	L	L	M	L	L	L	L	M	L	M	L	L	L	L
2.	Surface	Qual.	L	L	L	M	M	L	L	M	M	M	M	M	M	M	L	L	L	L	L
		Quan.	L	L	L	L	L	L	M	M	M	M	M	M	M	M	L	L	L	L	L
	Ground	Qual.	L	L	L	L	L	L	M	M	L	M	L	L	M	L	M	L	L	L	L
		Quan.	L	L	L	L	L	L	L	M	L	L	L	L	M	L	M	L	L	L	L
3.	Surface	Qual.	L	L	L	M	M	L	H	H	H	H	H	H	H	H	L	L	L	L	L
		Quan.	L	L	L	L	L	L	M	M	M	M	L	L	M	L	L	L	L	L	L
	Ground	Qual.	L	L	L	L	L	L	M	M	L	M	L	L	M	L	M	L	L	L	L
		Quan.	L	L	L	L	L	L	M	M	L	M	L	L	M	L	M	L	L	L	L
4.	Surface	Qual.	L	L	L	M	M	L	H	H	H	H	H	H	H	H	L	L	L	L	L
		Quan.	L	L	L	L	L	L	M	M	M	M	M	M	M	M	L	L	L	L	L
	Ground	Qual.	L	L	L	L	L	L	M	M	L	M	L	L	M	L	L	L	L	L	L
		Quan.	L	L	L	L	L	L	M	M	M	M	L	L	M	L	L	L	L	L	L
5.	Surface	Qual.	L	L	L	M	M	L	M	M	M	M	M	M	M	M	L	L	L	L	L
		Quan.	L	L	L	L	L	L	M	M	M	M	L	L	M	L	L	L	L	L	L
	Ground	Qual.	L	L	L	L	L	L	M	M	L	M	L	L	M	L	M	L	L	L	L
		Quan.	L	L	L	L	L	L	M	M	L	L	L	L	M	L	M	L	L	L	L
6.	Surface	Qual.	L	L	L	M	M	L	H	H	H	H	H	H	H	H	L	L	L	L	L
		Quan.	L	L	L	L	L	L	M	M	M	M	L	L	M	L	L	L	L	L	L
	Ground	Qual.	L	L	L	L	L	L	M	M	L	M	L	L	M	L	M	L	L	L	L
		Quan.	L	L	L	L	L	L	L	M	L	L	L	L	M	L	M	L	L	L	L
7.	Surface	Qual.	L	L	L	M	M	L	H	H	H	H	H	H	H	H	L	L	L	L	L
		Quan.	L	L	L	L	L	L	M	M	M	M	M	M	M	M	L	L	L	L	L
	Ground	Qual.	L	L	L	L	L	L	M	M	L	M	L	L	M	L	M	L	L	L	L
		Quan.	L	L	L	L	L	L	M	M	M	L	L	L	M	L	M	L	L	L	L

LEGEND

Impact Ratings: U - Undetermined, L - Low, M - Medium, H - High

WATER
IMPACT MATRIX
 Individual Lease Applications

HABITAT COMPONENTS	PRELIMINARY EXPLORATION			EXPLORATORY DRILLING				FIELD DEVELOPMENT					PRODUCTION OF ENERGY				CLOSE OUT		
	Air-borne	Off-Road (Foot)	Off-Road Vehicle	Road Const. & Use	Drill Site Dev.	Drilling	Well Test-ing	Int. Well Dev.	Well Vent-ing	Waste Dis-posal	Pipe-line Dev.	Power Plant Const.	Add'l Well Dev.	Const. Power Lines	Prod. & Use	Main.	Abandon Wells	Remove Equip.	Surface Reclaim & Rehab.
<u>ENDANGERED SPECIES</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>ANTELOPE</u>																			
Kidding Ground and Buffer Zones	L	M	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	M
Mig. Route and Buffer Zones	L	L	L	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	M
Winter Range	L	L	L	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Summer Range	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	M
<u>DEER</u>																			
Mig. Routes and Buffer Zones	L	L	L	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	M
Winter Concentration Area	L	L	L	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	M
Winter Range	L	L	L	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Yearlong Range	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>SAGEGROUSE</u>																			
Strutting Grounds and Buffer Zones	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yearlong Range	L	L	L	M	M	M	M	H	H	H	H	H	M	M	M	M	M	M	M
Summer Range	L	L	L	M	M	M	M	H	H	H	H	H	M	M	M	M	M	M	M
<u>WATERFOWL</u>																			
Production Area	L	L	L	M	M	M	M	H	H	H	H	H	M	M	M	M	M	M	M
<u>RAPTORS</u>																			
Nesting Areas and Buffer Zones	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<u>STREAMS and LAKES</u>	L	L	L	M	M	L	M	M	M	M	M	M	M	L	M	L	L	L	L

LEGEND

Impact Ratings - = Unknown 0 = None L = Low M = Moderate H = High VH = Very High

**SELECTED WILDLIFE HABITAT
IMPACT MATRIX**
Lease Application No. 1

HABITAT COMPONENTS	PRELIMINARY EXPLORATION			EXPLORATORY DRILLING				FIELD DEVELOPMENT					PRODUCTION OF ENERGY				CLOSE OUT		
	Air-borne	Off-Road (Foot)	Off-Road Vehicle	Road Const. & Use	Drill Site Dev.	Drilling	Well Testing	Int. Well Dev.	Well Venting	Waste Disposal	Pipeline Dev.	Power Plant Const.	Add'l Well Dev.	Const. Power Lines	Prod. & Use	Main.	Abandon Wells	Remove Equip.	Surface Reclaim & Rehab.
<u>ENDANGERED SPECIES</u>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>ANTELOPE</u>																			
Kidding Ground and Buffer Zones	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mig. Route and Buffer Zones	L	L	L	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	M
Winter Range	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Summer Range	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	M
<u>DEER</u>																			
Mig. Routes and Buffer Zones	L	L	L	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	M
Winter Concentration Area	L	L	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	M
Winter Range	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yearlong Range	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>SAGEGROUSE</u>																			
Strutting Grounds and Buffer Zones	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yearlong Range	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	M
Summer Range	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>WATERFOWL</u>																			
Production Area	L	L	L	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	M
<u>RAPTORS</u>																			
Nesting Areas and Buffer Zones	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<u>STREAMS and LAKES</u>	L	L	L	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH

LEGEND

Impact Ratings - = Unknown 0 = None L = Low M = Moderate H = High VH = Very High

LEASE APPLICATION NUMBER	PRELIMINARY EXPLORATION			EXPLORATORY DRILLING				FIELD DEVELOPMENT					PRODUCTION OF ENERGY				CLOSE OUT		
	Air-borne	Off-Road (Foot)	Off-Road Vehicle	Road Const. & Use	Drill Site Dev.	Drilling	Well Test-ing	Int. Well Dev.	Well Vent-ing	Waste Dis-posal	Pipe-line Dev.	Power Plant Const.	Alt'l Well Dev.	Const. Power Lines	Prod. & Use	Rein.	Aban-don Wells	Remove Equip.	Restore & Rehab.
1	0	H	H	H	H	H	M	H	H	H	H	VH	H	VH	0	0	0	0	M
2	0	H	M	H	H	H	M	H	H	H	H	VH	H	VH	0	0	0	0	M
3	0	M	M	M	M	M	L	H	M	H	H	H	H	VH	0	0	0	0	M
4	0	M	M	M	M	M	L	H	M	H	H	H	H	VH	0	0	0	0	M
5-T42N,R11E Sec.11: NW¼	0	H	H	H	H	M	L	H	H	H	H	H	H	VH	0	0	0	0	M
5-Remainder	0	L	L	L	L	L	L	M	L	L	M	M	M	H	0	0	0	0	L
6	0	M	M	VH	VH	H	M	VH	H	H	VH	VH	H	VH	0	0	0	0	M
7	0	H	H	H	VH	M	L	VH	H	H	VH	VH	VH	VH	0	0	0	0	L
8	0	H	H	VH	VH	M	L	VH	H	M	VH	VH	VH	VH	0	0	0	0	L
9	0	H	H	VH	VH	M	L	VH	H	H	VH	VH	VH	VH	0	0	0	0	L
10	0	H	H	H	H	M	L	H	M	H	H	H	H	H	0	0	0	0	M
11	0	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	-
12	0	H	M	VH	VH	M	L	VH	M	H	VH	VH	VH	VH	0	0	0	0	M
13-T42N,R12E Sec.33: NE¼, SE¼	0	VH	VH	VH	VH	H	M	VH	M	H	VH	VH	VH	VH	0	0	0	0	M
13-Remainder	0	L	L	L	L	L	L	M	L	L	M	M	L	L	0	0	0	0	L
14	0	M	M	M	M	M	L	H	M	H	H	H	H	VH	0	0	0	0	M
15	0	VH	VH	VH	VH	VH	VH	VH	H	H	VH	VH	VH	VH	0	0	0	0	L
16	0	H	H	H	H	H	M	VH	H	H	H	VH	H	VH	0	0	0	0	M
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	0	H	H	VH	VH	H	L	VH	H	H	VH	VH	VH	VH	0	0	0	0	M
19	0	H	H	VH	H	M	L	VH	L	H	VH	VH	VH	VH	0	0	0	0	L
20	0	VH	VH	VH	VH	H	H	VH	H	VH	VH	VH	VH	VH	0	0	0	0	M
21	0	VH	VH	VH	VH	H	L	VH	M	VH	VH	VH	VH	VH	0	0	0	0	M
22	0	VH	VH	VH	VH	H	L	VH	L	VH	VH	VH	VH	VH	0	0	0	0	M
23	0	VH	VH	VH	VH	H	L	VH	L	VH	VH	VH	VH	VH	0	0	0	0	L
24-T42N,R10E Sec.7: N¼ NE¼, NE¼ NW¼	0	VH	VH	VH	VH	H	L	VH	L	VH	VH	VH	VH	VH	0	0	0	0	L
24-Remainder	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	0	H	VH	VH	VH	H	L	VH	L	VH	VH	VH	VH	VH	0	0	0	0	L
26	0	VH	VH	VH	VH	H	L	VH	L	VH	VH	VH	VH	VH	0	0	0	0	L
27	0	VH	H	VH	VH	M	L	VH	VH	VH	VH	VH	VH	VH	0	0	0	0	L
28-T42N,R11E Sec.27: SW¼ NE¼, SE¼	0	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH
28-Remainder	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	0	VH	VH	VH	VH	M	L	VH	VH	VH	VH	VH	VH	VH	0	0	0	0	L

LEGEND

Impact Ratings - = Unknown 0 = None L = Low M = Moderate H = High VH = Very High

ARCHAEOLOGICAL AND CULTURAL
IMPACT MATRIX
Individual Lease Applications

LEGEND

Potential Negative Impacts:
 - = Slight or Very Negligible
 L = Low
 M = Medium
 H = High
 X = Unknown
 O = No Negative Impacts

**OVERALL ENVIRONMENTAL
IMPACT MATRIX
All Lease Applications**

COMPONENTS	PRELIMINARY EXPLORATION			EXPLORATORY DRILLING				FIELD DEVELOPMENT					PRODUCTION OF ENERGY				CLOSE OUT		
	Air-borne	Off-Road (Foot)	Off-Road Vehicle	Road Const. & Use	Drill Site Dev.	Drilling	Well Test-ing	Int. Well Dev.	Well Vent-ing	Waste Dis-posal	Pipe-line Dev.	Power Plant Const.	Add'l Well Dev.	Const. Power Lines	Prod. & Use	Main.	Aban-don Wells	Remove Equip.	Surface Reclaim & Rehab.
I. NON-LIVING COMPONENTS																			
A. Air																			
Air Movement Patterns	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O	O
Particulate Matter	O	O	L	L	-	L	-	L	L	-	-	-	L	L	M	-	-	-	-
Temperature	O	O	O	O	O	O	O	O	-	O	O	O	O	O	X	O	O	O	O
Noxious Gases	O	O	O	O	O	M	L	M	M	O	O	O	M	O	H	O	O	O	O
Non-ionizing Radiation	O	O	O	O	O	X	X	X	X	X	O	O	X	O	X	O	O	O	O
Noise	O	O	L	L	M	H	M	M	H	O	L	L	L	L	L	-	O	O	O
B. Land																			
Soil Depth	O	O	O	-	L	L	O	L	O	O	O	L	L	L	O	O	O	O	O
Soil Structure	O	O	L	L	L	M	O	L	O	O	L	L	L	L	L	O	O	O	O
Soil Erosion	O	O	-	L	L	-	O	L	O	L	L	L	L	L	O	O	O	O	O
Soil Pollutants	O	O	O	O	O	X	O	X	X	X	O	O	X	O	X	O	O	O	O
Geologic Structure																			
Land Use	O	O	O	O	O	X	O	X	O	X	O	O	X	O	X	O	O	O	O
Compatability	O	O	O	L	M	L	O	M	O	O	L	M	M	L	H	L	O	O	O
C. Water																			
Hydrologic Cycle	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O	O
Sediment Load	O	O	L	L	L	L	O	L	O	L	L	O	L	L	L	O	O	O	O
Dissolved Solids	O	O	O	O	O	X	O	X	X	X	O	O	X	O	X	O	O	O	O
Dissolved Oxygen	O	O	O	O	O	X	O	X	X	X	O	O	X	O	X	O	O	O	O
Toxic Chemicals	O	O	O	O	O	X	O	X	X	X	O	O	X	O	X	O	O	O	O
PH	O	O	O	O	O	O	O	O	O	L	O	O	O	O	X	O	O	O	O
Temperature																			
Radiological	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O	O
Contamination	O	O	O	O	O	X	O	X	X	X	O	O	X	O	X	O	O	O	O

COMPONENTS	PRELIMINARY EXPLORATION			EXPLORATORY DRILLING				FIELD DEVELOPMENT					PRODUCTION OF ENERGY				CLOSE OUT		
	Air-borne	Off-Road (Foot)	Off-Road Vehicle	Road Const. & Use	Drill Site Dev.	Drilling	Well Test-ing	Int. Well Dev.	Well Vent-ing	Waste Dis-posal	Pipe-line Dev.	Power Plant Const.	Add'l Well Dev.	Const. Power Lines	Prod. & Use	Main.	Aban-don Wells	Remove Equip.	Surface Reclaim & Rehab.
II. LIVING COMPONENTS																			
A. Plants (Aquatic)																			
* All	0	0	0	0	-	0	0	-	0	0	0	0	-	0	X	0	0	0	0
B. Plants (Terrestrial)																			
All	0	0	0	L	L	L	0	M	L	0	L	M	M	L	X	L	0	0	0
C. Animals (Aquatic)																			
All	0	0	0	-	L	-	0	M	M	0	L	L	L	L	X	0	0	0	0
D. Animals (Terrestrial)																			
Domestic	0	0	0	0	L	0	0	L	0	0	L	L	L	L	L	0	0	0	0
Wildlife	0	0	L	H	H	H	M	H	M	L	M	H	H	M	X	L	0	0	0
III. ECOLOGICAL INTER-RELATIONSHIPS																			
A. Ecological Processes																			
Succession	0	0	0	L	L	0	0	L	0	L	L	-	L	L	X	-	0	0	0
Predator-Prey	0	0	0	-	L	L	L	L	L	L	L	-	L	L	X	-	0	0	0
Plant Community Relationships																			
	0	0	0	L	L	0	0	L	0	L	L	-	L	L	X	-	0	0	0
IV. HUMAN VALUES																			
A. Landscape Character																			

LEGEND

Potential Negative Impacts:
 - = Slight or Very Negligible
 L = Low
 M = Medium
 H = High
 X = Unknown
 0 = No Negative Impacts

*** NOTE:**

These ratings assume adherence to Mitigating Measures

**OVERALL ENVIRONMENTAL
IMPACT MATRIX**
 All Lease Applications

Potential Negative Impacts:
- = Slight or Very Negligible

L = LOW

M = Medium

H = High

X = Unknown

0 = No Negative Impacts

OVERALL ENVIRONMENTAL IMPACT MATRIX

All Lease Applications

[illegible]

APPENDIX E

NEVADA BLM ENVIRONMENTAL ANALYSIS WORKSHEETS

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ENVIRONMENTAL ANALYSIS WORKSHEET

1. Action

GEOHERMAL LEASING

2. Stages of implementation

EXPLORATION

3. DISCRETE OPERATIONS

		<div style="display: flex; justify-content: space-around; text-align: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Airborne Exp.</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">ORV Travel</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Rd & Trail Const.</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Drilling/Seismographing</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Rehabilitation</div> </div>					
4. COMPONENTS, SUBCOMPONENTS, AND ELEMENTS IMPACTED		5. ANTICIPATED IMPACTS					6. REMARKS
I. NONLIVING COMPONENTS	A. AIR						
	Exhaust by products	-X	-X	-X	-X	-X	= X = Insignificant
	Particulate matter	0	-L	-M	-L	+H	
II. LIVING COMPONENTS	B. LAND						
	Soil erosion	0	-H	-H	-L	+M	Values are for local impacts
	Land use compatibility	0	-M	-M	-M	+L	Values are for local impacts
	Land use suitability	0	-L	-M	-L	X	Values are for local impacts (X = Unknown)
	Soil pollutants	0	X	-L	-M	+H	X = Insignificant
C. WATER							
Sediment load	0	-H	-H	-L	+M		
Chemical pollutants	0	-X	-X	-L	X	X = Insignificant	
Temperature	0	0	0	-H	0	Localized impact	
Radioactive pollutants	0	0	0	-X	0	X = Unknown	
A. PLANTS (Aquatic)							
Vascular plants	0	-H	-H	-H	+L	Localized impact	
Phytoplankton	0	-H	-H	-H	+L		
Floating	0	-H	-H	-H	+L		

(Continued on reverse)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
ENVIRONMENTAL ANALYSIS WORKSHEET

1. Action
GEOTHERMAL LEASING

2. Stages of implementation
ABANDONMENT

3. DISCRETE OPERATIONS

Removal Phys.
Plant
Surface
Reclamation
Restoration

4. COMPONENTS, SUBCOMPONENTS, AND ELEMENTS IMPACTED		5. ANTICIPATED IMPACTS				6. REMARKS
I. NONLIVING COMPONENTS	A. AIR	-L			+H	
	B. LAND					
	Solid Waste	+H		+H		
	Soil Pollutants	0		+H		
	C. WATER					
	Sediment Load	-L			+H	
	Availability	X			0	X = Unknown
II. LIVING COMPONENTS	A. PLANTS (Aquatic)	X			0	X = Unknown

(Continued on reverse)

DISCRETE OPERATIONS		Production				Maintenance				Waste Disposal				Expansion			
		Production				Maintenance				Waste Disposal				Expansion			
COMPONENTS, SUBCOMPONENTS, AND ELEMENTS IMPACTED		ANTICIPATED IMPACTS								REMARKS							
II. LIVING COMPONENTS (Con.)	B. PLANTS (Terrestrial)	O	-L	H	-H											Localized Impacts	
III. INTER-RELATIONSHIPS	A. ECOLOGICAL PROCESSES	X														X = Unknown Site Specific	
IV. HUMAN VALUES	A. LANDSCAPE CHARACTER	X	O	H	L											X = insignificant	
IV. HUMAN VALUES	B. SOCIOCULTURAL INTERESTS	+H															

- INSTRUCTIONS**
- Action** - Enter action being taken, analytic step for which worksheet is being used, environmental viewpoint of impact, and any assumptions relating to impact.
 - Worksheet is normally used to analyze "Anticipated Impacts" of action; however, it may be used to analyze "Residual Impacts." Worksheets may also be used to compare impacts before and after mitigating measures are applied.
 - State viewpoint that best describes environmental impact. For example, a fence viewed down the fence line has greater impact than the same fence viewed over an entire allotment. Generally, narrow viewpoints better illustrate specific impacts than will broad viewpoints.
 - Assumptions may be made to establish a base for analysis (e.g. estimated time periods, season of year, etc.).
 - Stages of Implementation** - Identify different phases of proposed project (e.g. a road project consists of survey, construction, use, and maintenance stages).
 - Discrete Operations** - Identify separate actions comprising a particular stage of implementation (e.g. the construction stage of the road project has the discrete operations of clearing, grading, and surfacing).
 - Elements Impacted** - Enter under appropriate heading all environmental elements susceptible to impact from action and alternatives. Relevant elements not contained in the digest should also be entered. See BLM Manual 1791, Appendix 2, Environmental Digest.
 - Anticipated Impact** - Evaluate anticipated impact on each element and place an entry in the appropriate square indicating degree of impact as low (L), medium (M), high (H), no impact (O), or unknown or negligible (X). Precede each entry by a plus (+) or minus (-) sign indicating a beneficial or adverse type of impact. If type of impact reflects a matter of opinion or is not known, do not precede with a sign. For example, construction of a wind mill on open range has a definite visual impact; however, to some people the effect is detrimental while to others it is an improvement. By not entering a plus (+) or minus (-) sign the worksheet is kept factual and unbiased. If both degree and type of impact are unknown, place an (x) in the appropriate square.
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 - Remarks** - Enter clarifying information.

ENVIRONMENTAL ANALYSIS WORKSHEET

GEO THERMAL LEASING

2. Stages of implementation

3. DISCRETE OPERATIONS

Production
Maintenance
Waste Disposal
Expansion

I. NONLIVING COMPONENTS

IV. LIVING COMPONENTS

DISCRETE OPERATIONS		Rd Construction & Improvement Drilling Operations Plant Construction & Development Electric Distr. Construction camp						
COMPONENTS, SUBCOMPONENTS, AND ELEMENTS IMPACTED		ANTICIPATED IMPACTS						REMARKS
II. LIVING COMPONENTS (Con.)	B. PLANTS (Terrestrial)	-H						Localized Impact
C. ANIMALS (Aquatic)	-H							
D. ANIMALS (Terrestrial)	-H							Localized Impact
III. INTERE- LATIONSHIPS	A. ECOLOGICAL PROCESSES	-H						Localized Impact
		-L	-L	-L	X	X		Areawide Impact X = Negligible
IV. HUMAN VALUES	A. LANDSCAPE CHARACTER	-H						Localized Impact
B. SOCIOCULTURAL INTERESTS								
Local reg. structure	H						Impacts of development cannot be broken down by discrete	
Alts. & Expec.	X							
Cult. Values	M						Operation	
Social Welfare	M							

INSTRUCTIONS

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ENVIRONMENTAL ANALYSIS WORKSHEET

2. Stages of implementation

DEVELOPMENT

3. DISCRETE OPERATIONS

Ad Construction
& Improvement
Drilling
Operations
Plant Construction
& Development
Electric Construction
Lines
Construction Distr.
Construction camp

I. NONLIVING COMPONENTS

LIVING COMPONENTS

DISCRETE OPERATIONS		Airborne Exp. ORV Travel Rd & Trail Const. Drilling/ Seismographing Rehabilitation					
COMPONENTS, SUBCOMPONENTS, AND ELEMENTS IMPACTED		ANTICIPATED IMPACTS					REMARKS
II. LIVING COMPONENTS (Con.)	B. PLANTS (Terrestrial)						
	Grasses, shrubs, forbs	O	-H	-H	-H	+H	Localized impact
			-L	-L	-L	-L	Area-wide impact
	C. ANIMALS (Aquatic)						
		O	-H	-H	-H	+L	Localized impact within habitat
III. INTERRELATIONSHIPS	D. ANIMALS (Terrestrial)						
		X	-H	-H	-H	X	X = Insignificant
	A. ECOLOGICAL PROCESSES						
		O	-H	-H	-H	X	X = Unknown, Localized impact
		O	-L	-L	-L	X	Area-wide Impact
IV. HUMAN VALUES	A. LANDSCAPE CHARACTER						
		O	-H	-H	-H	+L	Localized impact
		O	-L	-M	-L	+X	Area-wide Impact
							X = Insignificant
	B. SOCIOCULTURAL INTERESTS						
	Ed/Scientific	+M	O	O	+M	O	
	Cultural Values	O	-H	-H	-L	O	Localized Impact
	Social Welfare	+L	+L	+L	+L	O	

INSTRUCTIONS

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- Stages of Implementation** - Identify different phases of proposed project (e.g. a road project consists of survey, construction, use, and maintenance stages).
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- Remarks** - Enter clarifying information.

DISCRETE OPERATIONS		Removal Phys. Plant					Surface Reclamation Restoration				
COMPONENTS, SUBCOMPONENTS, AND ELEMENTS IMPACTED		ANTICIPATED IMPACTS					REMARKS				
II. LIVING COMPONENTS (Con.)	B. PLANTS (Terrestrial)	-L				+M					
III. INTERRELATIONSHIPS	C. ANIMALS (Aquatic)	X				X				X = Unknown Site Specific	
IV. HUMAN VALUES	D. ANIMALS (Terrestrial)	X				X					
V. HUMAN VALUES	A. ECOLOGICAL PROCESSES	H				H					
VI. HUMAN VALUES	A. LANDSCAPE CHARACTER	X				X				X = Unknown Site Specific	
VII. HUMAN VALUES	B. SOCIOCULTURAL INTERESTS	H				H					

INSTRUCTIONS

- Action** - Enter action being taken, analytic step for which worksheet is being used, environmental viewpoint of impact, and any assumptions relating to impact.
 - Worksheet is normally used to analyze "Anticipated Impacts" of action; however, it may be used to analyze "Residual Impacts." Worksheets may also be used to compare impacts before and after mitigating measures are applied.
 - State viewpoint that best describes environmental impact. For example, a fence viewed down the fence line has greater impact than the same fence viewed over an entire allotment. Generally, narrow viewpoints better illustrate specific impacts than will broad viewpoints.
 - Assumptions may be made to establish a base for analysis (e.g. estimated time periods, season of year, etc.).
- Stages of Implementation** - Identify different phases of proposed project (e.g. a road project consists of survey, construction, use, and maintenance stages).
- Discrete Operations** - Identify separate actions comprising a particular stage of implementation (e.g. the construction stage of the road project has the discrete operations of clearing, grading, and surfacing).
- Elements Impacted** - Enter under appropriate heading all environmental elements susceptible to impact from action and alternatives. Relevant elements not contained in the digest should also be entered. See BLM Manual 1791, Appendix 2, Environmental Digest.
- Anticipated Impact** - Evaluate anticipated impact on each element and place an entry in the appropriate square indicating degree of impact as low (L), medium (M), high (H), no impact (O), or unknown or negligible (X). Precede each entry by a plus (+) or minus (-) sign indicating a beneficial or adverse type of impact. If type of impact reflects a matter of opinion or is not known, do not precede with a sign. For example, construction of a wind mill on open range has a definite visual impact; however, to some people the effect is detrimental while to others it is an improvement. By not entering a plus (+) or minus (-) sign the worksheet is kept factual and unbiased. If both degree and type of impact are unknown, place an (x) in the appropriate square.
 - The measures of impact (e.g. low, medium, and high) are relative and their meaning may vary slightly from action to action. The term "low" should not be applied to impacts of a negligible nature. For example, we know that a pickup truck driving down a proposed fence line laying wire has some impact on air quality. However, the significance of this impact is not normally great enough to warrant even a "low" rating. In cases like this, the impact will usually be marked "O" or the element left off the worksheet.
 - It is recognized that some environmental elements may defy accurate measurement or in-depth analysis within current Bureau capabilities or expertise. The nature of the action as well as type and degree of impact should guide in the decision to seek outside expertise or assistance.
- Remarks** - Enter clarifying information.

APPENDIX F

OUTLINE OF TYPICAL EA CONTENT
(Geophysical Survey or Shallow Temperature Gradient Holes)

INTRODUCTION	
BACKGROUND AND DESCRIPTION OF PROPOSED ACTION ...	
Resource Development History	
Location	
Description of Plan of Operation	
BASELINE ENVIRONMENT	
Geology	
Geologic Hazards	
Soils	
Air Quality and Noise	
Climate	
Hydrology	
Vegetation	
Wildlife	
Current and Anticipated Land Uses	
Socio-Economic Characteristics	
IMPACT EVALUATION AND MITIGATING MEASURES	
Physical Characteristics	
Land Uses	
Socio-Economic Characteristics	
SPECIAL STIPULATIONS AND CONDITIONS	
Recommended Special Conditions	
ALTERNATIVES TO THE PROPOSED ACTION	
ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED	
IMPACT SUMMARY AND IMPACT EVALUATION MATRIX	
DETERMINATION	
REFERENCES	

Appendix A	Plan of Operation
Appendix B	Archeological Inventory
Appendix C	Coordination and Correspondence
Appendix D	Soils
Appendix E	Vegetation
Appendix F	Wildlife
Appendix G	Air and Water Quality Data
Appendix H	Special Lease Stipulations

Information
which
already
existed

Figure 1	Location of Soda Lake Unit, Churchill County, Nevada
Figure 2	Vicinity map of Soda Lake Unit, Churchill County, Nevada
Figure 3	Soda Lake Unit, Nevada
Figure 4	Proposed well locations, Soda Lake Unit, Nevada
Figure 5	Geologic Setting of Soda Lake Unit, Nevada
Figure 6	Geologic map of Soda Lake Unit, Nevada
Figure 7	Soils map of western portion of Soda Lake Unit
Figure 8	Soils map of eastern portion of Soda Lake Unit
Figure 9	Map of Soda Lakes - Upsal Hogback thermal area showing configuration of confined potentiometric surface
Figure 10	Vegetation Map
Figure 11	Wildlife Management Areas
Figure 12	Game Species habitat in Fort Churchill-Clan Alpine Area
Figure 13	Relationship of Soda Lake Unit to Lahontan Valley Bird study units
Figure 14	Migration routes in Carson Desert

Table 1	Explanation of geologic map of Soda Lake Unit Area
Table 2	Explanation of soils map symbols
Table 3	Water Data for Soda Lake and Little Soda Lake
Table 4	Dissolved Solids Content of Surface Water in Soda Lake Unit
Table 5	Ground water budget for Soda Lakes - Upsal Hogback Area
Table 6	Well Site Vegetation
Table 7	Waterfowl use days for Soda Lakes area
Table 8	Waterfowl production for Soda Lakes area
Table 9	Water, marsh, shore and other birds use and production for Soda Lakes area for calendar years 1972-74
Table 10	Recreational activity at Soda Lake area
Table 11	Population growth in Churchill County 1920-1976
Table 12	General population characteristics for Churchill County 1960, 1970, and 1975
Table 13	Population projections - Fallon and Churchill County
Table 14	Churchill County: employed persons by industry group 1960 and 1970
Table 15	Buying Groups/Income
Table 16	Gross Revenues by industry, Churchill County, 1970
Table 17	Land ownership in Churchill County

APPENDIX G

GEOHERMAL DEVELOPMENT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
BREITENBUSH AREA

GEO THERMAL DEVELOPMENT

Draft Environmental Statement

NARRATIVE

Breitenbush Area

**Willamette National Forest
Mt. Hood National Forest**

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APPENDIX H

**CASE HISTORY OF EIS PREPARATION
ON ISLAND PARK KGRA**

Island Park KGRA, Idaho

May 1974	First group of geothermal applications on Island Park area. BLM notifies Targhee Forest of geothermal interest.
May 1975	BLM communication to Forest Service that 150 lease applications received for area.
May 1975	Joint meeting of GS, BLM, FS, and FWS on Island Park area. <ul style="list-style-type: none">- A determination was made to go to EIS on this area.- It was also agreed that the Targhee National Forest would serve as the lead agency.
July 1975	BLM-SO notifies all lease applicants that full-blown EIS will be done.
October 1975	Targhee National Forest Supervisor presents testimony on EIS determination.
September 1976	EIS project team formed.
November 1976 - February 1977	Key EIS personnel added to project team.
January 1977	1st interagency EIS meeting held in Idaho Falls, Idaho
May 1977	1st public document presented requesting public input.

Further project schedule - See attached.

SCHEDULE

Complete Data Gathering	12/1/77
Organizational Review	
Present inventories, discuss involvement document	12/6-9/77
Complete Involvement Document	1/1/78
Conduct Public Involvement Session	2/4/78
Analyze Public Input	2/15/78
Complete Draft Statement	4/10/78
Draft Review	
Study team	4/24/78
Others	6/1/78
Draft Statement Printing	6/30/78
Send to Interested Publics	7/5/78
File with CEQ	7/5/78
Organizational Meeting	
Review public input and needs for additional data and/or modification	9/8/78
Complete Final Statement	10/20/78
Final Reviews (in-service-other appropriate agencies)	12/1/78
Final Printing	1/1/79
File with CEQ and Mail to Interested Publics	1/5/79
Implement Statement Recommendations	4/5/79