

U.S. geothermal, geologic patterns compared

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DATA from about 30,000 wells were used in preparation of the geothermal gradient map by the AAPG-sponsored Geothermal Survey of North America (GSNA), with publication of the map by the AAPG and USGS scheduled for

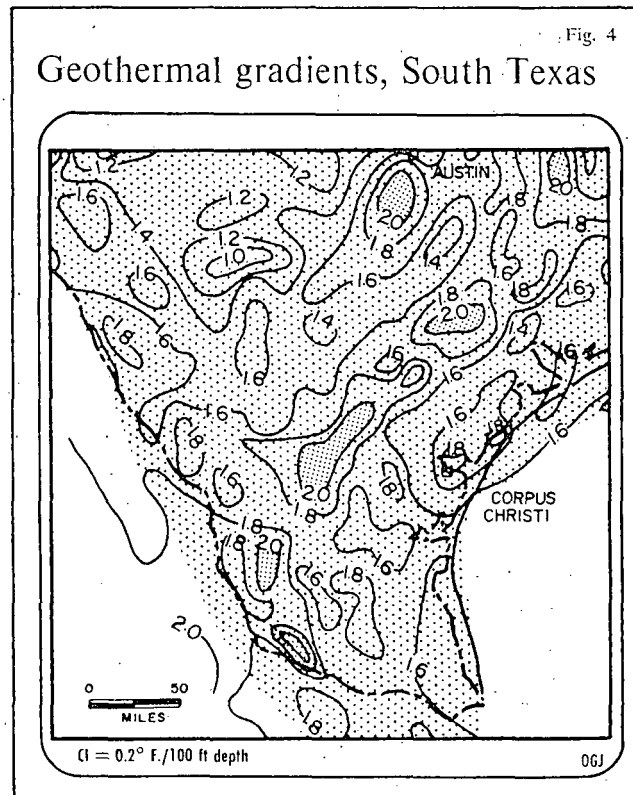
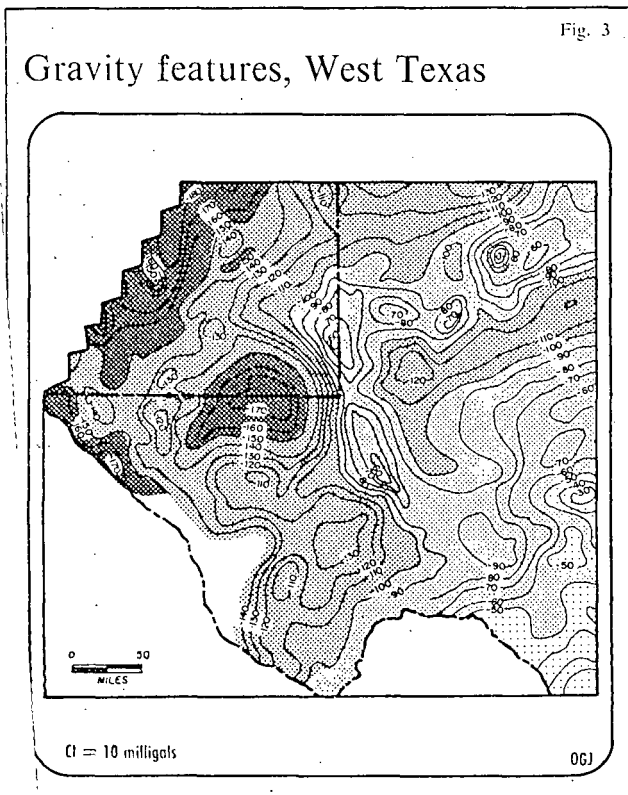
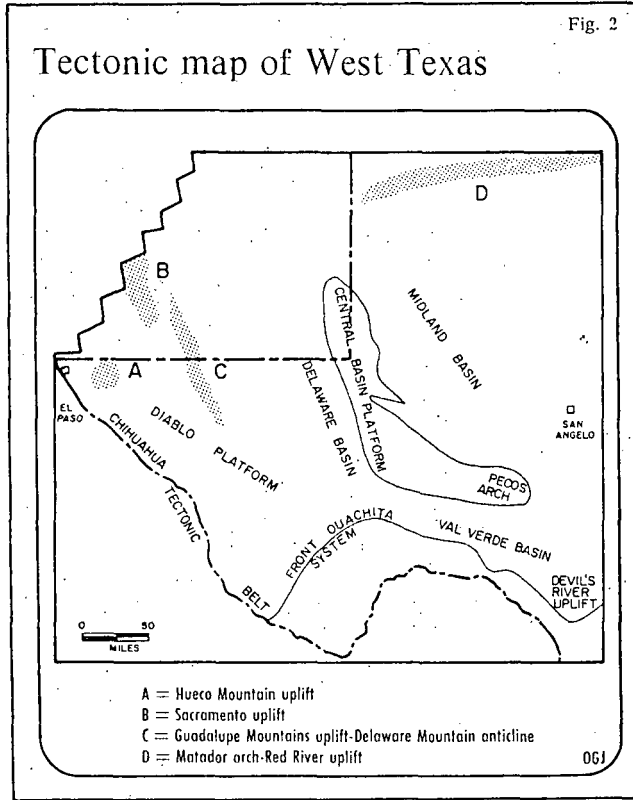
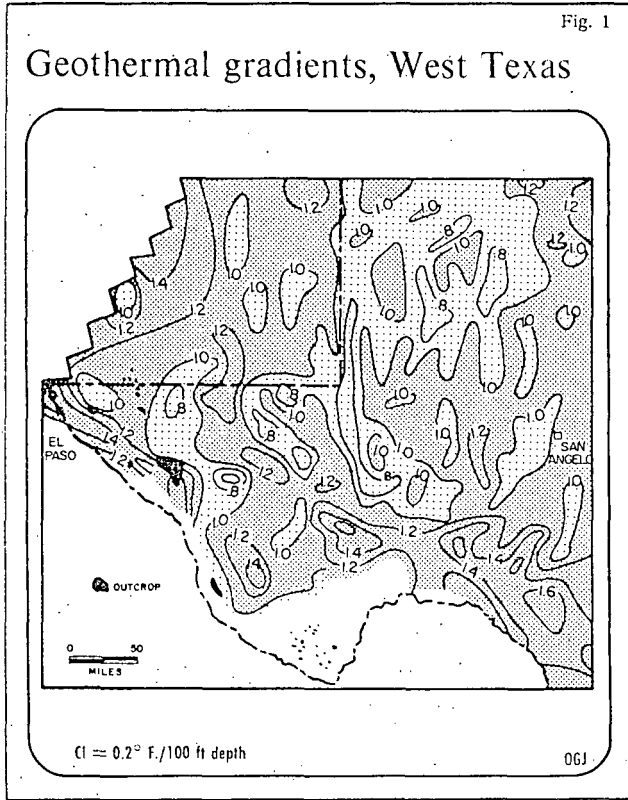
fall 1974.

For the United States there are data from some 20,000 wells drilled for oil and/or gas, 1,400 water wells, and 250 drill holes used specifically for crustal heat-flow measurements. On

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the geothermal gradient map prepared by GSNA, contoured values in the United States range from 0.6° F./100 ft of depth at the southern tip of

Florida to 3.0° F./100 ft of depth in eastern Oregon.

The map represents the geothermal regime in sedimentary rocks, which is thought to reflect a summation of a number of geologic and geophysical parameters expressed as thermal conduction and thermal convection and hydrodynamics.

In this paper typical empirical relationships in the United States will be illustrated by comparing regional geothermal patterns to geologic and gravity features in West Texas (Figs. 1-3) and South Texas (Figs. 4-6). Geothermal gradients are lower in West Texas (Fig. 1), where carbonates are a prominent part of the stratigraphic section, than in the Texas Gulf Coast (Fig. 4), which is characterized generally by a clastic-rich section.

A corresponding relationship is shown by the regional gravity field, as bouguer gravity values increase generally toward the coast (Figs. 3, 6).

In West Texas a geothermal minimum coincides with the Central basin platform and a gravity maximum (Figs. 1-3). The trend of two geothermal maxima north and east of the Ouachita system in West Texas cor-

responds to foreland basins, the southern part of the Delaware basin on the west and Val Verde basin on the east.

A line connecting two large gravity minima east of Alpine parallels the geothermal trend (Fig. 3). The geothermal maximum southeast of the trend of foreland basins is the approximate location of the Devil's River uplift.

An arcuate trend of two geothermal minima west of the Delaware basin delineates in a general way the Guadalupe Mountains uplift-Delaware Mountain anticline (C on Fig. 2), which is east of, but parallel to, gravity maxima extending from the Carlsbad area to Van Horn (Fig. 3). A subtle westerly to west-southwesterly trend, composed of several local geothermal maxima, may partially reflect the Matador arch-Red River uplift (D on Fig. 2).

Relatively high geothermal gradient values (1.6° to 1.8° F./100 ft of depth) along the Texas Gulf Coast north of Corpus Christi coincide with a ridge composed of Tertiary shale diapirs (Figs. 4, 5). The long geothermal maximum which parallels the coast some 80 to 100 miles inland reflects the position of a Cretaceous-Eocene fault zone (D on Fig. 5), as well as the Lower Cretaceous reef (E on Fig. 5) in the northeastern part.

A subtle trend of gravity minima is present along part of the geothermal anomaly which coincides with the reef tract (Fig. 6). Geothermal minima northwest of the fault zone-Cretaceous reef form a trend which corresponds in the southwest to the Charlotte fault zone (F on Fig. 5) and the Luling fault zone (G on Fig. 5) in the northeast. The area of minima is characterized also by gravity maxima.

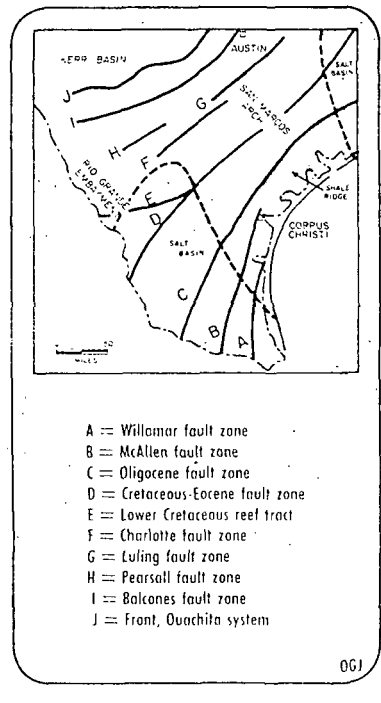
The northern part of the geothermal maximum south of Austin is part of a north-northeast trend which parallels the Balcones fault zone (I on Fig. 5) and the Ouachita system (J on Fig. 5). Although the trend is parallel to a gravity trend, the southern part of the geothermal anomaly extends obliquely across the trends toward the Luling fault zone.

The geothermal trends and patterns in West Texas and South Texas are typical of those mapped by GSNA. In the U.S. they commonly correlate with regional structural and gravity trends. Relationships also exist with stratigraphic features such as gross lithofacies.

STAT

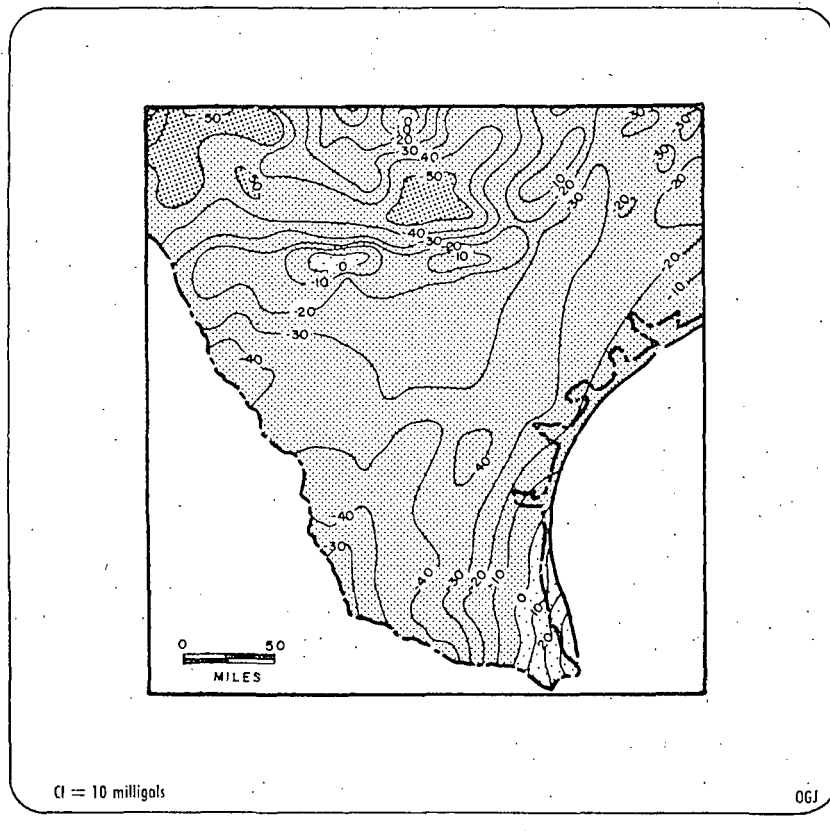
S. Texas tectonics

Fig. 5



Bouguer gravity anomaly map of South Texas

Fig. 6



API reports stocks by

Pennsylvania
Other Appalachia
Lima-Michigan
Illinois-Indiana
Kansas
Nebraska and N
Oklahoma
Arkansas
Mississippi, Ala
Texas
East Texas
West Texas
Gulf Coast
Panhandle
North
South
Rest of State
Louisiana
North
Gulf Coast
New Mexico
Wyoming
Other Rocky M.
California and A
Foreign in Distr
Other Foreign

Total

API refining

District

East Coast
Appalachian: Dist
Dist. 2
Ind., Ill., Ky.
Minn., Wis., Dak
Okla., Kan., Mo.
Inland Texas
Texas Gulf Coast
La., Gulf Coast
N. La. and Ark.
New Mexico
Other Rky. Mt.
West Coast

Nov. 15, 1974
Nov. 8, 1974
Nov. 16, 1973

*At refineries.

A Preliminary Analysis
of the Legal and Institutional Aspects
of the Trans-Pecos Geothermal Project

By Louis D. Lazarine
General Land Office
March 1979

UNIVERSITY OF UTAH
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INTRODUCTION

This report looks at legal and institutional aspects of development of the Trans-Pecos geothermal resources.

The report begins at the federal level with a look at federal laws regarding geothermal resources. Discussion of federal taxation and federal regulation of interstate electricity follow.

The next section of the report discusses development of geothermal resources at the state level. First, a summary of the Texas Geothermal Resources Act of 1975 is given. This is followed by discussions of ownership aspects, royalty and leasing, state taxation, and state regulation of electricity.

Next, a discussion of state agencies, their regulatory authority and their permit requirements is made. Subsidence and applicable Texas law is discussed next. This is followed by a discussion of local government authorities and multi-jurisdictional problems. A list of agencies which may have an interest in geothermal development is supplied.

A general summary concludes this report. At the back of this report are included copies of the various agency forms discussed.

FEDERAL LAWS

Geothermal development on federal lands is governed by the Geothermal Steam Act of 1970 (P.L. 91-581, 84 STAT. Sec. 1556 et. seq.). This Act authorizes the Secretary of the Interior to issue leases for geothermal steam and associated geothermal resources. Lands available for leasing include (1) public, withdrawn and acquired lands administered by the Secretary; (2) national forest and other lands administered by the Department of Agriculture; and (3) lands which have been conveyed by the U. S. subject to reservation of the geothermal steam and associated geothermal resources therein.

A federal policy to promote geothermal development by assisting in financing geothermal exploration and development projects is the Geothermal Energy Research, Development and Demonstration Act of 1974 (P.L. 93-410, 36 USC Sec. 1101 et. seq.). Title II of the Act initiated a loan guarantee program for geothermal operations, including:

- a) the determination and evaluation of the resource base;
- b) research and development with respect to extraction and utilization technologies;
- c) acquiring rights in geothermal resources; or
- d) development, construction, and operation of facilities for the demonstration or commercial production of energy from geothermal resources.

The Act limits geothermal loan guaranties to, at most, 75% of a project's aggregate cost. In addition, guaranties may not exceed \$25 million for any single project or \$50 million for any single borrower.

The Act defines "qualified borrower" as any public or private agency, institution, association, partnership, corporation, political subdivision or other legal entity which has presented satisfactory evidence of an interest in geothermal resources and is capable of performing research or completing the

development and production of energy in an acceptable manner.

The federal government's role in defining and enforcing national standards of water quality was greatly expanded by the Federal Water Pollution Control Act Amendments of 1972 (33 USCA Sec. 1251 et. seq.). The FWPCA provides for a national permitting program to control the discharge of any pollutant into navigable waters. The national permit system is called the National Pollutant Discharge Elimination System (NPDES). Federal discharge permits are granted by EPA under this system until such time as a state permit system has been approved in its entirety by the EPA Administrator. As of this time, Texas has not received such approval, however, it is significant that major portions of the Texas program appear to be acceptable to the Environmental Protection Agency (EPA). Since November, 1973, there has existed a Memorandum of Understanding between the Regional Administrator, EPA-Dallas, and the TWQB (now the Texas Department of Water Resources) that, insofar as practical, yet without actual delegation of permit authority, the TWQB "will assume the burden of the NPDES program".

The EPA can regulate underground waste disposal under the federal Safe Drinking Water Act (P.L. 93-523, 42 USC Sec. 300f et. seq.). The SDWA provides for protection of underground sources of drinking water through control over subsurface disposal of waste fluids by well injection. The EPA has developed guidelines for state underground injection control programs to provide broad protection to underground drinking water sources from endangerment by underground injection of contaminants.

The National Environmental Policy Act (P.L. 91-190, 42 USC Sec. 4321 et. seq.) requires the preparation of an environmental impact statement prior to any major federal action that would significantly affect the environment.

The federal Clean Air Act (P.L. 91-604, 42 USC Sec. 1857 et. seq.) has as its purposes:

a) to protect and enhance the quality of the nation's air resources so as to promote the public health and welfare and the productive capacity of its population;

b) to initiate and accelerate a national research and development program to achieve the prevention and control of air pollution;

c) to provide technical and financial assistance to state and local governments in connection with the development and execution of their air pollution prevention and control programs; and

d) to encourage and assist the development and operation of regional air pollution control programs.

FEDERAL TAXATION

Federal taxation of corporate income is the largest tax faced by geothermal operations. The levy of 48% on adjusted gross income exceeding \$50,000 affects developers and investors alike. Reductions in this tax liability are achieved through allowable deductions from gross income. Among standard deductions for businesses in general are investment losses, research and experimentation costs, rent, and equipment and inventory depreciation. Resource extraction industries have also been allowed resource depletion deductions, calculated as a percentage of gross income, and deductions for specified exploration and mine or well development expenditures.

The techniques and expenditures of geothermal exploration and field development are similar to those of the oil and gas industry. It is understandable, therefore, that the geothermal industry might anticipate tax deductions similar to those which have been accorded to petroleum development. And in fact, this has occurred.

The following is an analysis of federal taxation concerning geothermal resources. General federal taxation on businesses is not discussed. Federal taxation in the area of geothermal resources is relatively new. The Energy Tax Act of 1978 (see Conf. Report to H.R. 5263) is the first instance of specific discussion of such resources in the federal tax statutes. Sec. 403 of the Act amends Section 613 of the Internal Revenue Code to define "geothermal deposit" as a geothermal reservoir consisting of natural heat which is stored in rocks or in aqueous liquid or vapor (whether or not under pressure). Such a deposit shall in no case be treated as a gas well. The Trans-Pecos geothermal resources would probably fit into this definition.

The Energy Tax Act, Section 402(a), grants the operator of geothermal property the option to deduct intangible drilling and development costs as

capital expenditure or an expense item. The geothermal operator may do so to the same extent and in the same manner as such expenses are deductible in the case of oil and gas wells.

The Act, Section 402(b), makes the minimum tax on intangible drilling costs in the case of geothermal wells the same as the minimum tax as oil and gas properties under Section 57 of the I.R.S. Code.

The Energy Tax Act, Section 402(c), puts the gain from disposition of interests in geothermal wells on the same level as gains from the disposition of interests in oil and gas properties. Generally certain gains from such disposition is treated as regular income.

Section 402(d) of the Energy Tax Act placed geothermal deposits with oil and gas in the application of risk rules. This basically means that the aggregate amount at risk on the oil, gas, on geothermal property cannot be exceeded by the amount of losses deductible in a one year period.

The Energy Tax Act, Section 403, amends Section 613 of the I.R.S. Code to grant allowance for depletion of the geothermal deposit. The schedule for depletion allowance is:

1978, 1979, 1980	22%
1981	20%
1982	18%
1983	16%
1984 and thereafter	15%

These percentages are applied to gross income to determine the allowance.

FEDERAL REGULATION OF INTERSTATE ELECTRICITY

The Federal Energy Regulatory Commission (FERC) has the authority to regulate electric utility companies engaged in interstate commerce.

The Federal Power Act (16 USC Sec. 824 et. seq.), authorizes federal regulation, in the public interest, of matters relating to the generation of electricity, transmission of electric energy in interstate commerce, and the sale of wholesale electricity in interstate commerce. This federal regulation extends only to those matters not regulated by the individual state.

Electric energy is considered to be transmitted in interstate commerce if transmitted from a state and consumed at any point outside that state.

Section 824 a(e) allows no person to transmit any electric energy from the U.S. to a foreign country without first having secured an order from FERC authorizing it.

FERC requires every public utility, subject to its jurisdiction, to file schedules showing all rates and charges for any transmission or sale of electricity.

If FERC finds that any rate or rule subject to its jurisdiction is unjust or unreasonable it may determine the just and reasonable rate or rule and establish it by order.

In determining a just rate, FERC allows certain research and development expenses to be included. Advance FERC approval may be requested.

If the geothermal resources in the Trans-Pecos area were suitable for generation of electricity and that electricity were used in Mexico or New Mexico, certain FERC requirements would have to be met. Early consultation with this federal agency would be advisable.

This report will now focus on legal aspects of geothermal resources and development in Texas.

SUMMARY OF TEXAS GEOTHERMAL ACT

Geothermal resources in the state of Texas are governed by the Geothermal Resources Act of 1975, NAT. RES. CODE, Section 141.001 et. seq.

The following highlights the more significant sections of the Act. A text of the Act is included in the back of this report.

Section 141.002 declares the policy of the state to be that:

1) the rapid and orderly development of geothermal energy and associated resources located within the State of Texas is in the interest of the people of the State of Texas;

2) in developing the state's geothermal energy and associated resources, the primary purpose is to provide a dependable supply of energy in an efficient manner that avoids waste of the energy resources; and

3) consideration shall be afforded to protection of the environment, to protection of correlative rights, and to conservation of natural resources by all agencies and officials of the State of Texas involved in directing and prescribing rules or orders governing the exploration, development, and production of geothermal energy and associated resources and by-products in Texas.

Section 141.003(4) defines "geothermal energy and associated resources" as:

A) products of geothermal processes, embracing indigenous steam, hot water and hot brines, and geopressed water;

B) steam and other gasses, hot water and hot brines resulting from water, gas, or other fluids artificially introduced into geothermal formations;

C) heat or other associated energy found in geothermal formations; and

D) any by-product derived from them.

Section 141.003(5) defines "by-product" as:

any element found in a geothermal formation that when brought to the surface is not used in geothermal heat or pressure inducing energy generation.

Section 141.011 authorizes the Railroad Commission of Texas (RRC) to regulate the exploration, development, and production of geothermal energy and associated resources on public and private land for the purpose of conservation and the

protection of correlative rights.

Section 141.012 directs the RRC, in consultation with the General Land Office Commissioner, the Executive Director of the Texas Department of Water Resources, and the Executive Director of the Texas Air Control Board to make rules governing:

- 1) protection of the environment against damage resulting from the exploration, development, and production of geothermal energy and associated resources;

- 2) prevention of waste of natural resources, including geothermal energy and associated resources, in connection with the exploration, development, and production of geothermal energy and associated resources;

- 3) protection of the general public against injury or damage resulting from the exploration, development, and production of geothermal energy and associated resources; and

- 4) protection of correlative rights against infringement resulting from the exploration, development, and production of geothermal energy and associated resources.

Section 141.071 authorizes the Commissioner of the General Land Office to:

- 1) provide for the orderly exploration of land that belongs to the permanent school fund, excluding wildlife refuges and recreational areas, except as provided in Section 141.077 of this code; and

- 2) issue permits and charge reasonable fees for the permits in accordance with rules promulgated under this chapter by the board.

Section 141.073 states that:

- a) On direction of the commissioner, the board may lease land that belongs to the permanent school fund, excluding wildlife refuges and recreational areas, for the production of geothermal energy and associated resources.

- b) The board has full authority to set the terms and conditions of leases and may adopt rules relating to exploration, development, and production of geothermal energy and associated resources as the board determines to be in the best interest of the state.

c) The board may require the taking in kind of the state's interest in the geothermal energy and associated resources or its by-products provided from this land.

Section 141.076 requires sales of leases to be made by sealed bids.

Section 141.077 allows the School Land Board to grant permits and leases to state and federal institutions, organizations, or groups desiring to do exploratory or experimental research of geothermal energy and associated resource potentials on land that belongs to the permanent school fund, excluding wildlife refuges and recreational areas.

OWNERSHIP ASPECTS OF GEOTHERMAL RESOURCES

A very critical factor in development of geothermal energy in Texas is ownership of the resource. The Geothermal Resources Act of 1975 (NAT. RES. CODE, Section 141 et. seq.) does not make any explicit declarations in this regard. Leases, royalties, and other contractual obligations all hinge on ownership designation. The Act places regulation of geothermal resources in the hands of the Railroad Commission, traditionally the regulator of oil and gas, and the Commissioner of the General Land Office, traditionally, the lessor of state-owned lands for oil and gas development. This may indicate a preference that mineral law apply.

If geothermal resources are deemed to be "water", then ownership normally would be with the surface estate. If they are considered as a "mineral" then ownership would be in the hands of the mineral estate owner. Of course, in the case of a fee owner, i.e., owner holds both surface and mineral estate, there would not be a problem.

The most thorough analysis and discussion of the ownership issue is found in a report published by the Center for Energy Studies at the University of Texas at Austin. The report is entitled The Geopressured Geothermal Resources of Texas: A Report on Legal Ownership and Royalty Issues by A. W. Overbeck. Although the report discusses geopressured geothermal resources, its reasoning would, to a large extent, be applicable to the Trans-Pecos geothermal resources.

The report begins with a look at two cases arising in "The Geysers", an area of extensive geothermal development in California. The following is a recent update on the first case presented. In United States vs. Union Oil Co. of California (549 F. 2^d 1271 (1977) U.S. Cert. Den. 434 US 930), the U.S. brought a quiet title action under the Geothermal Steam Act of 1970 to determine whether the mineral reservation in patents issued under the Stock-Raising

Homestead Act of 1916, reserved to the U.S. geothermal resources underlying the patented lands.

Patents issued under the Homestead Act reserved to the U.S. all the "coal and other minerals" in the lands so patented. Although there was no specific reference to geothermal resources, the court said the words in the Homestead Act were capable of bearing a meaning that encompassed geothermal resources. The court said the general purpose of the Homestead Act was to convey public land for agricultural and stock raising, but to retain subsurface resources, particularly mineral fuels, in the U.S. for development and separate disposition in the public interest. Such a purpose would be served, the court said, by including geothermal resources in the act's reservation of "all the coal and other minerals". Thus, the court held that geothermal resources were in the mineral estate.

In Geothermal Kinetics, Inc. vs. Union Oil Company of California (No. 79314 Superior Court, Sonoma County, California), the question presented in a quiet title action was who owned the geothermal resources under certain land in The Geysers area of California. Plaintiff claimed ownership through a conveyance of the mineral estate in 1951 by the fee owners.

Certain of the defendants claimed ownership of the geothermal resources under what was actually a conveyance in 1953 of the retained surface estate by the original grantor.

The original mineral grant was made in terms of "all minerals in, on, or under those certain lots". The court stated in the widely accepted rule that:

A grant of all minerals includes all minerals to be found on the premises, whether known to exist or not, unless an intent to the contrary can be demonstrated.

For determining what is or is not mineral, the general approach of the courts was:

"The mineral owner is seeking to extract valuable resources from the earth, whereas the surface owner desires the land and such resources as are necessary to make it useful. Water remains with the surface owner because it is necessary to the enjoyment and productivity of the lands. On the other hand, the term minerals is generally construed as every substance which can be got from underneath the surface of the earth for the purpose of profit unless there is something in the content or in the nature of the transaction to induce the court to give it a more limited meaning. Mineral resources are generally found in veins or deposits and are distinct from the surrounding soil. Minerals are usually obtained by mining or drilling as opposed to open quarrying which would tend to destroy the surface. The mineral resources generally must be valuable, for its own sake and not merely as fill, or as common rock or gravel."

This reasoning by the California court in regard to what is included in a mineral estate is entirely consistent with the Texas approach expressed in Acker J. Guinn (464 S.W. 2^d 348), by the Texas Supreme Court in 1971.

The court's conclusions of law stated that the geothermal resources under the property were minerals within the meaning of the 1951 mineral grant, and the judgment quieted title to the geothermal steam and power and geothermal resources in, on, or under the property in the mineral estate owner.

Thus, viewing Union Oil and Geothermal Kinetics leaves one with the impression that geothermal resources may belong to the mineral estate.

The most detailed look at Texas law concerning geothermal resources occurs in Section III of the Overbeck report. This section is entitled "Analysis of Ownership Issues for Texas Resources" and consists of several subsections which will be briefly detailed here. For a more detailed overview of the legal situation, readers are advised to read the entire report.

Subsection A discusses the "Body of the Law for Resolving Issues". In this subsection, reference is made to the fact that since the largest material component of geothermal resources is water, a look at Texas water law would be advantageous. Also, since the Geothermal Resources Act relegates a number of

functions to the Railroad Commission, a look at oil and gas law would be beneficial in resolving issues. Texas water law developed, and was influenced to a large degree, by an agrarian economy and by a lack of understanding of the movement and characteristics of underground water and its interaction with surface water. This subsection ends with the statement that current water law, which favors the surface owner, does not seem to benefit the surface owner in his claim to geothermal resources.

Subsection B states that there are in law many kinds of water. In Sun Oil vs. Whitaker (483 S.W. 2^d 808 (Tex., 1972)), the Texas Supreme Court said that underground water is part of the surface estate and belongs to the surface owner unless it has been severed by reservation or conveyance. It also said that the mineral lessee has an implied grant of reasonable use of groundwater to carry out his operations under the lease.

Subsection C states that various sections of the Texas Water Code confirm the surface owner's vested private rights in "underground water". Section 52.001(3) of the Water Code defines "underground water" as:

"water percolating below the surface of the earth and that is suitable for agricultural, gardening, domestic, or stock raising purposes, but does not include defined subterranean streams or the underflow of rivers."

The Water Code thus differentiates between percolating water, that is "suitable for agricultural, gardening, domestic, or stock raising purposes" and those which are not. It seems only that "sweet" percolating water is vested with the surface owner.

Subsection D discusses "Rights in Salt Waters". The report states:

The Texas Supreme Court was faced with the issue of underground salt water ownership in 1973 in Robinson vs. Robbins Petroleum Corporation (501 S.W. 2^d 865 (Tex. 1973)). Robinson owned only the surface estate in a tract of land, and the mineral estate under the tract had been leased to Robbins

Petroleum for producing "oil, gas, and all other minerals". Salt water had been drawn from a former oil well on the Robinson tract to waterflood for secondary recovery of oil under Robinson's property, but also under other property outside of that tract. The court said that a question was presented as to whether "salt water" is part of Robinson's surface estate, but they did not answer that question directly. In the case, the salt water was being used as "water", not for the value of its mineral content, and the court said, under those circumstances, "saline content has no consequence upon ownership." They pointed out that if the water were being produced for the value of its mineral content [then it might well be the property of the mineral owner.] The case held Robinson was entitled to recover the value of that portion of the salt water used for the benefit of land outside of the Robinson tract.

Subsection E discusses "Classification of Geopressured Waters". A technical description of geopressured waters is presented. There seems to be a virtually complete physical separation of geopressured waters from the groundwater system. Development of the geopressured geothermal resources would not have any practical affect on the availability of groundwater which is vested in the surface owner.

Subsection F discusses "Geothermal Deposits as a Sui Generis Resource". Basically it is a discussion of the possibility of placing geothermal resources in a category unique unto itself.

Perhaps the section of the report entitled "Mineral Character of Geopressured Resources" provides the best insights as to how Texas courts might classify geothermal resources. The report lists several theories to support a mineral classification. They are: "The Geothermal Kinetics Approach", "The Doctrine of Guffey vs. Stroud", and "Reasonable Use by the Mineral Lessee".

Concerning the Geothermal Kinetics approach, the report states:

The valuable substances in the Texas geopressured resources are all contained in geothermal deposits which lie at great depth below the surface of the earth, and which are distinct from the surrounding soil. These valuable substances must be obtained by mineral drilling techniques similar to those used

in regular oil and gas recovery, and there is no requirement for open quarrying or strip mining which would essentially destroy the surface, or prevent its use by the surface estate owner for natural purposes. The substances obtained have substantial value for their own sake, not as fill material, or as common rock or gravel. The water in the geopressured deposits is not part of, and does not affect, in any practical sense, the supply of the percolating underground water which belongs to the surface owner, and is needed by him for enjoyment of his estate...Finally, the value of the geopressured fluids is in their energy and mineral content, and as withdrawn from the wells, they are not useful to natural development of the surface estate. All of these are characteristics which have caused courts in Texas and other states to declare other deposits to be part of the mineral estate, and included within a grant of "oil, gas, and other minerals." Presumably, the geopressured waters and their energy would be included within the "other minerals" term under this theory of mineral characterization.

The "Doctrine of Guffey vs. Stroud" approach is concerned mainly with the suspected presence of methane gas in the geopressured geothermal resources of the Gulf coast. Basically, the idea is that any grant carries with it by implication all things reasonably necessary to the enjoyment of the rights granted. To produce the methane gas, the mineral lessee must also produce the geopressured water which must not be "wasted" according to the Geothermal Resources Act. This doctrine, in effect, is a grant of other substances such as water, which are essential to the enjoyment of the actual grant.

The "Reasonable Use by the Mineral Lessee" approach also depends on the presence of methane gas. Basically, the developer would claim to be using geopressured water for the value of its mineral content and not simply as water.

In his summary assessment, Overbeck states:

The analysis in this report from a technical, policy, and most particularly, a legal viewpoint, strongly indicates that a characterization of the geopressured resources as mineral resources would be most correct, and also most beneficial for possible early development. Arguments for surface ownership of the entire resource, based upon a water resource characterization, are very weak, at best. Such a determination would seem to be contrary to existing Texas law, and

the public interest. A divided ownership of the resource, according to water and mineral components, would appear to deter development possibilities.

There are several bills and resolutions concerning geothermal resources before the legislature this session. Perhaps the most important one is H.B. 1490, Hanna, which attempts to classify geothermal resources as mineral resources.

ROYALTY AND LEASING

Royalties regarding geothermal resources is a new area in Texas law. As of yet, the state has not developed any set royalty amounts. Also unknown at this time is who should receive the royalty. It will remain unclear until such time as a determination is made as to which estate, surface or mineral, geothermal resources belong to. Of course, if a geothermal lease is given by a fee owner of land, the character of the geothermal resources is not material.

Under the federal Geothermal Steam Act of 1970, royalties are to be established at 10% to 15% of the value of the energy derived from production.

Perhaps royalty rates could be based on a percentage of the proceeds of the sale of geothermal water from the producer to a manufacturer for process heating or for other uses. Or perhaps if the same entity produced and utilized the resource then royalties could be based on net profit from the sale of electricity.

Royalty amounts in leases could perhaps be written with some amount of flexibility so that as we learn more about the economics of geothermal resources such royalty rates could be renegotiated.

The Geothermal Resources Act of 1976 (NAT. RES. CODE, Section 141) allows the School Land Board to lease state lands for production of geothermal energy. Work has begun on developing the appropriate regulations and the lease form to be used. Also, the Geothermal Resources Act in Section 141.073(c) allows the School Land Board to take in kind the state's interest in geothermal energy and associated resources.

Regarding leasing for geothermal resources, competitive leasing with a long primary term when no development was required would probably not generate significant revenue for the state. Perhaps speculators would acquire leaseholds for eventual resale rather than development of the resource. Maybe a short primary term on all leases with a somewhat heavy delay rental clause would

solve this problem.

Also, the state might consider the use of royalty bidding instead of bonus bidding. This would favor the use of capital for development rather than initial investment and thus increase the potential number of operators who would be able to participate in exploration and development.

Regarding lease size, minimum lease sizes should be large enough so that a developer would not interfere with other users and there should be a maximum size limitation to prevent monopolization of the geothermal resource.

Because geothermal development is relatively new, the state of Texas has not yet established lease terms. However, there will be a need to assure the lessee of resource availability over a long period of time.

STATE TAXATION

The Texas Geothermal Resources Act of 1975 does not mention taxation nor is there a state taxation statute that specifically includes geothermal resources. In the past, Texas has used the ad valorem tax to generate revenue for the operation of the government. These ad valorem taxes provide the financial base for various political subdivisions of the state including cities, counties, the state itself, hospital districts, school districts, drainage and irrigation districts, and other special districts. Each county collects the state ad valorem tax and forwards it to the state comptroller. There are thousands of taxing districts of various types in the state, and their assessment ratio and tax rate vary widely.

All property, real or personal, improvements to real property, mineral resources, etc. are subject to assessment and taxed at some ratio of its value, i.e., a certain percentage of its "fair market value". This can cause problems. The "fair market value" of a geothermal resource will fluctuate depending on the type of use, the user, the transportation burden, and other unknowns. Tax assessors should be somewhat experienced in oil and gas operation appraisals in order to make their assessments of property used in geothermal development.

Valuation of a geothermal resource may be complex. It may be difficult to discern the "fair market value" of fluids with a certain heat content, pressure content, and dissolved mineral content. The time of making the valuation is also a factor. Geothermal development takes a long time. It may be years between exploration to production of a geothermal reservoir. Perhaps assessment should not occur until the resource is actually in production.

The state imposes a tax of 7.5 percent of market value on natural gas at the point of production. Whether this occupation tax is imposed on geothermal resources depends on whether natural gas is present in the resource.

TEXAS REGULATION OF ELECTRICITY

In Texas the regulation of public utilities is done by the Public Utility Commission of Texas (PUC) under authority of the Public Utility Regulatory Act (TEX. REV. CIV. STAT. ANN. Art. 1446c et. seq.). The purpose of this Act is to establish a comprehensive regulatory system which is adequate to the task of regulating public utilities as defined by the Act and to assure rates, operations, and services which are just and reasonable to the consumers and to the utilities. The term "public utility" or "utility" includes any person, corporation, river authority, cooperative corporation, or any combination thereof, other than a municipal corporation, owning or operating for compensation in this state equipment or facilities for producing, generating, transmitting, distributing, selling, or furnishing electricity.

The PUC has the general power to regulate and supervise the rates charged and the services rendered by electric utilities except within the jurisdiction of municipalities. Cities regulate their own utilities. The PUC has appellate jurisdiction to review orders or ordinances of cities.

Section 38 of the Act requires the PUC to insure that every rate made, demanded, or received by an public utility, or by any two or more public utilities jointly, be just and reasonable. Rates are not to be unreasonable, preferential, prejudicial, or discriminatory, but will be sufficient, equitable and consistent in application to each class of consumers. In fixing the rates of a public utility, the PUC will fix its overall revenues at a level which will permit such utility to recover its operating expenses together with a reasonable return on its invested capital.

Section 50 of the Act requires that a public utility which provides or wants to provide retail utility service, must obtain from the PUC a certificate that the present or future public convenience and necessity requires such installation,

operation, or extension.

Section 52 requires that:

a) A public utility shall submit to the commission an application to obtain a certificate of public convenience and necessity or an amendment thereof.

b) On or before 90 days after the effective date of this Act, or at a later date on request in writing by a public utility when good cause is shown, or at such later dates as the commission may order, each public utility shall file with the commission a map or maps showing all its facilities and illustrating separately facilities for generation, transmission, and distribution of its services.

c) Each applicant for a certificate shall file with the commission such evidence as is required by the commission to show that the applicant has received the required consent, franchise, or permit of the proper municipality or other public authority.

Section 54 states that:

a) When an application for a certificate of public convenience and necessity is filed, the commission shall give notice of such application to interested parties, and if requested, shall fix a time and place for a hearing and give notice of the hearing. Any person interested in the application may intervene at the hearing.

b) Except for certificates for prior operations granted under Section 53, the commission may grant application and issue certificates only if the commission finds that the certificate is necessary for the service, accommodation, convenience, or safety of the public. The commission may issue the certificate as prayed for, or refuse to issue it, or issue it for the construction of a portion only of the contemplated system or facility or extension thereof, or for the partial exercise only of the right or privilege.

c) Certificates of convenience and necessity shall be granted on a non-discriminatory basis after consideration by the commission of the adequacy of existing service, the need for additional service, the effect of the granting of a certificate on the recipient of the certificate and on any public utility of the same kind already serving the proximate area, and on such factors as community values, environmental integrity, and the probable improvement of service or lowering of cost to consumers in such area resulting from the granting of such certificate.

Section 71 states:

Whenever it appears to the commission or railroad commission that any public utility or any other person or corporation is engaged in, or is about to engage in, any act in violation of this Act, or of any order, rule, or regulation of the commission or railroad commission entered or adopted under the provisions of this Act, or that any public utility or any other person or corporation is failing to comply with the provisions of this Act or with any such rule, regulation, or order, the attorney general on request of the commission or railroad commission, in addition to any other remedies provided herein, shall bring an action in a court of competent jurisdiction in the name of and on behalf of the commission or railroad commission against such public utility or other person or corporation to enjoin the commencement or continuation of any such act, or to require compliance with such Act, rule, regulation, or order,

PUC Rule 052.02.05.056(c) requires a Certificate of Convenience and Necessity for any construction and/or extension of new electric generating units and new electric transmission lines.

PUC Rule 052.01.00.032(d) states that applications for Certificate shall contain the following:

1) Two copies of the appropriate application form prescribed by the Commission, completed as instructed and properly executed.

2) Territorial maps filed in support of such applications for initial or amended certificates which shall fulfill the following requirements:

a) For all utilities other than water and sewer, the information shall be on a full scale state highway or Commission map or a portion thereof and shall be permanently legible.

b) For water and sewer, the area to be served shall be shown on a state highway county map, scale 1" = 2 miles. It shall show the location of the applicant and each neighboring water or sewer utility within five miles of applicant's present location. Facilities shall be shown on U.S.G.S 7-1/2 minute series map.

c) Two copies of each map shall be filed.

d) Separate maps shall be filed for each county in which the reporting utility operates.

e) If applicable, the map shall separately indicate the generating facilities, transmission facilities and distribution facilities as located within the territory claimed.

1) A color code may be used to distinguish the types of facilities indicated.

2) The location of any such facility shall be described with such exactness that the facility can be located "on the ground" from the map or in supplementary data with reference to physical landmarks where necessary to show its actual location.

3) Two copies of any evidence are required by the Commission to show that the applicant has plans to apply for, has applied for, or has received the required consent or permit of any other public authority, for example, FCC or FERC applications.

They must also contain the following information:

1) The name of the party supporting or opposing Commission action with the original copy of every pleading signed in ink by the applicant or his authorized representative.

2) The business phone number and the address, including the city, if any, and county, of the applicant and of his authorized representative, if any;

3) The jurisdiction of the Commission over the parties and subject matter;

4) All the known parties and territories, if applicable, which would be affected if the petition is granted;

5) The address of any party against whom any specific relief is sought;

6) A concise statement of the facts relied upon by the pleader.

All documents must be filed with the PUC Director of Hearings.

PUC Rule 052.01.00.042(a) requires that the Notice of Hearing shall include:

- 1) A statement of the time, place, and nature of the hearing.
- 2) A statement of the legal authority and jurisdiction under which the hearing is to be held.
- 3) A reference to the particular sections of the statutes and rules involved; and
- 4) A short and plain statement of the matters asserted. If the agency or other party is unable to state the matters in detail at the time the notice is served, the initial notice may be limited to a statement of the issues involved. Thereafter, upon timely written application, a more definite and detailed statement shall be furnished not less than three (3) days prior to the date set for the hearing.

Section (d) of the Rule also requires the notice to include:

- 1) A statement referring to the territory in which a license to operate is sought.

PUC Rule 052.01.00.043 requires notice to be given in the following ways:

- 1) Publication by the Commission in the Texas Register.
- 2) Publication in the Commission Bulletin by publishing twice monthly notice of all applications by which proceedings have been instituted before the Commission since the last previous publication of notices in the Bulletin.
- 3) Except in minor boundary changes, publication by the applicant in a newspaper having general circulation in the area of the state where a "Certificate of Convenience and Necessity" is being requested, in that newspaper once each week for two (2) consecutive weeks beginning with the week after the application is made with the Commission, of the applicant's intent to secure a "Certificate of Convenience and Necessity." This notice shall identify in general terms the type of facility, if applicable, and the area for which the certificate is being requested.
- 4) Written notice to the parties at least ten (10) days in advance of the hearing date.
- 5) The Commission may require the applicant to mail or deliver notice to other affected persons or agencies.

The PUC may require a pre-hearing conference concerning the Certificate.

A proposal for decision may be issued by the hearing examiner. If adverse to the applicant, he may file exceptions to it within fifteen (15) days of receipt of the proposal for decision. The PUC may file replies to the applicant's exceptions. This must be done within fifteen (15) days of the receipt of the exceptions.

If the Certificate is granted, it must be in writing and signed by at least two Commissioners. If the Certificate is denied, a motion for rehearing must be made within fifteen (15) days of the final decision or order. PUC action on the motion must occur within 45 days after the final decision or order.

Early consultation with the PUC before plant construction is advisable. Forms are included at the back of this report.

WASTEWATER DISPOSAL

Perhaps the largest problem facing development of geothermal resources is the disposal of waste water. The Texas Water Quality Act of 1967, as amended by Acts of 1977, 65th Leg. Ch. 870, is the controlling legislation regarding the discharge of waste into or adjacent to water in the state. The Act has been incorporated into Section 26 of the Texas Water Code.

Section 26.001 (5) defines "Water" or "Water in the State" to mean groundwater, percolating or otherwise, lakes, bays, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, and the Gulf of Mexico inside the territorial limits of the state, and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, navigable or non-navigable, and including the beds and banks of all watercourse and bodies of surface water, that are wholly or partially inside or bordering the state or inside the jurisdiction of the state.

Section 26.001 (5) defines "waste" to mean sewage, industrial waste, municipal waste, recreational waste, agricultural waste, or other waste, as defined in this section.

The Texas Department of Water Resources (DWR) is charged by Section 26.011 with administering the Water Quality Act, establishing the level of quality to be maintained, and with controlling the quality of the water in this state.

Section 26.127 states that the DWR is the principal authority in the state on matters relating to the quality of the water in the state. Section 26.027(a) allows the Texas Water Commission to issue permits and amendments to permits for the discharge of waste into or adjacent to water in the state. Section 26.121 prohibits the discharge of waste into or adjacent to any water in the state without a permit.

The Texas Disposal Well Act (Section 27.001 et. seq. TEXAS WATER CODE) requires a person to obtain a permit from the Texas Water Commission before he may begin drilling a disposal well or converting an existing well into a disposal well to dispose of industrial and municipal waste. Section 27.031 requires that any disposal into wells of any waste resulting from oil and gas operations must have a permit from the Railroad Commission. Should gas be found in the Trans-Pecos geothermal resources, subsurface injection would be controlled by the Railroad Commission.

Any application that comes to the DWR for subsurface injection is submitted to the Texas Department of Health for comments and recommendations, Section 27.017. As mentioned earlier in this report the federal Safe Drinking Water Act (SDWA) provides for the protection of underground sources of drinking water through control over subsurface disposal of waste fluids by well injection. The Health Department scrutinizes disposal well applications according to SDWA criteria to make sure that no contamination of public drinking water occurs. After consultation and negotiation with the DWR, and once assured of the protection such groundwater supplies, the Health Department concurs in the granting of such disposal permit.

DWR Rule 156.25.05.001-.016 governs the application procedures for obtaining a waste discharge permit which authorizes the disposal of a defined waste into or adjacent to the water in the state, and the disposal of a defined waste by disposal well. It is strongly recommended that the applicant confer with the Executive Director of DWR prior to preparing design plans for his project.

Section .001(b) of the Water Code requires that only one application need be filed for each geographical location where waste will be disposed of. The application needs to be signed by the applicant, verified before a notary

public and filed with the Executive Director. For a disposal well permit, five copies of the application and two copies of a technical report plus a \$25 fee for each disposal well shall be filed with the Executive Director. Also to be included with the disposal well permit application is a letter from the RRC stating that drilling the disposal well and injecting waste into the subsurface stratum will not endanger or injure any oil or gas formation. Only one copy of the application for waste discharge permit for surface disposal need be filed and there is no requirement for the \$25 fee or the RRC letter.

For a disposal well permit, a copy of the application and technical report must be sent by the applicant to the RRC.

Both surface discharge and subsurface injection applications require the inclusion of map(s) showing the tract to be used, each outfall, disposal well, and other places of disposal to be used by the applicant. The maps shall also show known geographical features and the ownership of tracts within a reasonable distance from the point of discharge. Other information is also required.

A supplemental technical report may be requested by the Executive Director.

An on-site inspection of a proposed disposal well site will be conducted by a DWR representative.

Plans for construction regarding handling of the waste disposal are subject to review by the Executive Director and require his approval.

The Executive Director will review the application for completeness of information submitted. During, the review, the applicant may be contacted for clarification or additional information. When the application has been reviewed and all pertinent information is present, the application will be forwarded for review by other state agencies and local governmental entities interested in water quality control, and a draft permit will be prepared. Completed copies

of disposal well applications are sent by the Executive Director to the Texas Department of Health, the Water Well Drillers Board, and the Texas Railroad Commission. The application will then be placed on a public hearing docket to be scheduled for a public hearing before the Texas Water Commission. The applicant may normally expect a pre-hearing visit from the department's field representative in his area.

A public hearing is required on every application for a waste discharge permit.

When the application has been scheduled for public hearing, the applicant will receive a letter of instruction and a public hearing notice from the Texas Water Commission to be published by the applicant. The applicant will receive these instructions and notice for publication approximately thirty days prior to the hearing.

Every applicant for a regular permit or an amendment to a permit shall publish notice of any public hearing on the application at least once in a newspaper regularly published or circulated in the county or counties containing persons who may be affected by the discharge or disposal of such waste. The Texas Water Commission will mail the notice to the applicant in ample time for the publication, which shall not be less than twenty (20) days prior to the date set for the hearing.

The Commission will mail notice of the hearing at which the application is to be considered to landowners, certain governmental entities and other parties who may be affected by the proposed waste discharge or disposal. This notice will be mailed not less than twenty (20) days prior to the date set for the hearing.

At the hearing, the applicant must present, among other information, a description of the activity producing the waste and the quality of effluent discharges, and its effects.

After the hearing, if all necessary information has been available for discussion, a report, which will contain the recommendations concerning the application, will be prepared. The report will be sent to the applicant and other interested parties prior to the decision of the Texas Water Commission. The applicant may file a reply to the report if it is adverse to him within 20 days. The Commission usually acts within 60 days. The permit will be mailed to the applicant if granted by the Commission.

Section .013 of the DWR Rule 156.25.05.001-.016 requires that the waste discharge permit issued by the Commission shall:

- a) state the name and address of the holder of the permit;
- b) state the duration of the order;
- c) describe the location of each authorized point or place of discharge, injection, deposit, or disposal; in the case of disposal by injection, the permit shall also identify the stratum or strata which may be used for disposal and the disposal zone;
- d) specify the maximum quantity of the defined waste that may be disposed of under the permit at any time and from time to time at each authorized point or place of discharge, injection, deposit, or disposal;
- e) specify the character and quality of the defined waste which may be disposed of under the permit at each authorized point or place of discharge, injection, deposit, or disposal;
- f) specify any monitoring and reporting requirements;
- g) state that the permit is granted subject to the rules and orders of the Department and the laws of the State of Texas.
- h) require immediate notice to a designated office of the Department in the event of a discharge, deposit, injection,

or other disposal of defined waste which exceeds the quantity or is of a poorer quality than authorized by the permit.

i) provide that acceptance of the waste discharge permit by the person to whom it is issued is an acknowledgement and agreement that he will comply with all the terms, provisions, conditions, limitations and restrictions embodied in the permit, and with the rules and other orders of the Department; and

j) contain such other provisions or terms as the Commission may direct.

A person may appeal to the Travis County District Court the decision if adverse to him within 30 days.

Copies of the application forms are included at the back of this report.

If an application for a state permit is for the discharge of wastewater to a watercourse, the person or firm seeking a state permit must also file an application for a NPDES (National Pollutant Discharge Elimination System) Permit with the U.S. Environmental Protection Agency. The federal Water Pollution Control Act Amendments of 1972 (33 USCA Sec. 1251 et. seq. (Supp. 1976)) sets up a federal permitting program and establishes federal water quality goals. The FWPCA directs each state to establish its own water quality program in conformity with the federal standards and procedures. A state program requires EPA approval to secure local autonomy. Texas has not yet received such approval but large portions of the Texas program are acceptable to EPA. As stated earlier, there exists a Memorandum of Understanding between EPA's Regional Administrator and the DWR. A copy of the Memorandum is included at the back of this report. Thus when an application is made to DWR for a surface discharge permit, the applicant is given an EPA permit request form which he fills out. Basically, what happens is that the DWR does almost all of the evaluation and technical research on the permit request according to EPA criteria. A package

of materials is then sent to EPA-Dallas which examines the application and its evaluation to make sure federal standards have been followed. In the package sent to EPA-Dallas is a certification from the Texas DWR stating that the discharge meets the applicable provisions of Sections 201, 302, 306, and 307 of the FWPCA. Normally the EPA will then issue a NPDES permit which has been developed for it by the Texas DWR in an NPDES format. The EPA requires that the NPDES be issued at least 180 days prior to the time that discharge begins. The EPA at this time does not have geothermal standards developed. However, proposed thermal discharge regulations appear at 40 CFR 122, 123, and 124. It is also at this time of EPA review of the application that a decision is reached as to whether the requirement of the National Environmental Policy Act (NEPA) for an environmental impact statement need be met.

In summary, an applicant who wishes to discharge on the surface and into the waters of the state needs: 1) a state permit from DWR, 2) a federal NPDES permit from EPA, and 3) a state certification for the NPDES permit.

RAILROAD COMMISSION AUTHORITY

The Texas Geothermal Resources Act of 1975, NAT. RES. CODE, Sec. 141 et.seq., charges the Texas Railroad Commission (RRC) with regulation of the exploration, development, and production of geothermal energy and associated resources on public and private land. The Railroad Commission is also directed to publish and enforce rules for protecting the environment against damage, and the general public against injury or damage, resulting from the exploration, development, and production of these resources. The Texas Water Code was not amended to place geothermal waste disposal specifically under the jurisdiction of the RRC. H.B. 1490 before the legislature this session attempts to correct this oversight by amending the Water Code to place geothermal waste under the exclusive jurisdiction of the RRC. The RRC has amended its statewide rules and regulations to include geothermal production. Basically, geothermal production is now included in the rules that apply to oil and gas production. Section 27.031 of the Water Code requires oil and gas wastes to be handled by the RRC. Discharge of the briny waste water involved in geothermal production is the primary concern.

The primary RRC Rule concerning fresh water protection is Rule 8 (RRC Rule 051.02.02.008):

a) Fresh Water to be Protected

Fresh water, whether above or below the surface, shall be protected from pollution whether in drilling, plugging, producing, or disposing of salt water already produced.

b) Exploratory Wells

Any oil, gas or geothermal resource well or well drilled for exploratory purposes shall be governed by the provisions of statewide or field rules which are applicable and pertain to the drilling, safety, casing, production, abandoning and plugging of wells, and all operations in connection therewith shall be carried on so that no pollution of any stream or water course of this State, or any subsurface waters, will occur as the result of the escape or release or injection of oil, gas, salt water, geothermal resource or other

mineralized waters for any well.

c) (1) All operators conducting oil, gas, or geothermal resources development and production operations are prohibited from using salt water disposal pits for storage and evaporation of oil field brines, geothermal resource waters or other mineralized waters.

c) (1) (C) Discharge of oil field brines, geothermal resource waters or other mineralized waters into a surface drainage water course, whether it be a dry creek, a flowing creek or a river, except where permitted by the Commission, is not an acceptable disposal operation and is prohibited.

The RRC may suspend producing and/or drilling operations from any facility when it appears that the provisions of Rule 8 are being violated.

The primary RRC Rule concerning salt water disposal is Rule 9 (RRC Rule 051.02.02.009):

a) Salt water or other water containing minerals in such an amount as to be unfit for domestic, stock, irrigation, or other general uses, may be disposed of, upon application to and approval by the Commission, by injection into the following formations:

1) All non-producing zones of oil, gas, or geothermal resources bearing formations that contain water mineralized by processes of nature to such a degree that the water is unfit for domestic, stock, irrigation, or other general uses.

b) Before such formations are approved for disposal use, the applicant shall ascertain whether or not the formations are separated from freshwater formations by impervious beds which will give adequate protection to fresh water formations and must submit a letter from the Texas Department of Water Resources, Austin, Texas, stating that the use of such formation will not endanger the fresh water strata in that area and that the formations to be used for salt water disposal are not fresh water bearing sands.

c) Salt water disposal wells shall be cased and the casing cemented in such a manner that there will be no danger to oil, gas, geothermal resources on fresh water reservoirs.

d) The application to dispose of salt water by injection into a porous formation not productive of oil, gas or geothermal resources shall be verified and filed with the Commission.

e) The applicant shall give notice by mailing or delivering a copy of the application to the surface owner and to each offset operator on or before the application is mailed to or filed with the Commission.

1) If complaints are made to the Commission within ten (10) days of receipt of the application that the proposed plans as contained in the application will cause damage to oil, gas, geothermal resources, or fresh water resources, then a hearing will be held on the application following notice to all interested persons of such hearing.

2) If no complaints are received by the Commission, then a permit will be issued without notice and hearing, subject to its approval of all the information submitted on or with the prescribed form.

The original application (RRC Form W-14) must include a complete electrical log, waivers or requests for waivers from all offset operators and all surface owners, and a letter of approval from the Texas DWR.

As stated in Rule 9 if no complaints occur within 10 days a permit will be granted administratively within 2-4 weeks, otherwise a hearing is held. Notification for the hearing is made to affected persons and other entities. The RRC must render its decision within 60 days of the hearing. Appeal of an adverse decision must be made within 15 days of the final order in the Travis County District Court.

The application for a permit to drill a geothermal resource well is governed by RRC Rule 5(RRC Rule 051.02.02.005): The form is numbered W-1. Accompanying the completed W-1 Form must be a neat, accurate plat or sketch of the lease. The plat must include:

1) Proration or density unit boundary for the location herein applied for and such unit boundaries for each producing well on this lease completed in the same field according to Statewide Rule 38(C) and give the acreage contained in each unit.

2) Location of the proposed site.

3) Perpendicular distance to nearest intersecting lease lines.

(Distinguish between survey lines and lease lines to avoid confusion.)

4) Distance to nearest drilling, completed, or applied for well on the same lease in the same field.

5) Section block, or lot.

6) Northerly direction.

7) Scale.

No hearing is required for this permit application. However, like the salt water disposal permit, if a complaint is made within 10 days of receipt of the application then a hearing will be held following notice to all interested persons. Normally the RRC can issue the permit administratively within a day or two of receipt of the application.

Other RRC forms concerning geothermal resource wells are:

GT-1 Geothermal Production Test Report - must be filed in the District Office not later than 10 days after the test is completed.

GT-2 Producer's Monthly Report of Geothermal Wells - must be filed with the RRC at Austin, Texas on or before the last day of the calendar month following the month covered by the Report.

GT-3 Monthly Geothermal Gatherer's Report.

GT-4 Producer's Certificate of Compliance and Authorization to Transport Geothermal Energy - must be filed in the District Office before geothermal energy natural gas, or other minerals are moved.

GT-5 Application to Inject Fluid into a Reservoir Productive of Geothermal Resources - must be filed with RRC at Austin, Texas and must include a plat of leases in project area and identify ownership of all surrounding leases. Normally takes 10 days to process unless a protest is received.

Copies of all the above discussed forms are included in the back of this report.

In its history of oil and gas development Texas has followed the "rule of capture". What this basically means is that ownership of the resource is obtained by reducing the resource to possession i.e. pumping it out of the ground makes it yours. In the past this led to uncontrolled over-production. The Geothermal Resources Act requires the RRC to develop

rules to protect against waste of geothermal resources. The principal rule in this regard is RRC Rule 37 (RRC Rule 051.02.02.037) which states in Section (a):

1) No well for oil, gas or geothermal resource shall hereafter be drilled nearer than twelve hundred (1200) feet to any well completed in or drilling to the same horizon on the same tract or farm, and no well shall be drilled nearer than four hundred sixty-seven (467) feet to any property line, lease line, or subdivision line; provided that the Commission, in order to prevent waste or to prevent the confiscation of property, may grant exceptions to permit drilling within shorter distances than above prescribed when the Commission shall determine that such exceptions are necessary either to prevent waste or to prevent the confiscation of property.

Consultation with the RRC prior to any drilling, construction, or other operation would be advisable.

AIR POLLUTION CONTROL

The development of geothermal resources will probably lead to the emission of certain air contaminants. The Texas Clean Air Act, TEX. REV. CIV. STAT. ANN. Art. 4477-5, has its policy stated in Section 1.02. The policy is for safeguarding air resources from pollution by controlling or abating air pollution and the emission of air contaminants. The Act, in Section 1.05 states that the Texas Air Control Board (TACB) is the state air pollution control agency.

The Texas Clean Air Act in Section 3.27 requires that anyone planning to construct a facility which will emit air contaminants must obtain a construction permit from the TACB before building the facility. Facilities which will not make a significant contribution of air contaminants may be exempted from the construction permit as well as from the operating permit required by Section 3.28 of the Act.

The procedure to obtain a construction permit is as follows:

I. Permit to Construct

A. Applications

1. Application forms for a permit to construct will be provided by the Texas Air Control Board, and may be obtained from a city or county air pollution control program, or the Texas Air Control Board at 8520 Shoal Creek Blvd., Austin, Texas 78758, or from a regional office of the Texas Air Control Board.
2. A complete application for permit to construct will consist of two application forms. The first form will be a general form requesting general information. The second form will be a detailed form requesting engineering data. The second form is designed to apply to specific processes and controls.
3. The forms will consist of an original and three copies. The original and two copies will be used by the Texas Air Control Board. One copy will be retained by the applicant.
4. When a general application form is received by the Texas Air Control Board, the application will be reviewed and additional information will be requested, if needed to complete the review. Any additional information received will become a part of the application.

5. When all the information needed to complete the review is received by the Texas Air Control Board, a copy of the complete application will be sent to the local air pollution control program and the regional office with a request that any comments they may wish to make be received within fifteen (15) days.

B. Review

1. When an application is received, it will be assigned to a Texas Air Control Board engineer for review. Comments from the local and regional control programs will be considered in the review. Conferences with the applicant may be requested when necessary.
2. The review will answer the following questions:
 - a. Will the new facility or modification comply with all rules and regulations of the Texas Air Control Board and with the intent of the Texas Clean Air Act?
 - b. Will the new facility or modification comply with Federal Environmental Protection Agency Standards of Performance for New Stationary Sources and National Emission Standards for Hazardous Air Pollutants?
 - c. Will the new facility or modification prevent the maintenance or attainment of any ambient air quality standard?
 - d. Will the new facility or modification cause significant deterioration of existing ambient air quality in an area?
 - e. Will the new facility or modification have provisions for measuring the emission of significant air contaminants?
 - f. Will the new facility or modification be located with proper consideration of land use?
 - g. Will the new facility or modification utilize the best available control technology with consideration to the technical practicability and economic reasonableness of reducing or eliminating the emissions resulting from the facility?
 - h. Will the design criteria for the new facility or modification achieve the performance specified in the application?
3. Upon completion of the review, the Permits Section will present the results of their review to the Executive Director of the Texas Air Control Board. The Executive Director will then make his decision to either grant or deny the permit. The Executive Director was authorized by the Board at their meeting on June 23, 1971, to grant or deny permits to construct or operate.

C. Granting or Denying a Permit to Construct

1. If the decision of the Executive Director is to deny the permit, he will report his objection in a written notice of denial to the applicant.
2. The applicant may appeal the denial of the permit to the Texas Air Control Board within 30 days after the date of an adverse decision. If a written appeal is made, a public hearing may be held in the area of the proposed construction. The hearing report will be given to the Board for their consideration.
3. After a review of the pertinent facts, the Board will notify the applicant in writing of their decision.
4. If a decision of the Board is to deny the permit, the Board will not accept any new applications from the applicant until all objections of the Board to the previously submitted application are rectified.
5. If a permit to construct is issued, a copy of the permit will be sent to the local air pollution control agency and the regional office of the Texas Air Control Board.

D. The Permit to Construct

1. A permit to construct will specify certain provisions as follows:
 - a. The permit is non-transferable from person to person or from place to place.
 - b. The permit is automatically void if construction is not begun within one year of the date of issuance.
 - c. The permit is automatically void when an operating permit is issued or denied.
 - d. The facility will be constructed as specified in the application for permit to construct.
 - e. Progress reports may be required.
 - f. The permit holder may be required to monitor the emissions of the source upon beginning operation.
 - g. The Board shall be notified prior to the startup of the facility in such a manner that a representative of the Texas Air Control Board may be present at the time of startup.
 - h. The Board shall be notified prior to the start of any required monitoring of the facility in such a manner that a representative of the Texas Air Control Board may be present during monitoring.

- i. The permit is not a guarantee that the facility will receive an operating permit at the end of the construction period.
- j. The permit does not absolve a person from the responsibility for the consequences of noncompliance at the end of the construction period.

Construction permits normally require 3-6 months to acquire.

As previously mentioned Section 3.28 of the Act requires that within 60 days after a facility has begun operation the person in charge of the facility must apply for an operating permit.

The procedure to obtain an operating permit is as follows:

II. The Permit to Operate

A. Applications

1. Application forms for a permit to operate will be provided by the Texas Air Control Board, and will be sent to an applicant at the time a permit to construct is issued.
2. After construction has been completed and operation of the facility has begun, the applicant has sixty (60) calendar days in which to apply for a permit to operate.
3. The Executive Director may extend the sixty (60) days time period when necessary.
4. The facility may continue to operate under the construction permit until such time as a decision on the application for an operating permit has been made.
5. Inspections by the State, regional and local air pollution control personnel will be made during the period of operation and monitoring.

B. Review

1. When an application for a permit to operate is received by the Texas Air Control Board, a copy will be sent to the local air pollution control program and the regional office of the Texas Air Control Board with a request that any comments they may wish to make be received within ten (10) days.
2. The review will answer the following questions:
 - a. Is the facility complying with the rules and regulations of the Texas Air Control Board and with the intent of the Texas Clean Air Act?

- b. Is the facility complying with Federal Environmental Protection Agency Standards of Performance for New Stationary Sources and National Emission Standards for Hazardous Air Pollutants?
 - c. Has the facility been constructed in accordance with the requirements and conditions contained in the permit to construct?
3. Conferences with the applicant may be requested when necessary.
 4. Upon completion of the review the Permits Section will present the results of their review to the Executive Director of the Texas Air Control Board. The Executive Director will then make his decision to either grant or deny the permit. The Executive Director was authorized by the Board at their meeting on June 23, 1971, to grant or deny permits to construct or operate.

C. Granting or Denying a Permit to Operate

1. If the decision of the Executive Director is to deny the permit, he will report his objection in a written notice of denial to the applicant.
2. If the permit is denied, the source must cease operation or be subject to the penalties specified in Section 3.28 (f) and Section 4.02 (a) of the Texas Clean Air Act.
3. The applicant may appeal the denial of the permit within 30 days of the date of decision to the Texas Air Control Board. If a written appeal is made, a public hearing may be held in the area where the source is located. The hearing report will be given to the Board for their consideration.
4. After a review of the pertinent facts, the Board will notify the applicant in writing of their decision.
5. If the decision of the Board is to deny the permit, the Board will not accept any new applications from the applicant until all objections of the Board to the previously submitted application are rectified.
6. If a permit to operate is issued, a copy of the permit will be sent to the local air pollution control agency and the regional office of the Texas Air Control Board.

D. The Permit to Operate

1. A permit to operate will specify certain provisions as follows:
 - a. The permit is non-transferable from person to person and from place to place.
 - b. The permit holder may be required to monitor the emissions of air contaminants from the source on a periodic basis.

specified in the permit, and provide the data to the Texas Air Control Board or a representative of the Board upon request.

- c. The facilities covered by the permit shall not be operated unless all associated air pollution abatement equipment is maintained in good working order and operating properly during normal facility operations.

The Texas S.I.P. (state implementation plan) has not been approved with respect to prevention of significant deterioration (PSD) of air quality in any portion of the state where the existing air quality is better than the national ambient air quality standards. Therefore, the geothermal well/generation plant may require a PSD Review by the E.P.A. pursuant to Title 50 C.F.R. Part 53, June 19, 1978.

Part 52(5)(1)(ii) defines "major stationary source" to any source which emits, or has the potential to emit, 250 tons per year or more of any pollutant regulated under the Act.

Part 52(i) states that no major stationary source or major modification shall be constructed unless a series of requirements have been met.

Part 52(1) requires that the owner or operator of the proposed source or modification demonstrate that allowable emission increases from the proposed source or modification, in conjunction with all other applicable emissions increases or reductions, would not cause or contribute to air pollution in violation of:

- 1) Any national ambient air quality standard in any air quality control region; or
- 2) Any applicable maximum allowable increase over the baseline concentration in any area.

Part 52(o) requires that the owner operator of a proposed source or modification shall submit all information necessary to perform any analysis to make any determination required.

Such information shall include amongst other things:

i) A description of the nature, location, design capacity, and typical operating schedule of the source or modification, including specifications and drawings showing its design and plant layout;

ii) A detailed schedule for construction of the source or modification;

iii) A detailed description as to what system of continuous emission reduction is planned for the source or modification, emission estimates, and any other information necessary to determine that best available control technology would be applied.

Within 30 days after receipt of an application to construct, or any addition to such application, the Administrator shall advise the applicant of any deficiency in the application or in the information submitted. In the event of such a deficiency, the date of receipt of the application shall be, for the purpose of this section, the date on which the Administrator received all required information.

Within 1 year after receipt of a complete application, the Administrator shall make a final determination on the application.

Approval to construct shall not relieve any owner or operator of the responsibility to comply fully with applicable provisions of the State implementation plan and any other requirements under local, State, or Federal law.

Whenever any proposed new source is subject to action by a Federal agency, there may be a need to prepare an environmental impact statement pursuant to the National Environmental Policy Act (42 USC Sec. 4321 et. seq.). In such case the PSD review shall be coordinated between the requirements of NEPA and the federal Clean Air Act to the maximum extent feasible.

At this time it is not known what pollutants nor what quantity of pollutants may be emitted by the geothermal project. Consultation with EPA prior to active development is strongly advised.

SUBSIDENCE

Subsidence could result from extensive fluid withdrawal occurring due to geothermal production. Subsidence results from the compaction of substrata layers and is essentially irreversible. It can lead to significant property damage, changes in water and drainage patterns, and other liabilities. The Trans-Pecos area is a relatively uninhabited rural area and the effects of subsidence probably would not be as severe as in other more populous areas. Geological investigations, monitoring, and balancing aquifer withdrawal with recharge rates may keep subsidence from occurring or alleviate some of the problems should it occur.

There is a recent Texas Supreme Court case which deals with subsidence. In Friendswood Development Co. vs. Smith - Southwest Industries, Inc. (Supreme Ct. B-6682, 11/29/78)(C.Civ.A. op 546 SW 2^d 890), the plaintiffs sued defendants alleging severe subsidence of their lands caused by defendant's withdrawals of vast amounts of underground water from neighboring land. The court held for the defendants because the settled law of this state at the time of the withdrawal was that a landowner has the right, in the absence of willful waste or malicious injury, to withdraw groundwaters from wells located on his own land without liability from resulting damage to his neighbor's land. However, the court said that as to future subsidence a new rule would apply: if the landowner's manner of withdrawing groundwater from his land is negligent, willfully wasteful, or for the purpose of malicious injury and such conduct is the proximate cause of subsidence of the land of others, he will be liable for the consequences of his conduct.

LOCAL GOVERNMENT

This report has focused primarily on the permit requirements and procedures of federal and state agencies. However, there is another level of government which probably MOST directly affects the population and that is local government.

Local governmental entities that would be concerned with the development of a geothermal resource facility include cities, counties, river authorities, underground water districts, municipal utility districts, water control and improvement districts, drainage districts, conservation and reclamation districts, soil and water conservation districts, fresh water supply districts, and others.

While these entities do not have direct permitting authority applicable to development of the Trans-Pecos geothermal resource, they are performing functions which make development of the resource possible. These local government units often receive permit applications forwarded by state agencies for review and comment. Their input is sought and heeded by the state agencies. Before any extensive development of geothermal resources occurs, it would be advisable to meet with representatives of these entities to discuss the concerns of all parties.

MULTI-JURISDICTION RESERVOIR

The Rio Grande Rift System probably underlies portions of Texas, New Mexico and Mexico. Development of these geothermal resources may cause problems because of non-uniform laws and regulations. Consultation between the appropriate foreign, federal, and state institutions is advised.

LIST OF INTERESTED AGENCIES

The following is a list of federal institutions which may have an interest in the development of geothermal resources:

1. Department of the Army-Corps of Engineers - provides technical services to state and local governments.
2. Department of Housing and Urban Development - provides funds under the Housing and Community Development Act of 1974.
3. U. S. Fish and Wildlife Service - studies effects of federal projects on fish and wildlife resources.
4. U. S. Geological Survey - studies mineral and water resources; administers program for the discovery of domestic minerals by private industry with federal assistance.
5. Internal Revenue Service - taxes income from investment in energy production and ownership.

State institutions with an interest include:

1. Attorney General - provides legal service to state agencies and represents them in civil and some criminal proceedings.
2. Comptroller of Public Accounts - administers State taxes on utility companies, handles taxation generally for the State.
3. Dept. of Agriculture - concerned with irrigation water supply.
4. Dept. of Highways and Public Transportation - builds highways, participates in A-95 Review procedures.
5. Dept. of Parks and Wildlife - protects fish and game.
6. Texas Industrial Commission - attempts to attract new industry to the state.
7. State Soil and Water Conservation Board - cooperates with the U. S. to assist local districts.

GENERAL SUMMARY

Development of geothermal resources in Texas is a relatively new phenomena. There has not been any specific Texas litigation concerning geothermal resources therefore many aspects of ownership are still unclear. More knowledge about the resource system would help in the development of laws, regulations, tax policies, and royalty and leasing policies. Experiences in other states will help provide an example in the development of state resources.

As seen in this report, several state and federal agencies have regulatory authority over various aspects of geothermal development. There have been tremendous changes in recent years in the statutes, rules, and regulations that these agencies operate within. More changes are forthcoming in the near future. In addition to their rules and regulations, all agencies have unwritten in-house procedures that are followed. All of these factors contribute to the complex and ever changing regulatory field that a developer must deal with.

Early consultation with these institutions to learn of their permit requirements is necessary. Also advisable is consultation with the numerous entities of local government concerned with various aspects of geothermal development.

FORMS INCLUDED

P.U.C. Form

D.W.R. and E.P.A. Forms

R.R.C. Forms

T.A.C.B. Form

Also Included:

Copy of Texas Geothermal Resources Act

Memorandum of Understanding Between E.P.A. and T.W.Q.B.