CUMULATIVE IMPACTS STUDY OF THE GEYSERS KGRA:

PUBLIC-SERVICE IMPACTS OF
GEOTHERMAL DEVELOPMENT

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PREFACE

Geothermal development in the Geysers KGRA has had a number of effects on the residents and the governmental entities in the four counties of the KGRA. These socioeconomic effects are related primarily to changes in the size of an area's resident population and the rate at which such changes occur. The effects of construction of a single geothermal power plant initially appeared to result in minimal impacts on local governments and fiscal resources. However, simultaneous construction of several power plants, combined with other aspects of geothermal development, has produced increasingly apparent impacts on local resources. This study provides a current information base as well as an up-to-date examination of the effects of geothermal development on local resources. Policy recommendations are provided for use in regulatory proceedings before the California Energy Commission.

ABSTRACT

Geothermal development in the Geysers KGRA has affected local public services and fiscal resources in Sonoma, Lake, Mendocino, and Napa counties. Each of these counties underwent rapid population growth between 1970 and 1980, some of which can be attributed to geothermal development.

This report identifies the number of workers currently involved in the various aspects of geothermal development in the Geysers. Using three different development scenarios, projections are made for the number of power plants needed to reach the electrical generation capacity of the steam resource in the Geysers. The report also projects the cumulative number of workers needed to develop the steam field and to construct, operate, and maintain these power plants. Although the number of construction workers fluctuates, most are not likely to become new, permanent residents of the KGRA counties.

The report examines the administrative and public service costs of geothermal development to local jurisdictions and compares them to geothermal revenues accruing to the local governments. Revenues do not cover the immediate fiscal needs resulting from increases in local road maintenance and school enrollment attributable to geothermal development. Several mitigation options are discussed, and a framework is presented for calculating mitigation costs per unit of public service.

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Chapter I

INTRODUCTION

The Geysers-Calistoga KGRA* is located approximately 75 miles north of San Francisco and encompasses an area of nearly 600 square miles. The major portion of the KGRA is located in Lake County, but it also extends into the counties of Sonoma, Napa, and Mendocino (see Figure 1). The majority of the geothermal resource development in this KGRA has taken place in the vicinity of an old hot springs resort named "The Geysers Resort." The geothermal development area is commonly referred to as "the Geysers" or "the Geysers KGRA."

The nature and magnitude of socioeconomic impacts attributable to geothermal development in the Geysers KGRA are becoming increasingly apparent. The socioeconomic effects of such development are related primarily to changes in the size of the area's resident population and the rate at which such changes occur.

Socioeconomic effects associated with changes in resident population cover a broad spectrum of potential impacts, ranging from subtle changes in an area's social value system, political structure, and community character; to changes

*The term KGRA is an acronym for known geothermal resource area. A KGRA is a geographic definition established by the United States Geological Survey (USGS) and delineates an area in which geothermal resources are present.

in land use and traffic patterns; to the acceleration of the need to repair, replace, or expand existing facilities; to a total breakdown of the area's ability to provide housing and services for newcomers.

Analysis of socioeconomic impacts most often focuses on the fiscal effects of a particular development on local governments. It is local governments that have the responsibility for providing basic services and amenities to residents within their jurisdictions. Some of the public services that may be provided by local governments are water supply, collection and disposal of liquid and solid wastes, education, police and fire protection, flood control, parks and recreational facilities, transportation facilities, and library services. Generally, the public services most immediately affected by changes in population are education, water supply, waste water collection and disposal facilities, and protective services.

Rapid changes in local population create corresponding changes in public service demand. An increase in demand for public services may require purchase and/or construction of new equipment and service facilities, most of which require substantial capital outlay. This initial, predevelopment capital cost can cause a significant drain on local fiscal resources. In the long term, a new residential, commercial, or industrial development will provide revenues which eventually compensate the local governmental entities for their initial cost. In the short term, however, the local governments have only limited fiscal flexibility to respond to rapid changes in public service demand.

Development of the geothermal resource in the KGRA for commercial production of electricity began in the 1950s. As the technology of steam field production and geothermal power generation developed, the industry itself grew and drew new residents to the four counties of the Geysers KGRA.

During the 1950s the geothermal industry was primarily limited to resource exploration, development, and steam production. During the 1960s, four power plants came into operation, producing 76 MW of power. During the 1970s the number of power plants increased by nine, and the power produced increased by 585 MW. Current estimates for the 1980s indicate an additional 20 power plants are expected to come into operation, producing an additional 1,727 MW of power. Projections for the 1990s indicate another seven power plants could come on line, producing an additional 612 MW (CEC, 1981 a and f).

Geothermal development in the Geysers area has had a number of impacts on the residents and the governmental entities in Sonoma, Lake, Mendocino and Napa Counties. The initial socioeconomic effects of geothermal development occurred slowly and were gradually "absorbed" by the local infrastructure* in the 1950s and 1960s. Toward the middle of the 1970s, the pace of geothermal development quickened. During this same period the four counties were experiencing rapid population growth unrelated to geothermal development. The combination of rapid growth and restricted funding capabilities has created stresses on the local governments' abilities to provide public services. The increasingly noticeable effects of geothermal development on local roads and some types of public services served to further compound the stresses on local government resources.

Initial evaluation of the socioeconomic effects of construction of a single geothermal power plant appeared to result in minimal impacts on local resources. However, the nature and magnitude of socioeconomic impacts attributable to simultaneous construction of several geothermal power plants in the

*Infrastructure refers to the set of those life support and public facility systems which must be provided in order to enable the development of healthy human settlements.

KGRA have become increasingly apparent. It also became apparent in the course of this study that the effects of power plant construction are not easily separated from the overall effects of other aspects of geothermal development.

The following socioeconomic questions have been identified as the most urgent to resolve: (1) the impact of cumulative geothermal development on demand for local public services, (2) the extent to which accrued local geothermal revenues provide mitigation of geothermal impacts, and (3) definition of the percentage of local growth that is related to power plant construction in the Geysers.

This study provides an examination of the demand for public services resulting from the estimated reasonable maximum development of the dry steam resource in the Geysers-Calistoga KGRA. The study also provides an evaluation of the ability of the local governments to finance increases in the demand for public services related to geothermal development. The information collected, in combination with the conclusions and recommendations of this analysis, is intended to aid local governments, developers, and the CEC in developing policies and programs to facilitate an orderly development of the geothermal resource. The information presented in this study provides a relatively current background for analysis of the socioeconomic effects of geothermal development in the Geysers. Using this document as a foundation, the CEC analysis can be further refined as new information and demographic data become available.

Chapter II

SUMMARY

The purpose of this study is twofold. First, the study represents a compilation of current information available in the literature and from numerous individuals and governmental agencies knowledgeable about socioeconomic impacts associated with geothermal development in the Geysers-Calistoga KGRA. The second objective of this study is to provide policy recommendations for the Energy Commission's regulatory proceedings on geothermal power plants.

The set of demographic and socioeconomic information compiled for this study provides an invaluable foundation on which to develop policy recommendations. These recommendations will provide a base for regulatory case analysis of future geothermal power plant proposals in the KGRA. In developing the policy recommendations the analysis focused on three major areas:

1. The impact of cumulative geothermal development on the demand for local public services;
2. The extent to which accrued local geothermal revenues provide mitigation of geothermal impacts; and

3. Identification of the percentage of local growth that is related to power plant construction in the Geysers.

The following is a summary of the analysis and conclusions relative to these three areas of focus.

IMPACT OF CUMULATIVE GEOTHERMAL DEVELOPMENT ON THE DEMAND FOR PUBLIC SERVICES

The demand for public service is related primarily to changes in the resident population in the service area and to the rate at which such changes occur. Significant impacts occur when the existing public services are near or over capacity and the demand for services increases. Impacts also may occur if the local governmental entities providing services have a limited capability to respond to the growth-induced stresses placed on the service system. Such a capability is usually limited by financial, technical, and/or legal constraints.

The four counties (Sonoma, Lake, Mendocino, and Napa) in the KGRA have each experienced very rapid rates of growth and development in the past 10 years. As discussed in Chapter IV, this growth resulted from a number of factors but was primarily caused by outward expansion from the San Francisco Bay area. The decade of the 1970s also saw considerable technological advances in the use of geothermal steam for power generation. During this period the number of power plants operating in the Geysers grew from 4 to 13 units (Table 18). The amount of geothermal steam being used annually for power generation increased from 14.302 billion pounds in 1970 to 105.964 billion pounds in 1980 (Thomas et al., 1981).

As the geothermal industry grew, it provided numerous employment opportunities requiring a wide range of skills. Many aspects of geothermal work required

skills and knowledge comparable to that needed for existing local nongeothermal industries. Thus, geothermal development supplemented local job opportunities and drew workers from the existing work force already resident in the four counties of the KGRA. Some of the work tasks involved in geothermal development, however, are relatively specialized and the availability of such jobs drew workers from outside the four counties.

Analysis of information provided by local governments, geothermal developers and power plant operators, and construction craft unions provides the basis for the following statements:

- o Geothermal workers whose employment in the Geysers area is relatively short term (i.e., a few weeks or months in duration) and who are not residents of the four KGRA counties are not likely to move permanently to the geothermal development area.
- o Geothermal workers involved in long-term jobs in the Geysers area and who are not residents of the four KGRA counties would be most likely to move to the area and become long-term residents.

Conclusions

Some portion of the growth and development in the four counties of the Geysers KGRA is related to the growth in the geothermal industry. Those geothermal workers and their families who have become long-term residents of the KGRA counties have contributed to an increase in the demand for local public services.

Among the public services provided by local governments are water supply, disposal of waste water and materials, education, police and fire protection, flood control, parks and recreational facilities, transportation facilities, and library and hospital services. Services which appear most immediately sensitive to changes in population include education, water supply, waste water disposal, law enforcement, and fire protection.

As the four counties have grown in population and as geothermal development has increased, local governments have begun to experience noticeable impacts on public services and fiscal resources. As discussed in Chapter VII, the revenues from geothermal development cover the immediate costs of meeting increased demands on local public services in all but two instances: education and road maintenance. In these areas the effects of geothermal development have continually increased, with funding from local and other sources being either inadequate or unavailable to meet the needs of local government in providing for the increased demand for services.

EXTENT TO WHICH ACCRUED LOCAL GEOTHERMAL REVENUES PROVIDE MITIGATION

Local governmental entities receive revenues from geothermal development in the Geysers from a number of sources (see Chapter VII). These sources include:

1. Property taxes on the steam wells, pipelines, power plants, and other facilities on privately owned lands;
2. Taxes on a developer/operator's possessory interest in facilities developed on federal lands;

3. Redistribution of a portion of steam royalty payments from leased federal lands to the county in which the steam originated (AB 1905);
4. Agreements made with local jurisdictions by tax-exempt power plant operators; and
5. County excise taxes on electricity generated from geothermal resources by tax-exempt power plant operators (Sonoma County Ordinance No. 2853-R* and the proposed Lake County Ordinance).

Local governmental entities also experience a number of fiscal effects related to geothermal development. These fiscal effects include: (a) administrative costs involved in reviewing, processing, and monitoring geothermal development projects; and (b) costs of providing public services to the resident population, including the workforce involved in all aspects of geothermal development.

Representatives of various local governmental entities provided the CEC with information on past, current, and projected revenues from geothermal development. Data on administrative costs of geothermal development was extrapolated from the existing literature and compared with local geothermal revenues. Under an assumed "worst-case" situation, the geothermal revenues cover the maximum reasonable expenditure for administrative costs.

Revenues from geothermal development also cover the immediate costs of meeting local public services needs related to geothermal growth in all but two

*This ordinance is the subject of a law suit and, pending the court decision, may or may not remain as source of geothermal revenues for Sonoma County.

instances: education and road maintenance. In the case of roads, the amount of locally accrued revenues is far lower than the currently estimated cost of rebuilding and repairing those roads in the counties which have been impacted by geothermal development. Negotiations and agreements have been completed for some amount of road impact mitigation in Sonoma and Lake counties. Methods of mitigation included:

- o Assessment of geothermal developers during project review and approval, for mitigation of impacts directly attributable to their project; and
- o Multi-party agreements between steam developers, power plant developers/operators, and the counties for impacts not associated with a specific project.

In the case of impacts on educational services, the mitigation measures focus on the need for additional facilities due to increased enrollments in districts that are near or over capacity. Several of the school districts in Lake County have demonstrated in testimony before the CEC that they currently are at or over capacity. Although testimony was presented to the CEC regarding enrollment impacts on the school districts in northeastern Sonoma County, a capacity problem has not been demonstrated. Evaluation of past and current enrollment figures for Sonoma County schools indicates that these districts are not yet over capacity. School districts in Medocino and Napa counties have not been impacted either by geothermal development or by rapid population growth to the degree that Lake and Sonoma counties have.

Several alternative mechanisms for mitigation of public services impacts are discussed in Chapter VIII. Each of these mitigation alternatives has been considered or applied in one or more of the geothermal development projects in the Geysers. These mitigation options include:

1. Allocation of Local Geothermal Revenues to Those Public Services
Experiencing Demonstrable Geothermal Impacts

Local geothermal revenues have been applied to several kinds of geothermal impacts in both Sonoma and Lake counties. To date, most of the local revenues have been produced by property taxes and by the AB 1905 funds. In 1980-81 the revenue from property taxes on geothermal developments accounted for 7.6 percent of Sonoma County's total property tax revenue. For Lake County, the various kinds of property tax revenues from geothermal development accounted for about 3 percent of the county's property tax revenues in 1979-80 and is estimated to increase to 32 percent in 1987-88.

The other major source of local geothermal revenues is the AB 1905 funds. These funds are redistributed from the state's share of lease and royalty payments made for steam developed on federal lands or private lands on which the federal government has mineral rights. This redistribution of revenues accruing to the state was initiated by state legislative action in 1980 with adoption of the Bosco-Keene Act (AB 1905).

Allocation of the AB 1905 funds is at the discretion of the county Boards of Supervisors. Under the terms of AB 1905, funds accruing to the counties of the Geysers KGRA in which the geothermal resource has been developed are earmarked for specific uses, including mitigation of impacts on public services. In Lake County approximately 85 percent of its 1980-81 AB 1905 funds were allocated for mitigation of geothermal development impacts on such public services as water supply, fire protection, schools, road maintenance and improvement, and sewerage

collection and treatment facilities. Sonoma County allocated approximately 50 percent of its 1980-81 AB 1905 funds for mitigation of impacts on roads in the geothermal development area.

Generally, most public service costs are financed out of the regular income which annually accrues to the local government from a variety of resources. However, the financing of educational services represents a special case which is different from other public services. For school districts, the financing for ongoing operation and maintenance costs is derived from one set of sources and governed by one set of rules, while the financing for the capital costs of facilities improvement is derived from another set of sources and governed by another set of rules.

School District Operation and Maintenance Costs

As part of the annual income to the county, the various kinds of property tax revenues are used to maintain local government activities and services. A portion of these revenues are disbursed to local school districts for operation and maintenance costs. Each school district has a state-authorized revenue limit for these costs which is based upon its 1972-73 budget, plus state-determined allowable increases, plus increases based on the previous year's Average Daily Attendance. If the school district's income from local property taxes does not match its revenue limit, the state provides supplemental funding, up to the allowable limit.

Following the passage of Proposition 13 in 1978, the county's income from local property taxes was significantly reduced. Subsequent adoption of AB 8 by the state Legislature in 1978 assured that the school districts

would annually receive a consistent percentage of the county's revenues, but the dollar amount would be reduced from pre-Proposition 13 levels. Many school districts required an increased contribution from the state in order to maintain their authorized revenue limits for operation and maintenance costs.

Capital Improvement Costs

Historically, when school districts needed new facilities or new schools, they raised funds for capital improvements through bond issues. If voters passed the bond issue, the costs of the bond issue were paid off through an add-on rate to local property taxes. Following the passage of Proposition 13, school districts could no longer legally receive financing for capital improvements through passage of school bonds. To provide a financing mechanism for needed facilities, the state legislature amended the 1976 Leroy Greene School Building Lease Purchase Act. The majority of the funding for the Leroy Greene Act is currently derived from state tidelands oil leases. These revenues are supplemented by funds from the state's annual budget for the state Department of Education.

Applications for Leroy Greene Act funds are made in three, sequential phases and are based upon projected enrollment increases which will require the school district to provide additional classroom space. Historically it has taken two or three years for an application to complete the review phases and receive approval for project construction. Since the number of applications exceeds the amount of funds available, the state established a priority ranking system for project applications.

In October 1981, the Leroy Greene Act funds were frozen by state Executive Order, and no further applications will be funded until this order is rescinded. Even if the funds were unfrozen, there would only be \$150 million available as of July 1, 1982, to fund a \$500 million backlog of eligible applications.

As shown in Table 27 of Chapter VIII, other potential mechanisms exist for financing the costs of capital improvements needed by school districts. These include the Emergency Classroom Act, sales or rentals of excess properties, assessment of developers' fees, discretionary use of local funds (such as surplus revenues, special fees, or allocation of local AB 1905 funds), application to the CEC for allocation of a portion of its AB 1905 funds, and assessment of geothermal developers by state and local regulatory authorities for mitigation of enrollment increases directly attributable to their projects.

As an example of discretionary use of local funds, in 1981 the Lake County Board of Supervisors allocated \$16,500 to the Knociti Unified School District and \$30,000 to the Middletown Unified School District. These funds were allocated to the districts to cover the costs of one-year leases on temporary classrooms. The Board indicated, however, that this allocation would not automatically be renewed each year. The board subsequently adopted a policy that Lake County's AB 1905 funds would only be disbursed for indirect effects of geothermal development which could not be directly attributed to a specific geothermal project.

As discussed in Chapter VIII, the funding mechanisms which theoretically are currently available to the impacted school districts in

Lake County for necessary capital improvements are not practically available since:

- o The Leroy Greene Act funds for new sites and permanent facilities are frozen and oversubscribed.
- o The Emergency Classroom Act funds are for temporary facilities.
- o The Lake County Office of Education has no excess properties.
- o Lake County has no ordinance for implementing developer's fees, and the Board of Supervisors refused the Office of Education's request to adopt such a law.
- o The Lake County Board of Supervisors considers the Lake County Office of Education to be a state agency. If available, local discretionary funds are unlikely to be directed at the needs of a "nonlocal" agency.
- o The Lake County Board of Supervisors has adopted a policy that its AB 1905 funds will specifically be applied to mitigation of indirect impacts of geothermal development.
- o The CEC has adopted a policy that up to one-third of its AB 1905 funds may be applied to mitigation of indirect impacts of geothermal development.
- o The AB 1905 funds became available by legislative action and are a discretionary distribution which could be withdrawn if the state's fiscal problems continue to intensify.

One capital cost financing mechanism remains reasonably available to those school districts in the Geysers KGRA which are experiencing adverse impacts from geothermal development. This mechanism is the assessment of the geothermal developers for the costs of enrollment increases directly attributable to their projects. Such assessments for mitigation could be required by the CEC or local agencies during their respective regulatory review and approval of the various aspects of proposed geothermal development.

2. Assessment of Project Developers for Costs Attributable to a Specific Project

The two most recent geothermal power plant siting decisions made by the CEC included the requirement that the applicant provide mitigation for identifiable project impacts on local public services. During the DWR South Geysers proceedings, DWR negotiated an agreement with Sonoma County for payment of mitigation costs for project impacts on local school districts, on the Geysers-Healdsburg Road, and on general public services provided by the county. A similar agreement was negotiated between DWR and the Lake County Office of Education for mitigation of impacts on school districts. The conditions of these agreements were incorporated into the CEC's decision on the South Geysers project.

Similar negotiations took place between the Lake County Office of Education and Occidental Geothermal, Inc. on the Oxy No. 1 project. Under this agreement, Occidental will provide mitigation funding to Lake County school districts for enrollment increases which are directly attributable to construction and operation of its power plant. In separate negotiations with the county, Occidental also agreed to provide

a large water storage tank, water quality monitoring equipment and automatic shut-off valves, and funding to mitigate project-related impacts on the water supply for the community of Anderson Springs in Lake County. The conditions of these agreements were incorporated into the CEC's decision on the Oxy No. 1 project.

Occidental also agreed to extend its school mitigation funding to impacts attributable to development of the steam resources for their proposed power plant. The requirement for steam development impact mitigation was under the jurisdictional authority of the Lake County Board of Supervisors and was required as part of granting the steamfield permit. According to a school district representative, the Board of Supervisors has applied such school impact mitigation requirements to permits for other geothermal and nongeothermal developments in Lake County where an identifiable project impact can be shown (Merrill, March 1982).

3. Mitigation Agreements Among Geothermal Developers, Operators, and Local Governments

Another geothermal mitigation measure implemented by the local governments is completion of agreements between geothermal resource developers, power plant developers, and power plant operators. Such agreements, to date, have taken place both within the CEC's regulatory proceedings on power plants and within the local government's regulatory jurisdiction over other aspects of geothermal development. These agreements have related primarily to mitigation of geothermal impacts on roads and have provided for the maintenance, rebuilding, and repair of the Bottle Rock and Socrates Mine Roads in Lake County and portions of the

Geysers-Healdsburg Road in Sonoma County. Another such agreement provides for the construction of a flashboard dam on Kelsey Creek in Lake County.

4. Formation of Assessment District Which Includes Lands Leased for Geothermal Development

Districts can be formed either by a petition of property owners within the potential district's boundaries or by action of the county Board of Supervisors. The formation of an assessment district is generally to accomplish a specific purpose and must be approved by the voters in the proposed district. The boundaries of the proposed assessment district and the proposed rate of assessment per property must be identified prior to the vote on the formation of the district. Assessment districts, however, may not be used to fund school facilities or activities.

Formation of an assessment district was considered in Sonoma County as a means of rebuilding and maintaining the Geysers-Healdsburg and Geysers-Cloverdale Roads. Although potentially useful in distributing the costs of a specific mitigation measure to participants involved in all aspects of geothermal resource development, this mitigation alternative lies within the jurisdictional authority of the local governments rather than the CEC.

5. Application to the CEC for Allocation of a Portion of Its AB 1905 Funds

Under the terms of AB 1905, the California Energy Commission annually receives 30 percent of the revenues accruing to the state from geothermal leases and steam production from lands on which the federal government

has mineral rights. In October 1981, the CEC adopted grant application procedures under which local governments throughout the state can apply for funding for geothermal activities. Under CEC regulations, up to one-third of the funds available each year for grants can be disbursed for mitigation of indirect impacts of geothermal development. Similar to the policy adopted by the Lake County Board of Supervisors in September 1981, the CEC's policy precludes the use of its AB 1905 funds for mitigation of impacts directly attributable to a specific geothermal development project.

Conclusions

Revenues accruing to local governmental entities from geothermal development cover the costs of providing administrative and general governmental services. The geothermal revenues also cover the costs of local public service demands related to geothermal development, except in the case of roads and education. The issue of geothermal impacts on roads and potential mitigation measures, although discussed to some degree in this study, is the subject of a separate transportation study and separate CEC hearings and workshops.

A portion of the revenues accruing to local governments from taxes on geothermal development and facilities is used to provide funds for school district operation and maintenance costs. The remaining portion of the funding needed to meet these costs comes from the state and may not exceed a state-determined revenue limit. Geothermal development affects the local school districts by producing increases in enrollment which produce corresponding increases in the need for additional facilities. A school district currently at capacity experiences a significant impact with the addition of

more students. Providing adequate educational services for new students may require a new classroom, a new bus, or other new facilities and equipment. These are capital costs which do not come out of the school district's operation and maintenance budget.

There are alternative measures other than new school construction or classroom additions which could ameliorate the impacts of increased enrollment. These alternatives include redistribution of students by busing, renting classroom space, instituting double sessions or year-round sessions, and the conversion of administrative offices and student activity areas to classrooms. These methods have inherent advantages and disadvantages, both as compared to one another and as compared to construction of additional classroom space.

By state law, financing for the capital costs of improving or increasing educational facilities may not be funded by local property taxes. Of the various financing mechanisms currently available for the costs of capital improvement of schools, only one currently proves to be actually and practically available: the assessment of geothermal project developers for the cost of mitigation for enrollment increases directly attributable to their projects.

Therefore, when a school district can demonstrate that it is or will be at capacity at the time project development starts, the geothermal power plant applicant should be required by the CEC to mitigate for impacts of enrollment increases directly attributable to its project. Such mitigation should be required for school impacts, regardless of whether the developer does or does not pay property taxes.

The CEC's regulatory review and jurisdictional authority applies only to power plants and related facilities. The CEC clearly has a responsibility to require mitigation of impacts directly attributable to those aspects of geothermal development within its jurisdiction. The increased enrollments being experienced by some school districts in the Geysers KGRA, however, are also related to other aspects of geothermal development besides power plant construction and operation. It is hoped that those agencies with jurisdictional authority over the other aspects of geothermal development will recognize the extent of the problem and respond to the urgency of the school districts' needs with comparable mitigation requirements of their own.

PERCENTAGE OF LOCAL GROWTH RELATED TO POWER PLANT CONSTRUCTION

The geothermal work force can be subdivided into eight different categories based upon the various aspects of geothermal development. The work force categories described include:

1. Geothermal Developers,
2. Steam Field Drillers/Developers,
3. Steam Field Maintenance,
4. Steam-Gathering System Construction,
5. Power Plant (and Related Facilities) Construction,
6. Power Plant Operation and Maintenance,
7. Geothermal-Related Services and Supplies,
8. Other, Induced Services and Supplies.

Based upon figures provided by geothermal industry representatives, there are currently about 1,300 persons employed either directly in the Geysers KGRA in some aspect of geothermal development or indirectly in geothermal-related services (categories 1 - 7, above). There are no data available on the number employed in other, induced services. However, since this group of workers is also involved in providing services to nongeothermal industries or to the local population in general, this group was not included in the total geothermal work force.

Among the categories of the geothermal work force, all but the construction workers (groups 4, 5, and portions of 7) would tend to have long-term, full-time jobs. Those groups of workers with long-term jobs would tend to already be, or to become, long-term residents of the four KGRA counties in order to be near their work. The rate at which geothermal workers with long-term jobs in the Geysers increases would directly correspond to the rate at which geothermal development progresses. The number of new, long-term residents drawn to work in the Geysers development area would depend upon the availability of qualified workers already resident in the four counties of the KGRA.

Of the 1,300 geothermal workers described in Chapter V, approximately 340 workers or about 26 percent, were involved in the construction of geothermal power plants and related facilities in the last quarter of 1981. As is evident in Figures 7 -10 and in the raw data charts in Appendix B, the number of workers involved in power plant construction fluctuates with the time of the year, with the stage of individual power plant development, and with the number of power plants under construction. As described in Chapter VI, the number of construction workers active in power plant construction is expected to peak at 540 workers in late 1982 under the 1,787 MW development

scenario and at 700 workers in early 1985 under the 2,447 MW and 3,000 MW scenarios. (These figures are based upon estimated project development schedules which were current as of February 19, 1982.) These peaks represent increases of 59 and 106 percent, respectively, over 1981 totals. Presumably, some portion of these construction workers could potentially become new residents of the four KGRA counties.

There are other factors to be considered in identifying the percentage of local growth attributable to workers involved in the construction of geothermal power plants and related facilities. Based upon the results of the commuter bus survey (refer to Table 21), over 72 percent of the surveyed construction workers active on several units of PGandE's Geysers Geothermal Power Plant between March 1977 and May 1979 listed their residence as one of the four counties in the KGRA. Another 18.5 percent listed their residence as one the seven Bay Area counties. Of the remaining 9.4 percent of the surveyed workers, 2.6 percent showed out-of-state residence, 2.8 percent resided in four Central Valley counties, and the final 4.1 percent resided in 16 counties scattered throughout the state.

Representatives of construction craft unions active in the Geysers indicated that some of their members were able to maintain full-time employment on geothermal power plants. Generally, however, most members of the construction craft members only worked several weeks or several months on a particular geothermal power plant construction job and then went on to other, nongeothermal jobs. These workers generally remain on call for future geothermal work assignments following their nongeothermal assignments.

Based on information provided by representatives of construction craft unions, most members employed on geothermal power plant projects who do not already

reside in the four counties of the KGRA tend to commute to the projects. Depending on distances between their permanent residence and the project area, these workers may commute daily or weekly. Weekly commuters usually maintain temporary residence in communities near the Geysers development area. Some workers whose permanent residences are outside convenient commuting distance, or perhaps even out-of-state, may maintain a temporary local residence for the duration of their employment in the Geysers area.

These factors lead staff to conclude that the percentage of new local long-term growth attributable solely to the power plant construction work force may not be significant. Construction workers commuting to/from temporary local residences for the duration of their short-term employment in the Geysers development area would produce fluctuations in the resident population. Such fluctuations would be similar in local impact to the population fluctuations caused by tourists and recreational users in the four KGRA counties.

Chapter III

RECOMMENDATIONS FOR CEC REGULATORY PROCEEDINGS

The California Energy Commission has jurisdiction over the siting of geothermal power plants with a rated capacity of 50 MW or greater. The power plant proponent has the responsibility for identifying potential project impacts and also for determining their significance in the broader, cumulative context. The project proponent generally only has mitigation responsibility for impacts associated with the construction, operation, and maintenance of the power plant and related facilities. Mitigation responsibility for impacts associated with development of the steam resource, well drilling, and construction of well pads, access roads, and steam transport lines belongs with the geothermal developers; the jurisdictional authority lies with the respective counties, the state Division of Oil and Gas, and responsible federal agencies.

Based upon the analysis conducted for this study, the public services currently most impacted by geothermal development are roads and education. The issue of road impacts is the subject of a separate CEC study and separate CEC hearings and workshops. Based upon review of past school district enrollment records, discussions with KGRA county school district representatives, and testimony presented during CEC regulatory proceedings, the school districts in Lake County are experiencing demonstrable enrollment increases related to geothermal development.

The recommendations in this chapter are directed at the mitigation of school district impacts which are directly attributable to power plant projects within the CEC's jurisdiction. Although directed at mitigation of impacts on schools, the methodology for calculation of mitigation costs could be adapted for application to impacts on other public services, such as water districts, sewer districts, fire districts, police services, and medical services.

POLICY RECOMMENDATIONS

Recommendations are proposed as Energy Commission policy to guide staff, power plant applicants, and intervening parties involved in the CEC's regulatory proceedings on proposed geothermal power plant developments.

Identification of Impacts on Public Services

1. All significant adverse impacts directly attributable to a specific power plant project should be mitigated by the project applicant.
2. The determination of project impact significance shall include an analysis of potential cumulative effects of multiple power plant projects and all other aspects of geothermal development.
3. Significant adverse impacts shall be deemed to occur when a school district is at, or over, capacity, provided that construction of new classroom space is the only timely and reasonable means of accomodating the excess enrollment.
4. Each school district shall document the basis for a determination that it is at or over capacity. The determination of capacity should be based upon the criteria set forth in the state Education Code, sections 17700,

et. seq., which are used to determine eligibility for funding from the Leroy F. Greene School Building Lease-Purchase Act.

5. Each school district shall identify project-specific and geothermal-related students by means of an annual student survey.
6. The determination of impacts directly attributable to a specific project should be identified in the project applicant's AFC analysis.
7. Lack of agreement on the determination of capacity or project impacts should be the focus of testimony before the CEC during regulatory proceedings on the project applicant's AFC.
8. All significant adverse impacts related to the indirect effects of a proposed project should be mitigated in proportion to the project's influence on geothermal-related services and suppliers.
9. The proportion of the proposed project's influence on geothermal-related services and suppliers shall be identified and agreed upon during negotiations between the power plant applicant and affected school districts.

Mitigation of Public Services Impacts

1. Applicants should pay one-time mitigation fees for new students who are either directly attributable to specific projects or indirectly attributable to general geothermal development.
2. Representatives of those school districts which have identified capacity enrollments and the project applicant should meet and begin negotiations on actions or measures necessary to mitigate effects specifically attributable to the project.

- a. Such negotiations should commence no later than the proponent's submittal of the project's Application for Certification (AFC) to the CEC for regulatory review.
- b. Such negotiations should continue in good faith between representatives of the project proponent and all potentially affected local governmental entities providing services.
- c. The applicant and the school districts should use the standardized algorithm prepared by the CEC as a foundation to seek agreement on the following:
 - o The date of the annual student survey,
 - o The basis for identifying project-specific students,
 - o The basis for identifying geothermal-related students,
 - o The adjustment factor to be used for geothermal-related students,
 - o The school district's average capital construction costs per square foot of classroom space,
 - o The mitigation fee to be paid per student.
 - o The basis for computing district enrollment,
 - o The basis for a determination that the school district is at, or in excess of, planned capacity,

- o The schedule for periodic re-evaluation of the impact mitigation agreement.
 - o The timing of funding, including, if necessary, a provisions for the return of funds not used within a specified period of time.
 - d. An applicant shall only pay a mitigation fee for the number of new students in excess of the highest previous survey.
 - e. The mitigation fee shall be based on the average capital construction cost per square foot per student, plus an additional amount representing the pro rata cost of providing additional bus service.
3. Since potential impacts on local public services are generally mitigated through provision of funding for additional services or materials and since local government's fiscal flexibility to respond to changes in service needs has been seriously constrained by the passage of Propositions 13, the project proponent should provide mitigation funding in advance of the project's impacts on local public services.
4. Prior to the end of the evidentiary hearings on the applicant's AFC, the mitigation agreement must be submitted by the applicant to the CEC Committee for the regulatory proceedings on the AFC.

Chapter IV

DESCRIPTION OF THE COUNTIES IN THE GEYSERS KGRA

The Geysers-Calistoga KGRA contains both dry steam and water-dominated geothermal resources. Based on available geological information, the dry steam resource appears to be concentrated in the southwestern portion of the KGRA in an area roughly coinciding with the Mayacmas Mountains, running from Mendocino County south to Napa County (see Figure 2). Currently, only the dry steam resource is being used in the Geysers KGRA for generation of electric power. Although the technology for use of the hot water resource for power generation has been developed, it is not yet available for large-scale power production. The hot water resources are more dispersed than the dry steam resource and cover a much larger area. Much less information is available on the extent of the hot water resource, and the limits of this resource within the Geysers KGRA have not been delineated.

Electrical energy development in the Geysers-Calistoga KGRA began in the 1950s with exploratory operations in an area of northeastern Sonoma County known as The Geysers Resort. To date there are 15 operating units (PGandE Units 1 through 15) and a total generating capacity of 908 megawatts (MW). In addition, construction is now under way on five new facilities, which will

FIGURE 2: THE GEYSERS K.G.R.A.
 DRY STEAM RESOURCE AREA

have a combined capacity of 451 MW. These include PGandE's Units 17 and 18, the Northern California Power Agency's (NCPA) Unit 2, the Sacramento Municipal Utility District's (SMUD) Unit 1, and the California Department of Water Resources' (DWR) Bottle Rock facility.

All of the existing generating facilities, except PGandE's Unit 13, are located on the western slope of the Mayacmas Mountains (see Figure 3). However, since the mid-1970s considerable geothermal resource exploration and development has occurred on the eastern slope and in adjacent portions of southwestern Lake County. Development activity in Lake County includes completion of one generating plant (PGandE Unit 13), construction of a second (DWR Bottle Rock), and proposals to the California Energy Commission (CEC) for three others (PGandE Unit 16, Occidental Geothermal No. 1, and NCPA No. 1).*

Information submitted to the CEC by the utilities indicates exploration and development of the dry steam resource will continue on both sides of the Mayacmas ridge. As developers explore the current limits of the dry steam resource, new activity may also begin to spread further along the Mayacmas ridgeline to the northwest and southeast.

Since the late 1950s and early 1960s, geothermal development activity in the Geysers KGRA has drawn new businesses, new services, new residents, and new workers to the development area. Based upon information presented in a number of earlier studies of geothermal development in the Geysers, Sonoma and Lake

*The PGandE Unit 16 project was approved by the CEC in September 1981, but construction is pending resolution of lawsuits challenging the proposed transmission route. The Occidental No. 1 project completed regulatory review in February 1982. The NCPA 1 project is not expected enter the regulatory review process until May 1983.

FIGURE 3: POWERPLANT DEVELOPMENT IN THE GEYSERS K.G.R.A.

counties have experienced the majority of such changes. Napa and Mendocino counties have experienced fewer changes, since they are located somewhat farther from the dry steam resource area being developed for electrical generation.

The following sections provide background information on the four counties potentially affected by geothermal development in the Geysers KGRA. They briefly describe the location and major physical characteristics of each county, the demographic characteristics of its population, the current county economic base and pattern of employment, and the current availability of housing in each county. Each of these features can affect and can be affected by population changes associated with geothermal development.

SONOMA COUNTY

Sonoma County is located north of the San Pablo Bay, bounded by the Pacific Ocean on the west and the Coast Range on the east. The topography of the county includes roughly equal proportions of valleys, rolling hills, and mountains. Primary transportation routes within and through the county are U.S. Highway 101 and State Highways 1, 12, and 116. The Northwestern Pacific

Railroad provides rail access through the county on a route which parallels U.S. Highway 101. The county is also served by airports in Santa Rosa and Healdsburg.

Sonoma County offers a combination of rural and urban living on the northern edge of the San Francisco Bay Area. Traditionally, the county has relied on a strictly local economic base for the livelihood of its population. Today, however, Sonoma County is an integral part of the expanding nine-county metropolitan San Francisco Bay Area. Agriculture and timber production continue as predominant sectors of the county's economy. Tourism, recreation, and related activities continue to be locally important in areas such as the Russian River, the wine country, and along the coast.

Sonoma County was the location of the first commercially successful electrical generating plant using geothermal steam. Since the first unit of PGandE's Geysers power plant came on line in 1960, geothermal development and use have broadened the industrial sector of the county's economic base. Recent Employment Development Department (EDD) reports indicate that geothermal development in Sonoma County provides employment for over one-half of the work force employed in the mining and construction sector. This sector provided employment for 6,300 workers, which was 6.5 percent of the county's work force in 1980. According to EDD projections, the various components of the county's economy are expected to remain quite diverse, and continued growth of geothermal-related industries and services is not expected to become a significant portion of the county's overall economic base (EDD, 1981a).

Sonoma County has eight incorporated cities where nearly 60 percent of the county's population resides. The incorporated areas include Santa Rosa, Petaluma, Rohnert Park, Cotati, Sebastopol, Sonoma, Healdsburg, and Cloverdale. The county also has a number of unincorporated towns and communities along its coastline and in the interior valleys.

Nearest the Geysers geothermal development area are the cities of Cloverdale and Healdsburg and the communities of Preston, Asti, Lytton, Jintown, Windsor, and Geyserville. Neither city has a population in excess of 10,000, and most of the towns are quite small. Several of these towns are oriented toward agriculture and recreational interests and have been relatively slow growing. The city of Santa Rosa is approximately 25 miles south of the Geysers area and, along with Rohnert Park and Cotati, is among the fastest-growing areas in the county. This growth is primarily a result of spillover expansion from the metropolitan areas of the San Francisco Bay Area.

The most direct access to the KGRA from Sonoma County is provided by the Healdsburg-Geysers Road from State Highway 128, north of Healdsburg near Jintown in the Alexander Valley. Additional access is possible via the Cloverdale-Geysers Road and the Pine Flat Road. A series of paved, privately maintained roads within the Geysers intersect with KGRA access roads and lead to the various geothermal project areas. Additional spur roads provide connections with proposed transmission tower pads and steam supply well pads.

Approximate driving distances between the various communities in the county and power plant project sites in the Geysers area range between 15 and 50 miles. Translating these distances into approximate driving times, it would

require about 45 minutes to travel from Cloverdale to the Geysers, 40 minutes from Healdsburg, 75 minutes from Santa Rosa, 90 minutes from Sebastopol, and 90 minutes from Rohnert Park and Cotati to the Geysers.

Demographic Characteristics

As summarized in Table 1, Sonoma County population has increased over 46 percent between the 1970 and 1980 U.S. Census. However, for several cities in the county, the individual growth rate far exceeded the overall county rate.

TABLE 1
POPULATION GROWTH IN SONOMA COUNTY

<u>City</u>	<u>1970 Population¹</u>	<u>1980 Population¹</u>	<u>Percent Change¹</u>
Cloverdale	3,251	3,910	20.3
Cotati	1,368	3,430	150.7
Healdsburg	5,438	7,137	31.2
Petaluma	24,870	33,397	34.3
Rohnert Park	6,133	22,426	265.7
Santa Rosa	50,006	81,977	63.9
Sebastopol	3,993	5,389	35.0
Sonoma	4,259	5,948	39.7
County Total	204,885	299,827 ²	46.3

1. 1980 United States Census, "Preliminary Counts for Cities, Counties and State" (January 1981).

2. The California State Census Data Center, "Newsletter" insert, preliminary final counts (March 31, 1981).

While the county's growth has not been notably high in terms of absolute numbers, the overall growth rate seems high because of the relatively small base population. Projections by the California Department of Finance (DOF) indicate continued growth in the county over the next 10 years, with an estimated population of 387,700 by 1990. The 1990 projection represents a 26.3 percent increase over the 1980 population (DOF, 1981).

Population growth in the two cities nearest The Geysers development area has proceeded at a slower rate than the rest of the county. The city of Cloverdale increased by a little more than 20 percent between 1970 and 1980; the population of Healdsburg increased by a little over 31 percent. No current figures are available on the population in the small, unincorporated communities near The Geysers.

Population growth in Sonoma County seems to be associated with expansion of urbanization from the San Francisco Bay Area. The availability of relatively lower cost housing, the rural atmosphere, and the improved highway access and availability of commuter transit systems to the Bay Area appear to be significant factors in the population shift away from the immediate Bay Area to neighboring counties.

Economic Base and Employment

Employment in Sonoma County has traditionally been based on agricultural and timber production. Due to the timber and agricultural orientation of the economy, there tended to be substantial seasonal fluctuation in employment/unemployment rates, particularly among those employed in farming, food processing, and lumber. However, with increasing urbanization, the employment

base has become more diversified, and employment opportunities have increased. This diversification has tended to reduce the seasonal rate as well as the average annual rate of unemployment in the county.

As indicated in Table 2, the unemployment rate in the area averaged 7.6 percent during 1980, with seasonal fluctuations occurring between October and April. Since 1974, unemployment rates for Sonoma County have generally exceeded the state average, with an average rate of 9.3 percent. During the 1974 - 1976 time span, the county's unemployment rate averaged 11.2 percent, with a peak of 13 percent in 1975. However, between 1976 - 1980 the average annual rate decreased to 8.5 percent (EDD, 1981f).

The economic base of Sonoma County is relatively diversified, with major activity in services and trade, agricultural processing, government, and manufacturing. The employment data presented in Table 3 provide an indication of activity within the various sectors of Sonoma County's economy.

As shown by the figures in Table 3, government is the major employer in the county. In 1980, nearly 21 percent (annual average) of the county's employed wage and salary workers were employed by some division of federal, state, or local government (EDD, 1981f). EDD projects a marginal increase of 100 positions each year in education in response to the growth of school enrollment in some school districts. The severe budget squeezes and the subsequent freeze of hiring in almost all levels of government will inhibit growth elsewhere in the public sector, and payrolls in federal, state, and local governmental agencies in Sonoma County are expected to remain virtually unchanged during the 1981-82 outlook period (EDD, 1981f).

TABLE 2

CIVILIAN LABOR FORCE, EMPLOYMENT AND UNEMPLOYMENT¹

Sonoma County 1974 - 1980

<u>Year</u>	<u>Labor Force² Annual Avg.</u>	<u>Employment³ Annual Avg.</u>	<u>Unemployment⁴ Annual Avg.</u>	<u>High Month</u>	<u>Unemployment Rate⁵ Low Month</u>	<u>Annual Avg. (percent)</u>
1974	96,700	87,800	8,900	Dec: 11.4	Aug: 7.7	9.2
1975	99,700	86,700	13,000	Jan: 14.6	Oct: 11.2	13.0
1976	106,100	94,000	12,100	Jan: 14.3	May: 9.1	11.4
1977	113,500	102,500	11,000	Jan: 12.1	Oct/Dec: 7.6	9.7
1978	120,800	111,800	9,000	Feb: 9.5	Nov: 5.7	7.5
1979	127,700	119,200	8,500	Jan: 8.2	Oct: 5.4	6.7
1980	131,600	122,000	9,600	April: 8.2	Oct/Nov: 6.5	7.3

Source: EED, 1981a.

1. Civilian labor force, employment, and unemployment are by place of residence.
2. Civilian labor force is the sum total of potential workers, employed, and unemployed.
3. Includes persons involved in labor management trade disputes.
4. Includes all persons without jobs and actively seeking work.
5. Unemployment rates and annual averages are computed from unrounded data; therefore, they may differ from rates and averages calculated by using the rounded figures in this table.

TABLE 3
WAGE AND SALARY EMPLOYMENT¹ BY INDUSTRY
SANTA ROSA SMSA
Sonoma County 1979 - 1982

	Annual Averages			
	Actual 1979	1980	Projected 1981	1982
Total, all industries	93,800	97,100	99,100	104,000
Agriculture, forestry, & fisheries	4,700	4,600	4,700	4,800
Nonagricultural total	89,100	92,500	94,400	99,200
Mining	400	400	400	500
Construction	6,300	5,900	5,600	6,000
Manufacturing	14,300	14,900	15,100	16,400
Nondurable goods	4,700	4,700	4,700	5,000
Food & kindred products	2,900	3,100	3,100	3,300
Other nondurable goods	1,800	1,600	1,600	1,700
Durable goods	9,600	10,200	10,400	11,400
Lumber and wood products	2,200	2,000	2,000	2,100
Machinery and instruments	5,500	6,500	6,800	7,600
Other durable goods	1,900	1,700	1,600	1,700
Transportation & public utilities	4,200	4,500	4,600	4,800
Wholesale trade	3,400	3,500	3,400	3,700
Retail trade	18,000	19,100	19,800	21,000
General merchandise stores	2,100	2,300	2,400	2,600
Food stores	2,600	2,900	3,100	3,200
Eating and drinking places	5,600	5,900	6,200	6,600
Other retail trade	7,700	8,000	8,100	8,600
Finance, insurance, and real estate	5,500	5,700	5,700	5,900
Services	17,400	18,300	19,300	20,500
Hotels	1,100	1,200	1,200	1,300
Personal	1,100	1,100	1,200	1,300
Business	1,600	2,000	2,300	2,600
Auto & miscellaneous repair	1,200	1,100	1,100	1,100
Recreation & motion pictures	800	800	800	900
Health care	5,600	5,700	5,900	6,100
Legal	400	400	400	500
Social services	3,300	3,700	3,900	4,000
Other services	2,300	2,300	2,500	2,700
Government ²	19,600	20,200	20,300	20,400

Source: EDD, 1981f.

1. Employment is reported by place of work and excludes self-employed, unpaid family workers and workers involved in labor disputes. Data are benchmark to March 1980.
2. Includes all civilian government employees regardless of activity in which engaged.

The services and trade industries comprise another major component of the local economy. Employment in service industries has displayed relatively rapid and consistent growth since 1972, and job gains are expected to continue through 1982. In 1980, nearly 19 percent (annual average) of the county's employed wage and salary workers were employed in the services division of the county's industries. During 1981-82, the services division is projected to be the fastest growing in the local economy.

By 1980, nearly 20 percent (annual average) of the county's employed wage and salary workers were employed in the retail division of the county's industries. This was influenced by increasing income and local population growth. The development of shopping centers in recent years has effected a substantial boost in Sonoma County food stores, department stores, and other miscellaneous retail outlets. Another factor contributing to the growth in retail employment in Sonoma County is the intensification of tourism, particularly in the wine country, and the resultant proliferation of new eating places and gift shops (EDD, 1981f).

Despite continued mechanization and gradual conversion of farmland into residential, commercial, and industrial uses, agriculture continues to be an integral part of Sonoma County's economy. While local farm employment is expected to show a long-term decline in keeping with the national trend, the rate of decline has slowed in recent years. In fact, a reversal of this recent trend is forecast during the 1981-82 period, and Sonoma County's agriculture will show slight overall payroll increases. Local crops, however, will display mixed trends as a result of differing market conditions (EDD, 1981f).

The manufacturing division of Sonoma County's major industries is the fourth largest employer of the county's work force. In 1980, nearly 16 percent (annual average) of the county's employed wage and salary workers were employed in manufacturing. Although job totals in the manufacture of construction-related materials fell due to the decline in new construction, manufacturing as a whole showed a 4.2 percent increase in jobs in 1980. Strong gains in the manufacture of electrical and electronic instruments and components helped to cushion the downturn (EDD, 1981f). Based upon the current growth in the electronics industry, the Hewlett-Packard Company is planning expansion of existing facilities in Santa Rosa and a phased development of a new facility in Rohnert Park. These facilities may eventually employ as many as 17,000 people in the next 20 years (Skanchy, November 1981).

The development of geothermal resources will continue to have an effect on Sonoma County's economy. As shown in Table 3, the number of people in the county employed in the mining division of local industries was 400 in 1980. This number has remained relatively constant since 1975. Jobs in this industrial category are expected to show a slight increase in the latter part of EDD's 1981-82 forecast period, primarily because of increased geothermal exploration activities in The Geysers. Employment in geothermal exploration accounts for over half of the total jobs in the mineral extraction industry (EDD 1981f).

Housing Availability

Due to the rising costs of construction and to the high cost of borrowing money for mortgages, a shortage of available housing is a fairly common problem throughout California. According to a Special Census conducted in Sonoma

County in 1975 by of the state Department of Finance, the housing vacancy rate in the county was approximately 10.8 percent. The preliminary 1980 Census figures estimated a 9.6 percent vacancy rate in Sonoma County, showing a slight decrease in housing availability. The Census Bureau's vacancy rate usually includes second homes, so the estimate for the area should be considered high.

According to the Sonoma County housing director, areas adjacent to the KGRA, such as Cloverdale, Geyserville, and Healdsburg, have very limited housing resources (Gouig, June 1981). Staff contacted local representatives of these three communities and received the following information:

- o Cloverdale--This city has a current vacancy rate of less than 2 percent; most rental units are filled and have waiting lists of potential renters. The city administrator indicated there is a 1.5 percent vacancy rate for single family units, a 0.5 percent rate for multi-family units, and a near-zero rate for mobile homes (Groom, October 1981). Based on information provided by the county housing director, the housing availability in Cloverdale decreased from a 5.83 percent rate in 1975 to 3.0 percent in 1981 (Gouig, June 1981).

In an effort to provide additional housing units, a number of motels have been converted to housing units charging weekly (Monday - Friday) rates for bachelor-type* units. The city representative believes that a very

*Bachelor-type units were defined by local planners as a studio apartment which has bathroom facilities but not kitchen facilities (Harris, September 1981).

low vacancy rate exists within the motel conversion units, since they provide reasonable weekly rates (Groom, October 1981).

- o Geyserville--Based on information provided by the Geyserville postmaster, there are approximately 800 residences within a 5 mile radius of the post office. The majority of these residences are single family units, and a very few are multi-family units (Falls, October 1981).

Other types of housing, such as mobile home parks and motels, are not available in Geyserville. The vacancy rate in the community during the past 4 or 5 years has remained relatively constant at less than 1 percent (Falls, October 1981).

- o Healdsburg--This city has approximately 2,985 housing units within the incorporated limits, and the current overall vacancy rate stands at less than 2 percent. Single family units comprise the largest portion of the available housing, and this type of housing has a vacancy rate of 1.4 percent. Multi-family housing comprises the smallest portion of available housing and has a nearly 10 percent vacancy rate (Youngblood, October 1981). There are three mobile home parks in the city, and all of the 90 units in these parks were occupied during recent housing surveys (Healdsburg, 1981b).

The county housing director provided additional information on a condominium study conducted within the city limits in March 1981. This study indicated that the overall vacancy rates had dropped from 8.3 percent in 1975 to 3.0 percent in 1980 and to 1.8 percent in 1981 (Gouig, June 1981). The vacancy rate for rental units was 4 percent in March 1981, and local realtors indicated a high demand for rental units. This

vacancy rate becomes more significant in light of the decline in construction of new rental units. Due to high interest rates and financing difficulties, there has been no construction of new, conventional rental apartments in the city since 1979 (Healdsburg, 1981b).

Other areas of the county in which geothermal workers might reside include Santa Rosa, Rohnert Park, Cotati, and Sebastopol. According to the DOF Special Census in 1975, the vacancy rates for these cities were 6.5 percent, 6.8 percent, 4.8 percent, and 4.6 percent, respectively. According to the housing director, housing availability in Sebastopol has decreased nearly to zero (Gouig, June 1981). Current estimates of vacancy rates show that Santa Rosa, Rohnert Park, and Cotati have vacancy rates ranging between 2 percent and 5 percent, indicating a general decline in housing availability for the Santa Rosa area (HUD, 1981). However, of the four counties in the KGRA, the housing market in the larger population centers in Sonoma County may have the greatest flexibility in responding to increased demand for all types of housing.

Public Services

Within Sonoma County, public services are provided by several federal, state, and local governmental entities. Public education is provided by 42 separate school districts and the County Office of Education. Water supply is provided primarily by five water districts within the county service area and by separate city agencies within the incorporated areas. In areas of large or concentrated population, a number of agencies provide sanitation services while the more rural areas use septic tanks for waste water disposal. Law enforcement services are provided through the County Sheriff's Department

or through individual city police departments. Fire suppression service is provided within the incorporated areas by the cities' departments and in the unincorporated areas by contract agreement with the state Department of Forestry.

School Districts--Northeastern Sonoma County is served by numerous school districts, including the Cloverdale and the Geyserville Unified; the Alexander Valley, Healdsburg, West Side, Rincon Valley, Windsor, and Piner-Olivet Union; and the Santa Rosa City Schools. (Refer to Figure 4 for boundaries of these districts.) According to school enrollment data, for the past 20 years most of the school districts near the KGRA have been operating below capacity enrollment (Sonoma County Office of Education, 1981a).

Up through the 1980-81 school year, the districts nearest the KGRA showing declining enrollment included Alexander Valley Union (K-6), Healdsburg Union (7-12), and Cloverdale (K-12). The most significant decline in enrollment occurred between the 1979-80 and 1980-81 school years, when the Kindergarten - 6th grades within Alexander Valley Union School District showed an enrollment decline of approximately 30 percent. The only school district near the KGRA showing a slight increase in enrollment was Geyserville Unified, with an approximate 5 percent enrollment increase between the 1979-81 and 1980-81 school years (Eagan, June 1981).

According to data from the Sonoma County Office of Education, 1980-81 overall enrollment in Sonoma County districts was down about 1,300 students from the previous year's level (Sonoma County Office of Education, 1981a). Within the northeastern Sonoma County districts cited above, only the Windsor and Piner-Olivet Union School Districts had 1980-81 enrollments at or near capacity. In the 1980-81 school year all other northeastern Sonoma County

districts were operating below capacity and could absorb additional students without difficulty. (Refer to Table 4 for enrollment capacity data.)

Estimates of future increases or decreases in enrollment in county schools are difficult to project, however, as evidenced by testimony presented to the CEC by county school district representatives in November 1981. In addition, the relative capacity of the classrooms in the district is affected by changes in state educational requirements for students-per-teacher-per-grade ratios and by the district school board's students-per-classroom limits. Whereas a district may have served a greater number of students in the same facilities in the past, they now may require more teachers and more classrooms to serve the same or a lesser number of students.

Water Supply--Sonoma County has five major water districts located within its boundaries. Each district has a system designed to meet its own needs. Districts located adjacent to the KGRA include Healdsburg, Geyserville, Cloverdale, and Santa Rosa.

- o Sonoma County Water Agency--The Sonoma County Water Agency is the largest wholesaler of water in the county. The agency provides water to districts and municipalities throughout Sonoma County and northern Marin County, including the communities of Santa Rosa, Sonoma, and Forestville. The continuous flow of the Russian River supplies the water for the agency (Jackson, May 1981).
- o The City of Santa Rosa--As a customer of the Sonoma Water Agency, Santa Rosa provides water to 35,000 customers. System storage capacity consists of approximately 12 million gallons with an additional 4 million gallon reservoir which should be completed by the end of 1982. This

TABLE 4
ESTIMATED ENROLLMENT CAPACITY

SONOMA COUNTY SCHOOL DISTRICTS LOCATED NEAREST THE GEYSER KGRA

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
	Alexander Valley-Union	Cloverdale Unified	Geyserville Unified	Healdsburg Union	Windsor Union	West Side Union	Santa Rosa City Unified	Piner-Olivet Unified
Enrollment	K-6	K-12	K-12	K-6 7-12	K-6 (K-8)*	K-6	K-6 7-12	K-6
Estimated Current Capacity	250 ¹	1260 ²	325 ³	1200 ⁴ 1800 ⁴	800 ⁵ (1025) ^{5*}	85 ⁶	3,900 ⁷ 10,200 ⁷	600 ⁸
Total 80-81	91	1137	298	860 1450	740	93	3,267 8,431	591
Estimated Remaining Capacity	+159	+123	+27	+340 +350	+60 (+285)*	-8	+633 +1,769	+9

Sources: Sonoma County Office of Education, 1981a.

1. William Gowan, September 1981	5. Norm Ginsburg, September 1981
2. James McAuley, September 1981	6. Terry Kneisler, October 1981
3. Robert Hileman, September 1981	7. Don Moore, October 1981**
4. Bob Malone, September 1981	8. Jack Hansen, October 1981

*Note: Windsor Union School District capacity will increase to 1,025 students by September of 1982 and will include grades 7 and 8.

**Assistant Superintendent, Business Services.

FIGURE 4
SONOMA COUNTY SCHOOL
DISTRICTS LOCATED NEAREST
THE GEYSERS KGRA.

increased reservoir capacity is projected to provide adequate water supplies until the year 2000 (Romano, June 1981). Present water use is approximately 12 million gallons per day. The utility has six wells with a reserve of 7 million gallons per day for back-up capacity. Additional reserves which may be tapped include Sonoma County's aqueduct reservoir which has a 36 million gallon storage capacity. Presently, the City Water Administrator believes the water supplies would not be overtaxed due to development, especially since the city council's adoption of a developer's ordinance. This ordinance requires a developer to financially compensate the city for future, developer-initiated city growth (Romano, June 1981).

- o Geyserville Water District--Geyserville has one of the smallest water storage capacities, approximately 75,000 gallons, in Sonoma County. Water use varies seasonally, so capacity usage in Geyserville ranges between 30 percent to 70 percent during winter to summer months. Wells are used to supply water to the district. Long-term district expansion plans depend upon the growth rate in the general area. The water district administrator indicated the district has no plans for immediate expansion due to geothermal development in the area. However, should the need arise, he feels capacity could be doubled with a pump (cost: \$5,000 - \$10,000), additional holding capacity (cost: \$20,000), and a pipe distribution system (cost: \$50,000). This would bring the total cost of doubling current capacity to approximately \$80,000 (Bosworth, June 1981).
- o The City of Healdsburg--Healdsburg has a storage capacity of approximately 5 million gallons. Seven wells located adjacent to the Russian

River provide the water necessary to supply the city. Two wells located adjacent to Dry Creek provide back-up reserve capacity. According to the city engineer, geothermal development has not caused a significant impact upon water supply in the area at this time. However, he states the actual impact is impossible to determine due to unavailability of present city population growth data related to employment (Pusich, June 1981).

Presently, the city council is developing an annexation policy to require a developer to compensate the city's public services for developer-initiated city growth. The calculated cost includes variables such as land density, number of residents per house, and amount of land. According to the city engineer, an influx of 1,000 people within the city limits would increase storage and well pumping requirements by 640,000 gallons. The cost in 1981 dollars based upon number of units per acre would be (1) 1 unit per acre = \$3,320 per unit, (2) 4 units per acre = \$2,840 per unit, and (3) 8 units per acre = \$2,600 per unit. Oversizing costs, including mains and distribution systems, based upon number of units per acre would be (1) 1 unit per acre = \$400 per lot, (2) 4 units per acre = \$500, and (3) 8 units per acre = \$1,000 (Pusich, June 1981).

- o The City of Cloverdale--Cloverdale supplies water to approximately 4,000 customers. Six wells located adjacent to the Russian River supply the water to fill the storage reservoir which has a 600,000 gallon capacity. Since water use depends upon seasonal variations, usage ranges between 100,000 to 600,000 gallons per day. Plans for expansion include construction of a 300,000 gallon reservoir on which construction is scheduled to begin in 1984. A proposed annexation of a new area to the city could require construction of an additional storage reservoir with

500,000 gallon capacity. This would bring the future water capacity to 1.4 million gallons. The cost of constructing both reservoirs would be approximately \$1.2 million (in 1981 dollars) (Cann, June 1981).

According to the city's Director of Public Works, there has been no apparent impact of geothermal development on the area. He also stated that the actual impact would be difficult to determine since there are no data available on the number of city residents employed in geothermal industry and services (Cann, June 1981).

Waste Water Facilities--Sonoma County has 10 sanitation districts located within its boundaries. Systems located nearest to the geothermal development area include Healdsburg, Geyserville, and Cloverdale.

- o The City of Healdsburg--Healdsburg has its own city system with a capacity of 1 million gallons per day (Wood, June 1981). Present use is approximately 900,000 gallons per day (Salisbury, May 1981). The city had expected the 10 percent reserve capacity of the current system to meet the expansion needs of Healdsburg until 1992. However, the Healdsburg system recently reached its capacity due to local industrial discharge of between 220,000 - 330,000 gallons per day. The city is making plans for expansion of waste water facilities to meet the city's future demand for services. The city council is also considering plans for a pretreatment ordinance to cover the city cost of additional service based upon actual use. The cost of additional services to double present system capacity would be approximately \$1 million (Wood, June 1981).
- o Geyserville Sanitation District--Until Geyserville completed its own waste water system on May 1, 1981, the community had used septic tanks.

A combination of state/federal grants and local bonds provided funding for the new system (Wood, June 1981). The capacity of the new system is 67,000 gallons per day. Present use is approximately 50,000 - 55,000 gallons per day (Salisbury, May 1981).

The current system reserve capacity of approximately 15 percent was expected to meet waste water system needs of the Geyserville locality until 1990. However, district representatives expect that completion of construction of Warm Springs Dam in late 1981 or early 1982 will produce an increase in recreational use of the area. This increased use is expected to reduce the system reserve margin, so capacity may be reached in 1982 and additional facilities may be required prior to 1990 (Salisbury, May 1981).

- o The City of Cloverdale--Cloverdale has a community waste water system. The 20-year design capacity of the system is 4.5 million gallons per day. Present use is between 35,000 and 60,000 gallons per day. The large reserve capacity of the current system is needed to handle infiltration through the antiquated collector system and is expected to meet expansion needs of Cloverdale until the year 2000. The cost of additional services to double present capacity would be approximately \$1.2 million (Cann, June and September 1981; January 1982).

Protective Services--Services available in the county are provided by local city departments or by county service districts.

- o Law Enforcement--Sonoma County maintains the County Sheriff's Department which provides protective services to the unincorporated portions of the county. The Sheriff's Department employs approximately 180 deputies to

provide protective services throughout Sonoma County. The main office is located in Santa Rosa, and it provides services to unincorporated communities, such as Geyserville, located near the geothermal development area.

Approximately 115 deputies are employed by the main office in Santa Rosa, while the remainder are divided between regional offices located in Sonoma Valley (16 deputies) and Guerneville (19 deputies). According to the Sonoma County Sheriff's Department, the annual cost of providing an additional deputy would be approximately \$30,000. The cost of the equipment for the new deputy would be approximately \$15,000. The county Sheriff's Department does not feel the need to increase the current force due to geothermal development in the area (Hess, June 1981).

The county also maintains a helicopter at the Santa Rosa airport which can be used for emergency evacuation in accident cases. The sheriff's helicopter has been used on several occasions in the Geysers in the past. Depending upon weather conditions, helicopter response time to locations in the Geysers area is between 15 and 30 minutes. In September 1981, the county allocated \$50,000 of its AB 1905 funds toward the \$450,000 cost of replacing one of the sheriff's helicopter units (Sonoma County, Office of County Administration, 1981).

Within the city limits of the incorporated areas of the county, law enforcement services are provided by municipal police departments. Of the three cities nearest the KGRA, the City of Santa Rosa has the largest police force, consisting of approximately 85 deputies (Wallace, May 1981). The City of Cloverdale employs seven deputies (Beebe, May 1981).

and the City of Healdsburg employs 13 deputies (Alves, May 1981). According to the Healdsburg Police Department, the cost of providing additional protective services generally ranges between \$35,000 - \$40,000, including the cost of an officer and equipment (Alves, May 1981). Such costs are assumed to be comparable for the remaining municipalities.

Based upon conversations with city representatives, none of the incorporated cities adjacent to KGRA plan to increase their force due to geothermal development (Cloverdale: Beebe, May 1981; Healdsburg: Paul, May 1981; and Santa Rosa: Walker, May 1981).

- o Fire Suppression Services--Within the county there are over 50 fire agencies which provide fire protection services. The local departments located near the KGRA include the City of Santa Rosa, the City of Healdsburg, the City of Cloverdale, Geyserville, and Alexander Valley. Local departments primarily handle structural fires and rescue calls and are also required to assist in wildland fires within their service areas which are not included in the designated State Responsibility Areas (Eirvine, September 1981).

Fire suppression services in the Geysers area are provided by both the California Department of Forestry and the City of Cloverdale. Although the CDF has primary responsibility for the area, the City of Cloverdale has responsibility for structural fires in the Geysers (Ramage, September 1981).

Fire suppression services of the local fire departments are supplemented by state and federal agencies. From May 1 through October 15, the U.S.

Forest Service has primary responsibility for fire protection within the federal lands located throughout the county. Under an agreement with the state, the Forest Service also protects several tracts of private land within or adjacent to the national forest lands. To protect large areas of undeveloped lands located outside the National Forest in the county, the California Division of Forestry has assumed responsibility for wild-fire suppression during the months of May through October. Through a separate agreement with the county, the CDF provides year-round protection to those parts of the county not covered by local fire departments.

LAKE COUNTY

Lake County is located about 60 miles inland from the Pacific Ocean in the California Coast Range on the western edge of the Sacramento Valley. Most of the county is mountainous, with elevations ranging from 700 to 7,000 feet (PGandE, 1974).

The county is located between two major intrastate transportation routes, U.S. Interstate Highway 5 and U.S. Highway 101. Primary transportation routes within and through the county are State Highways 20, 29, 53, and 175. There is no rail service into Lake County, but it is served by four airports located near the communities of Clearlake, Kelseyville, Hobergs/Siegler Springs, and

Lake Pillsbury (Gennis, 1978). The Lake County economy is based upon three sectors: agriculture, recreation and tourism, and government. Government and tourism associated with general outdoor recreation are the most important economic sectors (Gennis, 1978). Clear Lake is the major geographic feature in the county and attracts large numbers of recreational users, especially during the summer months.

Development of geothermal resources has intensified in recent years. As the exploration of the KGRA and proof of the resource have moved eastward, the county has begun to experience an increase in geothermal-related industrial development. With continued successful development of the resource, the geothermal industry and related services could become a significant component of the county's economic base (CEC, 1980b).

Prior to the general election in November 1980, Lakeport was the only incorporated city in Lake County. The new city of Clearlake was formed in November 1980 by the consolidation of the communities of Clear Lake Highlands and Clear Lake Park. A number of unincorporated communities lie along the shoreline of Clear Lake. Among these are Lucerne and Nice on the northeastern side and Glenhaven and Clear Lake Oaks on the eastern side. Somewhat inland from the lake are Upper Lake on the north, Kelseyville on the southwest, and Lower Lake on the southern side of the lake.

The town of Middletown and the communities of Anderson Springs, Cobb, Whispering Pines, Loch Lomond, Harbin Springs, Pine Grove, and Hobergs are communities located nearest The Geysers geothermal development area. Many of these smaller communities began as mountain and hot springs resorts in the late 1800s and continue to offer recreational opportunities and locations for second homes for residents of the nearby metropolitan areas.

Demographic Characteristics

As summarized in the table below, Lake County's population has more than tripled in the past 30 years, and the average annual growth rate has risen sharply since 1970. In the past five years Lake County has been among the fastest growing counties in the state. Preliminary census figures show a 1980 total population of 36,366 which is an 86 percent increase over the 1970 figure.

TABLE 5
POPULATION GROWTH IN LAKE COUNTY

<u>Year</u>	<u>Population</u>	<u>Percent Increase</u>	<u>Average Annual Increase</u>
1950	11,480 ¹	--	--
1960	13,786 ¹	20.1	2.0
1970	19,548 ²	42.9	4.3
1976	26,500 ¹	34.5	6.9
1978	30,000 ¹	13.2	6.6
1980	36,366 ³	21.2	10.6

1. California Energy Commission, Joint Environmental Statement, NCPA No. 2 (1980).

2. 1970 United States Census, Census of Population. Revised (April 1971).

3. 1980 United States Census, Preliminary Counts for Cities, Counties and State (January 1981).

Recent estimates of the population in the communities nearest The Geysers development area are Middletown--1,500; Anderson Springs--200; Cobb Valley--360; Whispering Pines--145; Loch Lomond--95; and Hobergs--60 (Occidental,

1981). Between June and August, the county usually experiences an influx of vacationers and tourists attracted by the recreational opportunities. This influx could generate an estimated temporary population increase of 100,000 additional persons during this 3-month period (Ecoview, 1978a).

Access from Lake County to the service roads in the Geysers geothermal development area is provided by Bottle Rock Road from the northeast and the Socrates Mine Road from the southeast. Both roads begin at State Highway 175 which runs north-south through the Cobb Valley, between Middletown and the outskirts of Kelseyville. Approximate driving distances between the various communities in the county and power plant project sites in the Geysers area range between 6.5 and 40 miles. Translating these distances into approximate driving times, it would require about 45 minutes to travel from Lakeport to the Geysers, 30 minutes from Middletown, 45 minutes from Clearlake, 20 minutes from Cobb, and 70 minutes from Nice.

Lake County has also proved attractive as a retirement area. The proportion of residents over 65 years of age was only 12 percent in 1940 but had risen to 24.3 percent by 1970, giving Lake County the highest median age (46.4) of any county in California. Staff at the Lake County office of the Social Security Administration attributed the increases in retirement age population to the use of formerly seasonal recreational cabins purchased in the 1940s and 1950s (and no longer subject to mortgage payments) as full-time, low cost residences (Martin, June 1981). If these observations are correct, the recent rapid rate of growth in the county may have tended to increase the proportion of the population over 65. This cannot be substantiated, however, until data from the 1980 Census becomes available.

Another unique characteristic of Lake County's population is that the birth rate is exceeded by the death rate. This pattern of natural decrease could be expected with the high percentage of the population over 65. In spite of this characteristic, however, the county has been experiencing rapid growth which must therefore be attributed to the in-migration of new residents. The in-migration may be a result of a number of factors, e.g., lower housing costs, a shift away from cities and "back to the land," and people retiring at a younger age.

Another possible factor may be the increase of local employment opportunities related to the expanded development of the geothermal resource in The Geysers KGRA. An informal survey of residents and business people in the Middletown Anderson Springs area in southwestern Lake County seemed to indicate a local belief that the growth in this area of Lake County was related to geothermal development (Gennis, 1978). A September, 1980 survey of students in the Middletown Unified School District showed that the parents of one-third of the students in that district were employed in geothermal-related industries and services.

The Lakeport office of the state Employment Development Department (EDD) has indicated that there may be a correlation between geothermal development in the KGRA and the moderation of seasonal fluctuations in the county's unemployment rate. As indicated in Table 6, the county's unemployment rate historically was high in the mid-winter months and low in the late summer months. The summer lows are due to the peak activity periods in the agriculture and tourism/recreational services sectors of the local economy. The increase in geothermal activity apparently produced an increase in the

TABLE 6
CIVILIAN LABOR FORCE, EMPLOYMENT AND UNEMPLOYMENT¹
Lake County 1974 - 1980

Year	Labor Force ² Annual Avg.	Employment ³ Annual Avg.	Unemployment ⁴ Annual Avg.	Unemployment Rate ⁵ (percent)		
				High Month	Low Month	Annual Avg.
1974	9,350	8,175	1,175	Feb: 18.8%	Aug: 7.2%	12.4%
1975	10,225	8,675	1,550	Feb: 20.9%	Sept: 8.1%	15.2%
1976	11,050	9,550	1,500	Jan: 19.3%	Aug: 8.3%	13.6%
1977	11,775	10,475	1,300	Jan: 16.4%	Sept: 6.9%	11.0%
1978	12,525	11,375	1,150	Jan: 16.8%	Aug: 5.7%	9.3%
1979	13,125	11,975	1,150	Feb: 13.2%	Aug: 5.7%	8.7%
1980	12,625	11,425	1,200	Feb: 12.1%	Aug: 6.9%	9.5%

Source: EDD, 1981c.

1. Civilian labor force, employment and unemployment are by place of residence.
2. Civilian labor force is the sum total of potential workers, employed and unemployed.
3. Includes persons involved in labor management trade disputes.
4. Includes all persons without jobs and actively seeking work.
5. Unemployment rates and annual averages are computed from unrounded data; therefore, they may differ from rates and averages calculated by using the rounded figures in this table.

availability of year-round employment opportunities in the service sector of the local economy (Wall, June 1981).

The Lakeport office of the EDD does not have data specifically related to the rates and seasonal patterns of unemployment among workers involved in geothermal development. Occasionally, workers operating the drilling rigs have filed claims for unemployment compensation between drilling assignments. Workers involved in the various aspects of power plant site preparation and facility construction may also be employed in nongeothermal developments in between periods of employment in geothermal development.

Economic Base and Employment

The economic base of Lake County has three major components: government and transfer payments, recreation and tourism, and agriculture (Gennis, 1978). The employment data presented in Table 7 provide an indication of activity within the various sectors of Lake County's economy.

As shown by the employment activity in Table 7, government is the major employer in the county. In 1980, nearly 23 percent (annual average) of the county's employed wage and salary workers were employed by some division of federal, state, or local government (EDD, 1981c). In addition to direct employment in government, governmental transfer payments, especially Social Security payments, comprise a large portion of the county's economic base (Gennis, 1978). The number of Social Security recipients in the county has increased from 6,249 in December 1970 to 12,060 in December 1979. Over 60 percent of the recipients were retired workers, and the percent of disabled persons increased from 7.5 percent in December 1970 to 23.8 percent in December 1979. The percent of dependents and survivors had remained relatively

constant at 26 or 27 percent up through 1977 but dropped to 16.2 percent in December 1979 (Social Security Administration, June 23, 1981).

TABLE 7
WAGE AND SALARY EMPLOYMENT BY INDUSTRY
Lake County 1980 - 1982

	Actual 1980	Annual Averages Projected	
		1981	1982
Wage and salary workers ¹	7,400	7,500	7,875
Agriculture, agric. serv., forestry and fisheries	750	775	775
Nonagricultural industries	6,650	6,725	7,100
Construction and mining	550	550	575
Manufacturing	300	300	325
Transportation and public utilities	375	375	400
Wholesale trade	250	250	275
Retail trade	1,575	1,625	1,750
Finance, insurance, & real estate	400	400	425
Services	1,550	1,575	1,700
Government	1,675	1,650	1,650

Source: EDD, 1981c.

1. Wage and salary employment is reported by place of work and does not include persons involved in labor-management trade disputes.

Note: Parts may not add to totals or subtotals due to independent rounding.

Another major component of the economic base is the services and trade associated with recreational use and tourism in the county. In 1980 over 21 percent (annual average) of the county's employed wage and salary workers were employed in the retail trade division and over 20 percent (annual average) were employed in the services division, of the county's industries. Activity in this portion of the county's economic base has slowed somewhat in response

to the national economic slowdown but is expected to improve as people reorient themselves to fuel-efficient travel and vacationing closer to home (EDD, 1981c).

Agriculture--primarily pear and walnut orchards and grape vineyards--is the fourth largest industry in Lake County. In the agricultural sector of the county's economy, the total gross value of agricultural products has more than tripled in the past decade, rising from \$9,128,330 in 1970 to \$33,449,765 in 1980. However, comparison of the gross value of agricultural production with gross value of taxable sales between 1965 and 1979 indicates that agricultural production is becoming a less significant component of the county's economic base (Sedway/Cooke, 1981b). Table 8 shows the decline in the ratio between the gross values of these two sectors.

TABLE 8
COMPARISON OF GROSS VALUES OF AGRICULTURAL PRODUCTION
AND TAXABLE SALES IN LAKE COUNTY, 1965 - 1979

<u>Year</u>	Gross Value of ^{1,2} <u>Agricultural Production</u>	Gross Value of <u>Taxable Sales</u>	<u>Ratio</u>
1965	\$ 9,128,330	\$ 23,754,000	.38
1970	10,778,209	31,544,000	.34
1975	19,589,910	65,319,000	.30
1979	33,449,765	139,564,000	.24

Source: Sedway/Cooke, 1981b.

1. Agricultural commodities are not subject to sales tax.
2. Gross value of agricultural products does not reflect the costs of producing these commodities or the net return to the grower.

The development and use of geothermal resources has and will continue to have an effect on Lake County's economy (Sedway/Cooke, 1981b). The county estimates that approximately 20 percent of its property tax income is currently provided by geothermal revenues (Strong, October 1981). This total does not include revenues from economic activity associated with development of sites and roads or construction of facilities.

Housing Availability

As indicated in Table 9, the total number of housing units available in Lake County has nearly doubled between 1970 and 1980. The most significant increase was in the number of mobile home units.

TABLE 9
LAKE COUNTY HOUSING TYPES, 1970 - 1980

<u>Type of Housing Unit</u>	<u>1970*</u>	<u>1980</u>	<u>Percent Increase</u>
Single Family	9,868	13,195	33.7
Multiple Family (2-4)	256	823	221.5
Multiple Family (5+)	227	489	115.4
Mobile Homes	1,129	5,576	393.9
TOTAL UNITS	11,606	20,083	73.0

Source: Sedway/Cooke, 1981b.

*This column does not add up to the total number of housing units. The 126 units missing from the table are all housing types which contain two or more units.

According to preliminary 1980 Census data, the number of housing units in Lake County increased by 89 percent between 1970 and 1980, while the population increased by 86 percent. The vacancy rate in the county has been quite high

in previous surveys. For example, in 1970 the vacancy rate was 36 percent and by 1980 had dropped to 23 percent (Sedway/Cooke, 1981b). Among the data collected by the United States Census Bureau in 1980 was the rate of vacancies for the various categories of housing units. The total vacancy rate for year-round housing units in the county in the April 1980 Census was 25.7 percent. The number of vacant units does not necessarily indicate the actual availability of housing for new residents moving to the county, since many of the vacancies are second homes or seasonal recreational units. The vacancy rate for year-round housing units available for rent or sale was 5.7 percent.

Discussions with several local real estate office representatives produced a somewhat different picture of housing availability. The county as a whole was described as having very few apartments or multiple family residences and very few rental units. One representative estimated the countywide vacancy rate (including sales and rentals) was about 3 percent (Cross, June 1981).

Single family units are available for sale, especially in the cities of Lakeport and Clearlake, and a few in the Kelseyville and Riviera areas. There has been some new construction, but it has been single, custom-type homes rather than subdivisions with several units. New home construction in the county has been subjected to the same kinds of financing difficulties as the rest of the state. The Middletown/Cobb area, closest to The Geysers geothermal development, was consistently described as having very little or no housing available for rent or sale.

Among the comments made during these discussions, there were contrasting opinions expressed on where workers in the geothermal development area might choose to live. One representative felt they would prefer to live in the

Middletown/Cobb area because they would have a much shorter commute distance (Cross, June 1981). Another representative believed newcomers (including geothermal workers) from the Los Angeles and San Francisco Bay areas would prefer to live in the Lakeport or Kelseyville areas because they offered city-type amenities, and the commute distance was insignificant compared to what they were used to in the Bay area (Campbell, June 1981).

Public Services

Within Lake County, public services are provided by several federal, state, and local governmental entities. Public education is provided by seven separate school districts and the County Office of Education. Water supply is provided by numerous private companies and individuals and by the City of Lakeport and several county water agencies. Four sanitation districts in the county provide waste water treatment and disposal services in the more densely populated areas. Residents of the more rural areas rely on individual septic systems for waste water disposal. The county Sheriff's Department provides law enforcement services to all areas of the county except for the two incorporated cities. Fire suppression services are provided by federal and state agencies and local districts, depending upon which entity has jurisdiction over the area involved.

School Districts--Lake County has a total of seven school districts. The districts include Kelseyville Unified, Konocti Unified, Lakeport Unified, Lucerne Elementary School, Middletown Unified, Upper Lake Elementary School, and Upper Lake Union High School (Sedway/Cooke, 1980a). Refer to Figure 5 for a map of district boundaries.

Figure 5 Lake County School Districts

LAKE COUNTY, CALIFORNIA

This map shows generalized data.
Detailed maps are on file with the
Lake County Planning Department.

0 10,000 20,000 feet

Sedway/Cooke

Source: Lake County General Plan Update, Working Paper Number 1

TABLE 10

CHANGES IN SCHOOL ENROLLMENT* IN LAKE COUNTY, 1970-1980
For Middletown Unified, Konocti Unified and Kelseyville Unified Districts

	70**	71	72	73	74	75	76	77	78	79	80	Capacity
MIDDLETOWN UNIFIED												
K-8	224	230	251	225	245	302	319	308	331	345	408	
% Change	-6.6	2.7	9.1	-10.4	8.9	23.3	5.6	-3.4	7.5	4.2	18.3	
9-12	110	123	114	111	123	121	135	149	151	165	161	
% Change	-8.3	11.8	-7.3	-2.6	10.8	-1.6	11.6	10.4	1.3	9.3	-2.4	
Total Enrollment	334	353	365	336	368	423	454	457	482	510	569	580
KONOCTI UNIFIED												
K-8	863	847	864	896	946	1044	1066	1179	1272	1343	1449	925
% Change	11.7	-1.9	2.0	3.7	5.6	10.4	2.1	10.6	7.9	5.6	7.9	
9-12	353	361	376	401	434	506	549	586	620	707	687	850
% Change	8.9	2.3	4.2	6.6	8.2	16.6	8.5	6.7	5.8	14.0	-2.8	
Total Enrollment	1216	1208	1240	1297	1380	1550	1615	1765	1892	2050	2136	1775
KELSEYVILLE UNIFIED												
K-8	454	479	521	513	515	556	538	575	619	674	721	705
% Change	9.4	5.5	8.8	-1.5	0.4	7.9	-3.2	6.9	7.7	8.9	6.9	
9-12	241	258	240	223	256	242	256	300	294	327	362	570
% Change	9.5	7.1	-6.9	-7.1	14.8	-5.5	5.8	17.2	-2.0	11.2	10.7	
Total Enrollment	695	735	761	736	771	798	794	875	913	1001	1083	1275
LAKE COUNTY												
Total Enrollment	4242	4368	4375	4292	4544	4856	4895	5275	5524	5842	6118	
% Change	6.2	2.9	0.2	-1.9	5.9	6.9	0.8	7.7	4.7	5.7	4.7	

Source: Lake County Office of Education, June 1981

* Active enrollment at start of school year.

** Percent change based on enrollment records for 1969

In recent years all of the districts in the county have received increasing numbers of new students, especially in the lower grades, K - 8. With the increasing enrollment of new students, most of the schools have reached capacity and have had to use temporary classrooms to provide additional capacity. A major concern among all of the school districts is the need to expand or improve existing facilities. Many of the districts are applying (or have applied) for financial assistance through the Leroy Greene Act to initiate building programs (Sedway/Cooke, 1980a). In October 1981 these funds were indefinitely frozen by state Executive Order and are not available for financing the cost of capital improvements.

In December 1980, the Middletown Unified District conducted a survey to identify the impact that geothermal development has had on the district. Parents of all students in the district completed a registration card which included questions on the parent's occupation, name of their employer, and their job location. Analysis of survey information shows that parents of one-third of the students were involved in geothermal occupations, and the majority of these parents were employed in drilling operations (Cornelison, 1980). Although similar surveys have not been conducted in the other Lake County school districts, the County Superintendent of Education indicated this will be done in December 1981 for the 1981-82 school year (Luchsinger, June 1981). Results of this countywide survey will be available in May 1982 and will assist the school districts, the county, the geothermal developers, and the Energy Commission in identifying impacts of geothermal resource development and use.

Of the seven districts in the county, the Kelseyville, Konocli, and the Middletown districts are located closest to The Geysers geothermal development

area. As shown in Table 10, each of these districts has experienced a significant increase in enrollment since 1970. Each of these districts is operating at or close to capacity.

- o The Kelseyville Unified School District has experienced an influx of elementary age students. To help manage the increase, the district has shifted its sixth grades from the elementary school to the intermediate school. It also is renting classroom space and planning a small addition for the high school. Based upon 1980 capacity figures shown in a working paper prepared for the County General Plan Update, the elementary and intermediate schools are at or in excess of capacity (Sedway/Cooke, 1980a).
- o The schools in the Konocti Unified School District are all at or beyond capacity, even with supplemental temporary classroom units and rented space. The district has applied for funding available through the Leroy Green School Building Leasing Act to develop additional classroom space for all schools except the East Lake Elementary School (Sedway/Cooke, 1980a). Additional relief was provided by the Lake County Board of Supervisors in May 1981 when they voted to disburse \$16,500 from the County's AB 1905 account. This money will pay for the first year's lease for four portable classroom units. (Refer to Chapter VII for additional discussion of AB 1905 funds.)
- o The Middletown Unified School District was at or near capacity during the 1980-81 school year. In October 1980, the district applied for funds through the Leroy F. Greene Act and was eligible for an additional 16,000 square feet of space. The district plans to build a new elementary school in the Cobb Mountain area where most of its elementary age

students reside. Long-term plans through 1985 include purchase of additional land adjacent to the existing facilities in Middletown, construction of a new high school on this land, and purchase of land and initial planning for a new elementary school in the Hidden Valley area. Assuming an annual increase in enrollment of 10 percent, these facilities should be adequate up through the fall of 1986 (Cornelison, February 1981).

One further consideration in the proposed construction of the Cobb Elementary School is the location of the proposed site in the Boggs Mountain State Forest. A special bill (AB 476) was introduced by Assemblyman Doug Bosco and Senator Barry Keene in February 1981 authorizing the release of state-owned lands from the forest. Following a number of amendments, this bill was passed by the Assembly in May and sent to the Senate where it was further amended. Just prior to adjournment of the legislative session in September 1981, the bill was returned to the Assembly Committee Conference for consideration when the legislature reconvened in January 1982. No action has yet been taken on this bill. If the district had received timely authorization to purchase the state lands for the school site and final plan approval, construction could have begun by April 1982, and the school would have been ready for use by February 1983. Recent "disappropriation" of Leroy Greene Act funds will further lengthen the time involved in getting authorization to develop the proposed Cobb Elementary School.

In April 1981, the County Board of Supervisors approved disbursement of \$30,000 from the county's AB 1905 account for the first year's lease of four portable classroom units. At the time of disbursement, the board told school district representatives not to assume that they would

receive a comparable amount for similar expenses either next year or in subsequent years (Record-Bee: April 24, 1981).

Water Supply--Water for use in Lake County is drawn from both surface and underground sources within the county. Clear Lake is the primary surface source of water for several county water suppliers, either through riparian rights or through purchase from the Yolo County Flood Control and Water Conservation District. This Yolo County district operates Clear Lake as a storage reservoir to the Cache Creek Basin, and the water is used for irrigation in Yolo County (Sedway/Cooke, 1980a).

Principal underground sources in the county are the Scott's Valley, the Big Valley, the Upper Lake, and the Collayomi groundwater basins. These basins experience some seasonal fluctuation in the depth of the water below the surface. Water levels drop during the summer months due to the combined consumption effects of irrigation and tourist population influx and usually recover during the winter rains. However the Scott's Valley and Big Valley groundwater basins have shown some signs of potential overdrafting. The Scott's Valley basin has receded about 0.4 foot per year in the past several years, and there have been some complaints that wells being drilled in the Big Valley basin have to be dug deeper each year (Sedway/Cooke, 1980a).

Within the county, water service is provided by nearly 100 different water suppliers which are registered with the county's Health Department. In addition, many residents of the county have their own wells, pumps, and storage facilities and are not served by any of the suppliers. The registered suppliers may distribute water to as few as 1 or 2 active customers or to well over 5,000 customers. Only 15 of the registered suppliers have more than 200 active customer hookups. (Refer to Figure A in Appendix A for location of these suppliers.)

Most of the water suppliers active in the county seem to have adequate or potentially adequate supplies to meet current demands. Additional water is available either through purchase from sources outside the county, by development of new dam and reservoir facilities on creeks in the county, or by expansion of existing equipment and facilities. (For a more complete discussion of such alternatives, refer to the county's Resource Management Plan prepared in 1976 for the Lake County Flood Control District.)

One potential new resource in the county is construction of the Pomo Dam on Kelsey Creek in the Rincon Valley area 5 miles south of Kelseyville. The proposed dam would impound about 41,000 acre-feet of water in a lake about 3 miles long. In April 1981 the county Board of Supervisors disbursed \$24,000 from its AB 1905 funds for an update of the project cost and revenue figures developed in the mid-1970s (Record-Bee: April 29, 1981). The Pomo Dam project had been abandoned in 1977 due to rising costs but could be reactivated if the updated figures are more favorable.

With so many separate water suppliers scattered throughout the county--each with varying facilities, resources, and capacities--evaluation of their capability to meet future demands is complex. Some of the smaller suppliers may not have the capability to develop and use additional resources. A brief summary of the status of the 15 suppliers with 200 or more active customers is provided in Appendix A of this study. For a more complete discussion of facilities and service capability, refer to "Working Paper #1: Public Facilities and Services" prepared in 1980 by Sedway/Cooke for the Lake County General Plan Update.

One water supplier directly affected by geothermal development was the former Anderson Springs Water Company. It provided service to approximately 200

customers. Its source of water is one or more springs in the Gunning Creek watershed which is traversed by the Socrates Mine Road leading into the southeastern portion of The Geysers geothermal development area. Local residents and the water supplier were concerned that the water source may be adversely affected by geothermal development. In April 1981, the county Board of Supervisors allocated \$2,000 from the AB 1905 funds to complete an initial study of the water resource and services for the Anderson Springs area (Record-Bee: April 24, 1981).

In November 1981, the residents of Anderson Springs elected to form a County Service Area to operate and maintain water service for the community. The voters' approval makes the service area eligible for government grants and authorized the service area to purchase the existing facilities of the Anderson Springs Water Company. The service district can also assess taxes on service users for costs of operation and maintenance. During recent CEC regulatory review of the proposed Occidental Geothermal Plant No. 1 project, Occidental agreed to discuss funding of new facilities for the Anderson Springs County Service Area as a mitigation measure for its proposed project. On December 23, 1981, Occidental agreed to provide a 65,000 gallon storage tank to the district and contribute \$78,000 for metering devices and automated shut-off valves (Record-Bee, December 23, 1981).

Waste Water Facilities--Waste water collection and treatment services in the county are either provided by individual land holders or by facilities operated by public service districts. In the more densely populated portions of the county, waste water services are provided by the Lake County Sanitation District through the Southeast Regional Waste Water System, the Southwest Regional Waste Water System, and the Northwest Regional Waste Water System, and by the City of Lakeport (Sedway/Cooke, 1980a).

In the more sparsely populated areas of the county, waste waters are disposed of through individual septic tank and leach field systems. Several areas within the county have experienced problems with failure of such systems, particularly in the Clearlake Highlands area just south and east of the new City of Clearlake. To help reduce such failures the county adopted Ordinance No. 418 which regulates the use of septic tanks and their location in relation to groundwater tables and other septic tank leach field systems (Sedway/Cooke, 1980a).

- o Southeast Regional Waste Water System--This system serves the communities of Clearlake Park and Clearlake Highlands (portions of which became the incorporated city of Clearlake) and Lower Lake. The system is comprised of a treatment plant which has a capacity of 1.75 million gallons per day (mgd) and a storage reservoir and sprinkler irrigation system covering 250 acres for disposal of treated effluent. Recent expansion of the irrigation area provides space for discharge of up to 3.5 mgd of effluent (Sedway/Cooke, 1980a).

The system is currently operating at about 40 percent of capacity. Average summer flows are 0.68 mgd, and average winter flows are 1.2 mgd. The winter flows include runoff from seasonal rainfall and may occasionally exceed the capacity of the storage reservoir. The treatment plant is expected to meet the area's service needs through 1985. Additional storage facilities and land for effluent disposal would be needed to use this capacity (Sedway/Cooke, 1980a).

One irregularly shaped area south of Clearlake Highlands remains unsewered and is subject to a discharge prohibition by the Central Valley

Regional Water Quality Control Board which does not allow construction or use of any new septic tank/leach field systems in the area. The area has applied for Clean Water Grant Act funding for construction of a collector system to connect it with the Southeast Regional treatment plant. Funding for such collector systems currently has a low priority with the federal government, and these funds may no longer be available for new projects after October 1, 1981 (Brown, July 1981).

- o Northwest Regional Waste Water System--This system serves the area north of Parkway Road near Lakeport and the communities of Nice, Kono Tayee, and Upper Lake. Upper Lake has decided not to use the regional system, and Kono Tayee expects to connect to it this year. To serve these areas the system includes two major interceptor pipelines, one running southward toward Lakeport and the other running northeasterly toward Nice and Lucerne (Sedway/Cooke, 1980a).

The Northwest system is comprised of a treatment plant which has a capacity of 2.75 mgd and a storage reservoir and sprinkler irrigation system covering 540 acres for disposal of effluent. The system is currently operating at 40 percent of capacity. Average dry weather flows are 1.3 mgd, and average wet weather flows are 1.8 mgd. The winter flows include runoff from seasonal rainfall and may occasionally exceed the capacity of the storage reservoir (Sedway/Cooke, 1980a).

- o Southwest Regional Waste Water System--This system serves the Kelseyville area and is comprised of a treatment plant, stabilization ponds, and a series of flood irrigation ditches used for disposal of effluent. Treatment plant capacity is 0.284 mgd, and the plant is operating at about 60 percent of capacity. Average dry weather flows are 0.18 mgd,

and average wet weather flows are 0.234 mgd. There currently are no plans for service expansion other than construction of another stabilization pond and a chlorine contact structure (Sedway/Cooke, 1980a).

- o City of Lakeport--This system serves residents within the city and a portion of the area north of the city limits. The city also contracts with the Northwest Regional Waste Water System to treat 400,000 gallons of waste water per day. This amount will increase to 500,000 gpd by 1984 (Sedway/Cooke, 1980a).

The city's waste water system is comprised of a treatment plant, storage ponds, and a sprinkler irrigation system covering 150 acres for disposal of effluent. The disposal system has been expanded to include an additional 240 acres for sprinkler irrigation. Treatment plant capacity is 569,600 gallons per day (gpd), with average dry weather flows of 500,000 gpd and average wet weather flows of 569,000 gpd.

The treatment plant was designed to handle expected flows through the year 1986, at which time additional expansion would be necessary. The city has undertaken a pipeline repair and replacement program which should improve capacity by reducing infiltration. An area south of the city limits has expressed an interest in annexation for sewer services because the residents' present septic tank/leach field systems are subject to failures during the rainy season when the groundwater table is high (Sedway/Cooke, 1980a).

Protective Services--Services available in the county are provided primarily by local departments, county service districts, and service contracts. Within the city limits of Lakeport, protective services are provided by the city

police force and city fire department. Outside the city limits, local fire departments are supplemented by the California Division of Forestry and the United States Forest Service for fire suppression and rescue services. The county Sheriff's Department provides law enforcement services.

- o Law Enforcement--Law enforcement services in unincorporated portions of the county are provided by the Sheriff's Office which is headquartered in Lakeport. Of the 72 employees in the Sheriff's Office, 25 are assigned to the patrol division. The remainder of the employees include executive officers, detectives, bailiffs, boat patrolmen, administrative staff, and civil deputies (Record-Bee: May 13, 1981).

In May 1981, the Sheriff's Office requested a disbursement of AB 1905 funds to hire four new deputies, to replace two wrecked patrol cars, and to purchase additional safety equipment for the officers. Estimated costs were as follows:

Four deputies salaries and fringe benefits	\$ 96,132
Training new deputies at police academy	10,000
Two patrol cars	16,000
Equipment	<u>3,952</u>
TOTAL	\$126,084

In requesting the AB 1905 funds, the Sheriff's Office stated that they believed the Middletown area has been most affected by geothermal-related population increases. The department currently has two deputies working near the Middletown area and was proposing to use the funds to double the number of deputies serving the area (Record-Bee: May 15, 1981). Following additional discussion among representatives of the county Board

of Supervisors and the Sheriff's Office, the board allocated \$90,000 from county funds to hire three new deputies and to purchase necessary equipment (Record-Bee: June 5, 1981). Funds from the county's AB 1905 account were used to provide \$48,795 of this amount, and the new deputy was to be assigned to the Middletown/Cobb area (Cox, August 1981).

The county Sheriff's Office initially provided services to the newly incorporated city of Clearlake under a contract agreement. The city hired and trained its own police force and had cars and equipment ready to take over law enforcement services within the city in October 1981. The county Sheriff's Office then reassigned the deputies serving in Clearlake to other areas of the county (Record-Bee: May 13 and October 2, 1981).

The City of Lakeport police department has one office in the city with a full-time staff of 11, plus a reserve force of 7 officers. The department is also assisted by 16 - 19 year old youths who are participating in an Explorers-Cadets program (Sedway/Cooke, 1980a).

- o Fire Suppression Services--Within the county there are seven local fire departments and one park and recreation district which provide fire suppression services. The local departments include the City of Lakeport; the Upper Lake, Clearlake Oaks, Lakeshore, Lower Lake, Kelseyville, and the Middletown Fire Departments; and the Lucerne Park and Recreation District. These local departments handle primarily structural fires and rescue calls but are also required to assist in wildland fires within their service areas which are not included in the designated State Responsibility Areas (Sedway/Cooke, 1980a).

In late May 1981, the Kelseyville Fire Protection District requested that the county Board of Supervisors disburse funds from the county's AB 1905

account to cover the cost of replacing an aging district fire truck. The district's fire chief indicated that they were responding to an increased number of fire calls in the Loch Lomond area. He indicated this increase was a result of an increase in full-time residents related to geothermal activity, and that another geothermal power plant was planned in the area. After some discussion the Board of Supervisors voted to allocate as much as \$30,000 from the AB 1905 funds toward the purchase of a replacement vehicle (Record-Bee: May 22, 1981).

Fire suppression services of the local fire departments are supplemented by state and federal agencies. From May 1 through October 15, the U.S. Forest Service has primary responsibility for fire protection within the Mendocino National Forest in the northern third of the county. Under an agreement with the state, the Forest Service also protects several tracts of private land within or adjacent to the national forest lands. In order to protect large areas of undeveloped lands located outside the National Forest in the county, the California Division of Forestry (CDF) has assumed responsibility for wildfire suppression during May through October. Through a separate agreement with the county, the CDF provides year-round protection to those parts of the county not covered by local fire departments (Sedway/Cooke, 1980a).

MENDOCINO COUNTY

Located about 100 miles north of San Francisco, Mendocino County is bounded by the Pacific Ocean and, on the inland sides, by the counties of Humboldt, Trinity, Tehama, Glenn, Lake, and Sonoma. Two major transportation routes which traverse the county from north to south are U.S. Highway 101 in the interior and State Highway 1 along the coast. Other major routes within the county are State Highways 128, 162, and 253. The Northwestern Pacific Railroad provides rail access through the county on a route which parallels U.S. Highway 101. The county is also served by airports at Covelo, Willits, Mendocino, Booneville, and Ukiah.

Most of the county's 3,500 square miles are rural, and the traditional mainstays of the local economy are timber harvesting and processing and agriculture. The scenic coastline and outdoor recreational facilities have become increasingly popular tourist attractions and are now comparable to timber and agriculture in importance to the local economy (Mendocino County Chamber of Commerce, 1979).

Demographic Characteristics

The principal population centers of Mendocino County are the four incorporated cities of Fort Bragg, Point Arena, Ukiah, and Willits. As shown in Table 11, the county's total population has increased over 30 percent, from 51,101 in 1970 to 66,751 in 1980 (U.S. Census, 1980). The county's population remained fairly constant until 1976 with an annual average 2.6 percent growth rate. The overall growth rate of Mendocino's incorporated cities has averaged approximately 15.8 percent since 1970.

TABLE 11

POPULATION GROWTH in MENDOCINO COUNTY

<u>City</u>	<u>1970 Population¹</u>	<u>1980 Population¹</u>	<u>Percent Change¹</u>
Fort Bragg	4,455	5,032	+ 13.0
Point Arena	424	427	+ 0.7
Ukiah	10,095	12,067	+ 19.5
Willits	<u>3,091</u>	<u>4,018</u>	+ 30.0
County Total	51,101	66,738 ²	+ 30.6

1. 1980 United States Census, "Preliminary Counts for Cities, Counties and State" (January 1981).

2. The California State Census Data Center, "Newsletter" insert, preliminary final counts (March 31, 1981).

Unlike most California counties, Mendocino County's population resides primarily outside incorporated communities. In 1970 the distribution was 34.5 percent urban and 65.5 percent rural (U.S. Census, 1970). Ukiah is the county's largest city and is located nearest The Geysers KGRA. It is situated in the U.S. 101 corridor where most of the county's population is also centered. Unincorporated communities within the KGRA are located either along Highway 101 or Highway 128. The principal unincorporated areas in the county are the communities of Yorkville (population: 202); Booneville (976); Redwood Valley (2,762); Calpella (841); Talmage (1,045); and Hopland (796). These communities are located within 60 miles of The Geysers development area.

The county anticipates continued population growth because of the (1) attractiveness of the rural nature of the county, (2) increased retail and commercial development in the Ukiah area, (3) reduction in commute time to Santa Rosa due to improvements on Highway 101, and (4) the comparatively lower

land and housing costs in contrast to Sonoma or the Bay Area counties (Mendocino Chamber of Commerce, 1978). According to statewide projections, Mendocino County is considered one of the 10 fastest growing counties in California with a population of less than 100,000 (DOF, 1980).

Access from Mendocino County to the eastern portion of The Geysers geothermal development area is provided by U.S. Highway 101 to the intersection with State Highway 175 near Hopland and across the Mayacmas Mountains into Lake County. Access to the western portion of The Geysers is provided by U.S. Highway 101 to the intersection with State Highway 128 either near Cloverdale or near Healdsburg in Sonoma County. In either case the driving distance is approximately 60 or 70 miles, and the estimated travelling time is about 1 hour and 40 minutes.

Economic Base and Employment

The economy of Mendocino County is based primarily on the agriculture government, services, manufacturing (primarily lumber and wood products), and tourism. The mainstays of the local economy have been abundant timber resources and agriculture. The scenic coastline and outdoor recreational facilities have provided increasingly popular tourist attractions and may help to offset some of the decline in the timber industry. Except for the governmental sector, the majority of the county's economy is subject to seasonal fluctuation.

After three years of rapid growth, total employment in Mendocino County in the first quarter of 1981 reached its lowest point since 1976. This slower trend was primarily due to the depressed lumber industry and the lack of any new major industrial development within the county (EDD, 1981e). As shown in

Table 12, unemployment had decreased to 12.5 percent during 1979. By the first quarter of 1981, however, it had risen to 16.1 percent, which was double the current state average. Due to the seasonal pattern of Mendocino's major industries (lumber, agriculture, tourism), unemployment rates are projected by county planners to continue to outpace state and seasonal rates (Bashoe, June 1981). Although agricultural jobs increased slightly in 1979 and 1980 due to larger pear and wine grape harvests, lumber industry jobs are still expected to decline (BLM, 1978). According to county planning staff, Mendocino County has a shortage of highly skilled workers and an abundance of semiskilled and unskilled workers (Bashoe, June 1981).

Wage and salary employment in the county declined in 1980 as the national recession influenced payrolls in every industry division. Lumber and construction payrolls were the hardest hit, losing 700 jobs in 1980. Services, finance, insurance, real estate, and government posted employment gains but at a slower rate of growth than in previous years. The outlook in 1981 was for slow growth followed by continued improvement in 1982 with employment reaching 24,000 as the economy recovered (EDD, 1981d).

As shown in Table 13, the manufacturing division maintained its position as the largest wage and salary employer in Mendocino County in 1980, employing nearly 22 percent of the workers. Despite receding payrolls in lumber and wood products, this sector employed nearly 64 percent of those employed in manufacturing. Lumber payrolls continued the decline begun in 1979 in response to slackening demand from the nation's construction industry. In 1981 EDD expected that the high interest rates, tight money, and inflation which depressed demand for lumber during 1980 would continue to keep the

TABLE 12
CIVILIAN LABOR FORCE, EMPLOYMENT AND UNEMPLOYMENT¹
Mendocino 1974 - 1980

<u>Year</u>	<u>Labor Force² Annual Avg.</u>	<u>Employment³ Annual Avg.</u>	<u>Unemployment⁴ Annual Avg.</u>	<u>Unemployment Rate⁵ (percent)</u>		
				<u>High Month</u>	<u>Low Month</u>	<u>Annual Avg.</u>
1974	23,250	20,575	2,675	Dec: 19.5	Aug: 7.1	11.5
1975	24,375	20,775	3,600	Jan: 22.3	Aug: 9.6	14.8
1976	25,825	22,875	2,950	Jan: 18.0	May: 7.0	11.4
1977	28,000	24,975	3,025	Jan: 15.7	Aug: 8.0	10.8
1978	29,100	26,500	2,600	Jan: 13.2	Oct: 5.9	9.0
1979	29,875	27,275	2,600	Jan: 12.5	Sept: 6.1	8.7
1980	29,500	26,375	3,125	April: 13.3	Sept: 8.1	10.6

Source: EDD, 1981d.

1. Civilian labor force, employment and unemployment are by place of residence.
2. Civilian labor force is the sum total of potential workers, employed and unemployed.
3. Includes persons involved in labor management trade disputes.
4. Includes all persons without jobs and actively seeking work.
5. Unemployment rates and annual averages are computed from unrounded data: therefore, they may differ from rates and averages calculated by using the rounded figures in this table.

TABLE 13
WAGE AND SALARY EMPLOYMENT BY INDUSTRY
Mendocino County 1980 - 1982

	Actual <u>1980</u>	Annual Averages Projected	
		<u>1981</u>	<u>1982</u>
Wage and Salary Workers ¹	23,025	23,275	24,000
Agriculture, Agri. Services, Forestry, and Fisheries	1,425	1,475	1,500
Nonagricultural Industries	21,600	21,800	22,500
Construction and Mining	725	725	750
Manufacturing	5,050	5,025	5,175
Lumber & Wood Products	3,225	3,225	3,300
Other Manufacturing	1,825	1,800	1,875
Transportation and Public Utilities	1,075	1,100	1,150
Wholesale Trade	625	650	700
Retail Trade	4,325	4,375	4,525
Finance, Insurance, and Real Estate	800	825	850
Services	4,300	4,425	4,700
Government	4,700	4,675	4,650

Source: EDD, 1981d.

1. Wage and salary employment is reported by place of work and does not include persons involved in labor management dispute.

Note: Parts may not add to totals or subtotals due to independent rounding.

lumber industry payrolls below their 1978 and 1979 levels. As interest rates begin to fall in early 1982 and the demand for construction increases, the industry should also begin to recover (EDD, 1981d).

Mendocino County's manufacturing activities became more diversified during the seventies. By 1980, 36 percent of the area's manufacturing jobs were outside of lumber and wood products. Many of the new jobs were in nonelectrical machinery production which is one local industry that could benefit from national plans for increased defense spending during the EDD's 1981 - 1982 forecast period. Additional jobs will be generated by local food processors who have plans for expanding wine making, while other scattered employment gains will continue to occur as small manufacturing establishments start operations in the county (EDD, 1981d).

The second largest wage and salary employer in the county is government. In 1980 over 20 percent (annual average) of the county's workers were employed by some division of federal, state, or local government. This category showed a 5 percent increase in workers over 1979 figures due to new positions in schools and local government funded by revenue sharing. Federal employment registered unusually high figures during the summer and fall of 1980 due to temporary hiring for the 1980 Census. During 1981 and 1982 the total number employed in the public sector will decline with the tightening of public funding. The amount of "bailout" funds available from the state surplus to local government to soften the effects of Proposition 13 will be minimal in 1981, resulting in reductions in government personnel. At the same time, inflation-fighting and cost-reducing policies planned by the new administration will not only keep payrolls within the federal government from growing

during the forecast period but also curtail locally run but federally funded programs (EDD, 1981d).

Mendocino County's third largest industry, retail trade, employed 3,325 people in 1980, an increase of only 25 jobs above the 1979 level. Nineteen percent of the total wage and salary employment for the county is in the retail trade division. This normally fast-growing industry slowed in 1980 with increases restricted primarily to eating and drinking establishments and food stores (EDD, 1981d).

The services industry ranks fourth in employment in Mendocino County and has shown strong, steady growth in recent years with a job increase of almost 100 percent since 1972--more than double the growth rate for all other industries. In 1980 services grew to an all time high of 4,300 jobs, and during the 1981-82 period this industry is expected add 400 new jobs (EDD, 1981d).

Agriculture, Mendocino's fifth largest industry, which employed 1,425 people in 1980, will climb to 1,500 by 1982, as pear and grape acreage continues its slow, steady growth. In addition to the reduced size of annual catches, the fishing industry was hard hit by the early closing of the fishing season in 1980 (EDD, 1981d).

Housing Availability

Since 1970 the number of housing units in Mendocino County has increased by nearly 53 percent, while the population has increased by nearly 31 percent (DOF, 1981 a&b). Information on 1980 vacancy rates for the county will be available when the 1980 U.S. Census data are published sometime in 1982. Since Mendocino County has a high percentage of second homes, the actual

availability of housing in the county may be lower than vacancy rates would indicate.

Of the four incorporated cities in the county, Ukiah is located nearest The Geysers development area. Ukiah is the county seat and has shown over a 37 percent increase in housing units between the 1970 and 1980 U.S. censuses and a 20 percent increase in population (DOF, 1981a&b). According to a 1977 survey of housing done by the state, the vacancy rate for Ukiah and vicinity was slightly over 4 percent (McCrossin, June 1981).

City representatives provided estimates of current housing vacancy rates: slightly less than 2 percent in May (Payne, May 1981) and somewhat more than 1 percent in October (Harris, October 1981). Single family units comprise the majority of the 4,900 housing units within the incorporated city limits, with a vacancy rate that ranges between 0.5 and 1.0 percent. The remainder of the housing units are multiple family units and mobile homes. The vacancy rate for mobile home units ranges between 0 and 1.0 percent (Harris, October 1981) and is about 2 percent for multiple family units (Harris, January 1982).

Recently, five or six motels have been converted into short-term housing units which charge weekly or monthly rates for bachelor-type units. These conversion units also have a low vacancy rate, since they are available at a reasonable rate. These units have proved attractive to low-income people and have moderated the seasonality of income to owners of the units (Harris, January 1982).

The community of Hopland is located approximately 12 miles south of Ukiah, near the intersection of State Highways 101 and 175. Hopland is a rural community of about 1,200 residents and, according to the local postmaster, has

a vacancy rate of about 1 percent. Single family residences comprise the majority of the housing units in the area and have an estimated vacancy rate of 1 percent. There are also multi-family residences and mobile homes in the community, but the vacancy rate is nearly zero. Two local motels have been converted to monthly rentals and the vacancy rate for these units also is quite low (Phillips, October 1981).

Public Services

Within Mendocino County, public services are provided by several federal, state, and local entities. Public education is provided by 12 separate school districts and the County Office of Education. Water supply is provided by approximately 10 major water districts throughout the county and, for some rural landowners, by individual wells. In areas of large or concentrated population, a number of agencies provide sanitation services while the more rural rely on septic systems for waste water disposal. Law enforcement services are provided through the county Sheriff's Department or through individual city police departments. Fire suppression service within the incorporated areas is provided by the cities' departments and in the unincorporated areas by contract agreement with the state Department of Forestry. Within the national forest, the U.S. Forest Service provides fire suppression services.

School Districts--Mendocino County has 12 school districts with 22 elementary schools and 13 secondary schools. Countywide, the total current enrollment in Mendocino elementary and secondary schools has reached approximately 15,000 students. Total enrollment increased by 4 percent between 1972 - 1976 and by 10 percent between 1976 - 1981 (Delsol, June 1981).

School districts located nearest the KGRA include (1) Ukiah Unified, 5,600 students; (2) Potter Valley Community Unified, 500; (3) Anderson Valley Unified, 450; and (4) Willits Unified, 1,800. Although all of these districts except Anderson Valley are operating near capacity, each district could absorb approximately 100 additional children. The Ukiah Unified District could absorb between 200 - 300 additional children, since the district is the largest in the area (Delsol, June 1981).

Water Supply--Mendocino County has approximately 10 major water districts to provide water supplies throughout the county (Hudson, June 1981). The City of Ukiah Water District is located nearest the geothermal development area. The district has a storage capacity of 2.6 million gallons. The Russian River supplies the majority of the water, and deep wells supply additional water. Currently, the city is planning a reservoir with a storage capacity ranging between 2.5 - 3.0 million gallons. Although the city has adequate water supplies, they believe there is a need to expand the existing storage capacity to meet future population growth needs (Goforth, June 1981).

Waste Water Facilities--Mendocino County has approximately 10 major sanitation districts. Unincorporated rural areas of the county rely on septic tanks and leach field systems for waste water disposal.

The city of Ukiah has a waste water treatment capacity of 2.5 million gallons per day, and present use during the dry season is 1.8 mgd. Since 1976 the city has been under a cease and desist order from the Water Quality Control Board due to periodic high water flows which exceed capacity. To correct the problem the city is planning to modernize existing waste water facilities at a cost of approximately \$6 million (Noyd, July 1981).

Protective Services--Services available within the county are provided primarily by local departments, county service districts, and service contracts.

- o Law Enforcement--Mendocino County maintains its own Sheriff's Department, and incorporated cities have additional police protection. The closest Sheriff's Department office adjacent to the KGRA is located in Ukiah, and it provides services to unincorporated communities such as Hopland. The Sheriff's Department employs 55 deputies to provide law enforcement services throughout the county. The Sheriff's Department is not planning to expand present services (Pascoe, June 1981).

Within the City of Ukiah, the Police Department employs 22 officers to provide law enforcement services within the city limits. The department also employs 22 reserve officers to provide additional services as needed. Although the department is feeling the effects of population growth, it currently has no plans for expansion. The cost of expanding existing police services is approximately \$ 45,000 which includes both salary and benefits for one additional police officer (Williams, June 1981).

- o Fire Suppression Services--Within the county there are four fire districts with 23 local fire departments. The local fire districts include the City of Ukiah and the Little Lake, Redwood Valley, and Brooktrails Fire Districts. All districts have voluntary fire staff except the City of Ukiah which has a paid staff of 19 employees (Donahue, September 1981).

The Ukiah Fire District is the only nonvolunteer district in Mendocino County. The district has two departments covering the City of Ukiah,

which contains approximately 4 square miles, and the adjacent county area, with an area of approximately 40 square miles. The majority of fire services provided by the district is sponsored by a contract between the City of Ukiah and Mendocino County. According to the Ukiah District Fire Chief, unless Mendocino County meets its contract obligations of \$50,000 during the current 1981/1982 Fiscal Year, the city will maintain fire services only within the incorporated limits of the City of Ukiah (Donahue, September 1981).

Fire suppression services of the local fire departments are supplemented by state and federal agencies. From May 1 through October 15, the U.S. Forest Service has primary responsibility for fire protection within the Mendocino National Forest and other federal lands within the county. Under an agreement with the state, the forest service also protects several tracts of private land within or adjacent to the national forest lands. In order to protect large areas of undeveloped lands located outside the National Forest in the county, the California Department of Forestry has assumed responsibility for wildfire suppression from May through October. Through a separate agreement with the county the CDF provides year-round protection to those parts of the county not covered by local fire departments (Donahue, September 1981).

NAPA COUNTY

Napa County lies 45 miles north of San Francisco and Oakland, and is part of both the nine-county "Bay Area," and the six-county "Redwood Empire." Located in the California Coastal Range, 45 miles west of the Pacific Ocean, the county is bordered by Lake County on the north, Sonoma County on the west, Solano County on the southeast, and Yolo County on the east. The primary transportation routes within the county are State Highways 29, 121, and 128. The Southern Pacific Transportation Company provides rail access up the Napa Valley as far as Calistoga. The county is served by airports at Napa and Calistoga.

Major topographic features include the Napa Valley, which is internationally known for its wine industry, and the mountain ranges surrounding the Napa Valley. These mountains have elevations up to 4,400 feet and are a major recreational resource for the San Francisco Bay Area. Lake Berryessa, located in the county's eastern mountain range, is the most significant recreational attraction in the county (EDD, 1979).

Access from Napa County to the eastern portion of The Geysers geothermal development area is provided by State Highway 29/128 to the northerly separation of State Highway 29 in Calistoga and on through Lake County. Access to the western portion of The Geysers is provided by State Highway 128 to the intersection with the Geysers-Healdsburg Road north of Healdsburg in Sonoma County. Approximate driving distances from communities in Napa County to The Geysers geothermal development area range between 30 and 70 miles. Translating these distances into approximate driving times, the trip from Yountville to The Geysers would require 65 minutes; from St. Helena, 55 minutes; from Calistoga, 45 minutes; and from Napa, 75 minutes.

Demographic Characteristics

According to Department of Finance projections, Napa County is among California's 10 fastest growing counties with populations less than 100,000 and is experiencing the largest numerical gain of these counties (DOF, 1980). As indicated in Table 14, the county's total population increased over 25 percent between 1970 and 1980 (U.S. Census, 1980). The growth rate remained fairly constant at approximately 2 percent annually until 1980 when the growth rate doubled to 4 percent. The principal population centers of Napa County are the four municipalities of Calistoga, Napa, St. Helena, and Yountville. These four cities are located on Highway 29/128, and nearly 62 percent of the county's population resides in these incorporated communities. Based upon the data in Table 14, the population of Calistoga apparently has more than doubled in the past 10 years, but this growth is attributable, in part, to an increase in the city's incorporated limits.

The City of Napa is the commercial and residential hub of Napa County. In the 10 years between 1970 and 1980, the population of the city increased 13,879. This was the largest growth in absolute numbers of any community in the county. In an effort to control its growth, the city adopted a growth management plan in 1979. The goal of this plan is to limit the city's growth to a total population of 75,000 in the year 2000 by restricting residential construction (EDD, 1979).

TABLE 14

POPULATION GROWTH IN NAPA COUNTY

<u>City</u>	<u>1970 Population¹</u>	<u>1980 Population¹</u>	<u>Percent Change³</u>
Calistoga	1,882	3,882	+ 106.3
Napa	36,103	49,892	+ 38.2
St. Helena	3,173	4,661	+ 46.9
Yountville	<u>2,332</u>	<u>2,850</u>	<u>+ 22.7</u>
County Total	79,140	99,199 ²	+ 25.3

1. 1980 United States Census, "Preliminary Counts for Cities, Counties and State" (January 1981).
2. The California State Census Data Center, "Newsletter" insert, preliminary final count (March 31, 1981).
3. Change includes growth due to annexation of new areas.

Unincorporated areas of the county outside the Napa Valley have not displayed substantial growth. In fact, these areas have shown a moderate decrease. The trend of migration toward the urban centers has acted to conserve the county's agricultural and scenic land resources outside of the Napa Valley (EDD, 1979). Unincorporated communities in the county nearest The Geysers geothermal development area are generally located along State Highway 128. The principal unincorporated areas are the communities of Angwin (population: 3,526); Deer Park (1,454); Rutherford (150); Aetna Springs (150); and Pope Valley (250).

Economic Base and Employment

The economic base of Napa County is primarily agriculture, government services, tourism, and manufacturing. The mainstays of the local economy are the wine industry and tourism. Government comprises the largest employment

sector in Napa County's economic base. Services and retail trade are the second and third largest employers in the county. Geothermal development represents an insignificant portion of Napa County's economy at this time (Nelson, June 1981).

As indicated in Table 15, the average annual unemployment rate in Napa County has ranged between 7.2 and 10.3 percent since 1974. These rates were consistently lower than the statewide average for the same time period. This trend is expected by EDD to continue due to the local economy's reliance upon nonseasonal employment such as services, retail trade, and manufacturing. These sectors currently account for 75 percent of local county employment, and EDD expects employment gains to continue, bringing about 21,000 new jobs to the Vallejo-Fairfield-Napa SMSA between 1980 and 1985. Replacement needs during this period will create another 19,000 job openings as workers retire or leave the labor force for other reasons (EDD, 1981g).

Although agriculture employs less than 10 percent of the work force in Napa County, agricultural production, especially of wine grapes, has continued to be an important contributor to Napa County's economy. In 1980, agriculture contributed over \$66 million to the local economy--the highest value ever recorded--and wine grapes constituted nearly 75 percent of that value. During the next two years, no major changes are expected to take place that would substantially affect the number of agricultural jobs (EDD, 1981g).

TABLE 15

CIVILIAN LABOR FORCE, EMPLOYMENT AND UNEMPLOYMENT¹

Napa County 1974 - 1980

<u>Year</u>	<u>Labor Force² Annual Avg .</u>	<u>Employment³ Annual Avg.</u>	<u>Unemployment⁴ Annual Avg.</u>	<u>Unemployment Rate⁵ (percent)</u>		
				<u>High Month</u>	<u>Low Month</u>	<u>Annual Avg.</u>
1974	99,700	93,800	5,900	Jan: 7.2	Aug: 4.8	5.9
1975	103,800	96,400	7,500	Jan: 8.8	Aug: 6.5	7.2
1976	109,400	100,700	8,700	Nov: 10.3	May: 5.8	7.9
1977	116,300	106,900	9,400	Jan: 9.9	Dec: 6.8	8.1
1978	120,100	112,100	8,000	Jan: 7.8	Oct: 5.6	6.6
1979	124,000	116,000	8,000	Jan: 7.4	June: 5.6	6.4
1980	126,600	117,200	9,400	April: 8.3	Dec: 6.7	7.4

Source: EDD, 1981b.
Joe Preston, EDD.

1. Civilian labor force, employment and unemployment are by place of residence.
2. Civilian labor force is the sum total of potential workers, employed and unemployed.
3. Includes persons involved in labor management trade disputes.
4. Includes all persons without jobs and actively seeking work.
5. Unemployment rates and annual averages are computed from unrounded data; therefore, they may differ from rates and averages calculated by using the rounded figures in this table.

As indicated in Table 16, government is the largest employer in Napa County. In 1980, 26 percent (annual average) of the county's work force was employed by some division of federal, state, or local government. During the next two years, government entities will be forced to operate in the face of serious reductions in funding brought about by major cutbacks in the federal budget. The reduction and cancellation of federal funds to various state and local programs will restrict job growth at all levels (federal, state, and local) as many human services programs are either eliminated or greatly curtailed. Hiring freezes are currently in effect at the federal and state levels, as well as in some city and county jurisdictions, and this is likely to continue through the 1981-82 period (EDD, 1981g).

The services division is the second largest major industry group in the county, employing over 23 percent (annual average) of the county's wage and salary workers. Growth among service industries has traditionally been strong and steady, and this trend was maintained in 1980. During the next two years, EDD expected the growth rate for service industries to slow from the 1980 pace, but they expected an additional 200 jobs in services in 1981 and another 300 jobs in 1982 (EDD, 1981g). Retail trade is the third largest employer in Napa County, employing over 16 percent (annual average) of the county's work force in 1980. During the 1981-82 forecast period, EDD expects an additional 500 jobs in retail trade as population growth, decreasing interest rates, and a pickup in tourism produce an increase in retail activity (EDD, 1981g).

Manufacturing is the fourth largest employer in Napa County, providing jobs for nearly 13 percent of the county's work force in 1980. The manufacturing

TABLE 16

WAGE AND SALARY EMPLOYMENT BY INDUSTRY

Napa County 1979 - 1982

	Annual Averages			
	Actual 1979	1980	Projected 1981	1982
Total Wage & Salary Workers ¹	33,400	34,100	34,600	35,700
Agricultural employment	2,700	2,800	2,800	2,800
Nonagricultural employment	30,700	31,200	31,800	32,900
Mining & construction	1,500	1,400	1,300	1,400
Manufacturing	4,600	4,400	4,600	5,000
Durable goods	2,100	1,800	2,000	2,200
Nondurable goods	2,500	2,600	2,600	2,800
Food & kindred products	1,500	1,600	1,600	1,700
Other nondurable goods	1,000	1,000	1,000	1,300
Transportation & public utilities	1,300	1,300	1,300	1,300
Wholesale trade	7700	700	700	700
Retail trade	5,400	5,500	5,700	6,000
Food stores	1,000	1,100	1,100	1,200
Eating & drinking places	1,800	1,800	1,900	2,000
Other retail trade	2,600	2,600	2,700	2,800
Finance, insurance, & real estate	1,100	1,000	1,100	1,100
Services	7,400	8,000	8,200	8,500
Health	2,700	2,900	3,000	3,100
Other services	4,700	5,100	5,200	5,400
Government	8,700	8,900	8,900	8,900
Federal	200	300	300	300
State and local	8,500	8,600	8,600	8,600

Source: EED, 1981g.

1. Employment reported by place of work and does not include persons involved in labor-management trade disputes.

Note: Parts may not add to totals due to independent rounding.

division is dominated by two industries, food processing and primary metal production. Together these industries provide more than half of the employment in the division. During 1980, manufacturing payrolls fell by 200, as high interest rates and inflation caused manufacturers to slow down production. The effects of the current recession were most evident in the durable goods sector where job totals were well below the previous year's level. Jobs in the nondurable goods sector rose slightly due to expansion in some of the area's larger wineries (EDD, 1981g).

The adverse conditions that plagued the home building climate in 1980 were not expected to significantly improve in 1981. Even though the demand for housing remains strong, potential home buyers faced high mortgage rates and difficulty in obtaining building funds. With inflation remaining high and building costs escalating, housing starts were kept to a minimum. According to EDD projections, 1982 should see a gradual improvement in both the economy and local building activity (EDD, 1981g).

Housing Availability

Since 1970 the number of housing units in Napa County has increased by over 49 percent while the population has increased by about 25 percent (US Census, 1980). According to a 1975 DOF Census, the total housing vacancy rate for Napa County ranged between 3.6 percent in Napa to 15.5 percent in Calistoga with an overall county average of 6.7 percent. The study categorized housing units by structure type and showed the lowest vacancy rate occurring in single family dwellings and the highest vacancy rate occurring in large, multi-family dwellings (DOF, 1975).

Information on 1980 vacancy rates for the county will become available when the 1980 U.S. Census data are published. Since some areas of Napa County also have a number of second homes, the actual availability of housing in the county may be lower than vacancy rates would indicate.

Of the four incorporated cities in Napa County, Calistoga is located nearest The Geysers development area. Between the 1970 and 1980 Censuses this city showed over a 106 percent increase in population and about a 79 percent increase in housing units (DOF, 1981a&b). City planning staff have indicated there is an average housing vacancy rate of less than 1 percent. The majority of the housing in the city is single family units, and the vacancy rate is nearly 1 percent. For the multi-family and mobile home units, the vacancy rate is nearly zero (Noble, October 1981).

Conversion of motel units to housing units in the summer months provides some additional housing. However, city staff indicated that competition for housing in the city for either rental or for purchase is so great that there is often a waiting list of potential renters and buyers for each unit expected to become vacant (Noble, June 1981).

The City of St. Helena is located about a 10 minute drive south of Calistoga. The population of the city has increased by nearly 47 percent between the 1970 and 1980 Census, while the number of housing units has increased by over 65 percent (DOF, 1981a&b). Single family units comprise the majority of housing in the city, and there is a vacancy rate of between 2 and 3 percent. The vacancy rate for mobile homes and multi-family units is nearly zero (Musso, October 1981).

The City of Yountville is located about 15 miles south of St. Helena. The population increased by over 22 percent between the 1970 and 1980 Census, while the number of housing units increased by over 106 percent (DOF, 1981a&b). There are approximately 900 housing units located within the city limits. Most of the available housing is either single units or mobile homes, and the vacancy rate is about 3 percent (Lander, October 1981).

Public Services

Within Napa County, public services are provided by several federal, state, and local entities. Public education is provided by five separate school districts and the County Office of Education. Water supply is provided by four districts and, for some rural landowners, by individual wells. In areas of large or concentrated population, four sanitation districts provide waste water treatment and disposal services, while more rural areas may rely on individual septic systems. Law enforcement service is provided through the County Sheriff's Department or through local city police. Fire suppression services are provided by federal, state agencies, and local districts, depending upon which entity has jurisdiction over the area involved.

School Districts--Napa County is served by five school districts encompassing 18 elementary schools and 5 secondary schools. Present total enrollment in these districts is approximately 14,412, and there has been little growth for the past 10 years (Merritt, July 1981). School districts nearest the KGRA include the Calistoga Joint Unified and the Napa Valley Unified.

Napa Valley Unified is the largest school district with a total enrollment of 12,000 students. Decreased enrollment trends have already closed two schools within the districts, and the county is considering closure of other small,

rural one-room schoolhouses. The Calistoga Joint Unified is also operating below capacity and could absorb additional students without difficulty (Merritt, July 1981).

Water Supply--Napa County has four major water suppliers located within its boundaries. The American Canyon Water District is the largest water district and encompasses the southern portion of Napa County. Municipal water districts located nearest the KGRA include those in the cities of Napa, Calistoga, and Yountville. Outside the incorporated areas, water is generally provided by individually operated wells.

- o The City of Napa--The city has its own municipal utility to provide water to over 18,000 customers. System storage capacity consists of 1,233 acre-feet of water. Two reservoirs, Lake Hennessey and Lake Milliken, are Napa's primary water source, and the city purchases an additional 5,000 acre-feet annually from the North Bay Aqueduct. Current storage capacity is projected to provide adequate water supplies until the year 2010. Annual water use is 14,000 acre-feet. Although the City of Napa has no expansion plans for the near future, the city can purchase additional water from the North Bay Aqueduct for a cost ranging between \$250 - \$300 per acre-foot. The city's Director of Public Works does not believe public services in Napa have been overtaxed due to geothermal development (Lindblad, July 1981).

- o The City of Calistoga--Calistoga receives its water primarily from Kimball Reservoir which has a storage capacity of 116 million gallons. Additional water can be obtained from a 1 million gallon water storage tank which can supply 20,000 gallons of water per day (Anderson, July

1981). Present annual water use is 135 million gallons, which ranges between 36,000 gallons and 75,000 gallons per day depending on seasonal fluctuations in use. Calistoga is presently rationing water due to its zero reserve capacity (Taratino, July 1981).

Future plans for expansion in Calistoga include a \$5 million water project that will provide a 14 mile water distribution system leading to the City of Napa. The distribution system will utilize the City of Napa's storage capacity while Napa increases its North Bay Aqueduct water supply. Calistoga will pay the City of Napa costs for treating and "wheeling" the additional water supplies. The proposed expansion plan will provide for a 3 percent annual growth rate in Calistoga until the year 1993 (Taratino, July 1981). According to the city administrator, Calistoga is presently studying the impact of geothermal development upon available public services (Cavanero, July 1981).

- o The City of Yountville: Water supply in Yountville is provided by water purchased from the Veterans Home located in Yountville and from the City of Napa. The city pays \$75 per acre-foot to the Veterans Home for treated water and \$190 per acre-foot to the City of Napa for partially treated water. Annual water use is approximately 300 acre-feet which varies seasonally between 1/3 acre-feet to 2 acre-feet per day. Currently, the city is negotiating with the County of Napa to purchase water from the North Bay Aqueduct to provide for Yountville's expansion needs until the year 2000. According to the city administrator, geothermal development has not caused a significant impact upon water supply in the area at this time (Lander, July 1981).

Waste Water Facilities--Napa County has four sanitation districts located within its boundaries. The largest district, American Canyon Water District, provides services to the southern Napa County region. Districts located nearest the geothermal development area include the City of Napa, the City of Calistoga, and the City of Yountville.

- o The City of Napa--Napa provides waste water services to approximately 23,500 customers. Current system capacity will accomodate approximately 15.5 million gallons of waste water annually. Presently, 6.8 million gallons of waste wate are treated annually, so the City of Napa expects to meet its projected growth needs without expansion until the year 2000. The current estimated cost of expanding existing capacity by 50 percent ranges between \$15.5 - \$23 million (Lynch, July 1981).
- o The City of Calistoga--Calistoga completed its waste water system in 1976 to meet the need of the city until the year 1990. Due to an extremely high population growth rate, Calistoga has already reached its 400,000 gallon per day system design capacity (Anderson, July 1981). The city has no plans for waste water system expansion due to the lack of available funding. Presently, Calistoga has a building moratorium, since the city is unable to meet additional waste water system and water supply needs (Taratino, July 1981).
- o The City of Yountville--Yountville has the waste water system capacity to treat 2 million gallons of waste water per day. Presently, the waste water system is treating between 60,000 gallons and 2 million gallons of water per day, depending upon seasonal variations. Yountville completed modernizing its waste water system in 1979 for an approximate cost of \$4

million, and the city does not have plans to expand the current system until 1989 (Lander, July 1981).

Protective Services--Services available within the county are provided primarily by local departments, county service districts, and service contracts.

- o Law Enforcement Services--The county Sheriff's Department provides law enforcement services to the unincorporated areas of the county and, by contract, to some cities in the county. For the unincorporated communities adjacent to the geothermal development area, the closest Sheriff's Department is located in the City of Napa. The Sheriff's Department employs approximately 57 deputies to provide protective services throughout Napa County. For the 1982/83 Fiscal Year, the Sheriff's Department has plans to increase its existing police force by 15 deputies to keep pace with population growth in the county. The annual cost of increasing the existing force is approximately \$40,000 per deputy which includes salary, fringe benefits, training, and equipment (Robertson, September 1981).

The City of Yountville contracts with the Sheriff's Department to provide protective services. During the 1980/81 Fiscal Year, the Sheriff's Department will provide 40 hours of protective services per week to the City of Yountville at a cost of \$43,285. Presently, the City of Yountville has no plans to increase existing law enforcement services, although the city administrator feels present services are near capacity (Lander, July 1981).

The City of Napa has 63 police officers to provide protective services. Since 10 additional police officers recently joined the existing police force, the city does not feel the need to expand current services (Berg, September 1981). The cost of increasing the existing police force was approximately \$30,000 per officer, including salary and benefits.

The City of Calistoga employs eight police officers and four reserve officers to provide law enforcement services. Calistoga has reached its existing police force capacity due to increased population growth in the area. Plans for expansion include two additional officers. These plans, however, are contingent upon funding available during the next fiscal year. The cost of adding an officer to the existing police force would be approximately \$23,661, including salary and fringe benefits (Johnson, July 1981).

- o Fire Suppression Services--Within the county there are 15 local fire departments which provide fire suppression services. The local departments located near the KGRA with a paid staff include the City of Napa, City of Yountville, and the City of St. Helena. Volunteer fire departments located near the KGRA include Napa County Airport, Angwin, Pope Valley, and Deer Park (Rowe, September 1981).

Local fire departments handle primarily structural fires and rescue calls. During the fire season the local departments assist the California Department of Forestry in protecting wildland areas from fires within their service areas which are not included in the designated State Responsibility Areas (Rowe, September 1981).

Some fire departments provide special services such as helicopter or paramedic service. Special services are provided by the Napa County Fire Department and the City of Napa Fire Department. During the fire season, between the months of May through October, the Napa County department has access to a helicopter to cover the 1.5 million acres of land within its jurisdiction. Other fire departments such as the City of Napa provide paramedic services (Rowe, September 1981).

The incorporated communities near the KGRA providing a paid fire staff include the City of Napa and the City of Yountville. The City of Napa fire department is presently operating at capacity. Plans for expansion are contingent upon 1982/1983 funding priorities. The City of Yountville contracts fire services from the County of Napa Fire Department, and the department currently has no plans for expansion (Rowe, September 1981).

The City of Calistoga, an incorporated community located near the KGRA, has its own volunteer fire department. The Calistoga Fire Department has an elected fire chief and 40 volunteers. Currently, the fire department does not have funding problems, since the primary funding source is county/city revenue sharing, and the city voluntarily contributes their share from fund-raising activities and endowments (Noble, September 1981).

Fire suppression services of the local fire departments are supplemented by state and federal agencies. During the fire season, May 1 - October 15, the U.S. Forest Service has primary responsibility for fire protection on federal lands located throughout the county. Under an agreement

with the state, the Forest Service also protects several tracts of private land within or adjacent to the national forest lands. In order to protect large areas of undeveloped lands located outside the National Forest in the county, the California Department of Forestry has assumed responsibility for wildfire suppression during the months of May through October. Through a separate agreement with the county, the CDF provides year-round protection to those parts of the county not covered by local fire departments (Rowe, September 1981).

Chapter V

DESCRIPTION OF THE GEOTHERMAL WORK FORCE

Development of the geothermal resource for use in electric power generation is comprised of four major stages:

1. Resource exploration and steam field development,
2. Construction of the power plant and related facilities,
3. Operation and maintenance of these facilities, and
4. Concurrent maintenance of the steam supply.

Except for steam field development and maintenance, the work force involved during each stage is different from the others in the number of workers needed and the job skills required.

RESOURCE DEVELOPMENT AND STEAM FIELD MAINTENANCE WORK FORCE

The processes of exploration and development used for geothermal resources are very similar to those used for petroleum resources. Due to such similarities, many of the geothermal developers active in The Geysers are also involved in oil and gas production in California and other Western states. A geothermal development company coordinates resource exploration, steam field development,

and maintenance of production. Through contract arrangements the developer oversees the work of drilling which brings the geothermal steam to the surface where it can be used for power production.

Geothermal Development Work Force

Development of the geothermal steam in The Geysers KGRA begins with the leasing of large tracts of land and exploratory drilling to determine the location, amount, and quality of the underground steam resources. As of November 1981, there were about 16 geothermal developers active in The Geysers. Generally, each geothermal development company maintains a local office which oversees and coordinates its operations in The Geysers.

The number of staff in the local offices depends upon the amount of land the developer has leased, the extent of its development activities, and the extent to which the developer subcontracts its development management activities. Union Geothermal has been active in The Geysers since the early 1960s and currently employs over 200 full-time workers (Pardini, September 1981). Amin-oil has been active in The Geysers since the mid-1960s and currently has a staff of about 90 (Box, October 1981). MCR Geothermal maintains a district office staff of six (Stoleson, October 1981). Thermogenics has been active in The Geysers since the early 1970s and temporarily has a minimum operations staff of six, although they have employed as many as 30 (Evans, October 1981). Geothermal Kinetics Incorporated had a local staff of two in the fall of 1982 and this will increase to three in the spring of 1982 when they begin final drilling for the DWR South Geysers project (Bannister, October, 1981). Based upon these figures, there could be as many as 350 persons currently employed in geothermal development in The Geysers.

Most of the geothermal developers have both office staff and field staff. The office staff may include clerical workers; administrative managers; professionals such as engineers, geologists, and environmental specialists; and land agents. The field staff includes construction foremen and workers; production foremen and workers; drilling supervisors; field engineers; and roustabouts. Most of these workers oversee and coordinate the activities of a varying number of subcontractors which are involved in preparation of well pads and access roads and in the drilling for steam.

Information provided by representatives of the various geothermal developers, indicates that the employees of the local offices of the developers tend to be relatively long-term residents of the local area, particularly given the length of time between the leasing of the resource lands and the production of electricity from the steam. Many of the job skills required for the work force in the developers' local offices are available in the local labor pool. Those employees whose job skills require familiarity with geothermal resources or specialized technical knowledge may have moved into the local area for initial development activities and then remained.

Steam Drilling Work Force

Each geothermal power plant requires approximately 1,000,000 pounds per hour of steam to produce 110 megawatts of power. Depending upon the quality of the steam available within 1 mile or less of the proposed plant site, approximately 12 - 15 wells would initially be needed to provide steam for a 110 MW

power plant. This total includes standby and reinjection wells. Over the lifetime of the power plant an additional 10 - 15 wells would have to be drilled to maintain the necessary supply of steam (Stelling, January 1982).

Development of each steam well takes approximately 60 days with drilling crews working around the clock. A typical drill rig is operated by four crews of 5 or 6 persons during each 24-hour period (USGS, 1978). Thus, there is generally a total work force of about 25 persons associated with each drilling rig (Stelling, May 1981; et al.). Overseeing the activities of the drilling crews is a drilling superintendent who is employed by the geothermal developer.

Worker skills needed during the steam field development stage include drillers, derrickmen, roughnecks, roustabouts, floorhands, tool pushers, motormen, welders, foremen, and rig superintendents (Cornelison, 1980). Most of the steam drilling work force are not members of a craft union, although some may choose to belong to a union. Since nonunion drilling workers generally do not register on a union out-of-work list, they tend to file claims with the local office of EDD when they are between job assignments (Wall, June 1980).

Information provided by representatives of the various geothermal developers indicates that the work force associated with the drilling rigs also tend to be relatively long-term residents of the local area. Although there may be changes within the personnel assigned to a drilling rig as workers move in and out, a minimum number of workers must be maintained for the rig to function. Once a particular rig and crew are active in The Geysers, the geothermal developers prefer to keep it busy there, since the crews become familiar with the geologic idiosyncracies of the area, and the drilling equipment is

prepared to respond efficiently to those characteristics (Stoleson, June 1981; Stelling, January 1982).

The number of drilling rigs active in The Geysers has fluctuated in the past. As development of the resource and the number of active developers have increased, there appears to be enough work to keep several rigs busy throughout the year. A representative of the California Division of Oil and Gas estimates that there has been an average of 8 to 10 rigs active in The Geysers during the past 2 years (Stelling, May 1981). This number of drilling rigs would provide employment for 200 - 250 persons. A representative of one of the developers estimated that his company has used one rig year-round and a second rig intermittantly for the past four or five years. He also estimated that another developer had used four rigs year-round and a fifth rig intermittantly during this same time period (Bannister, October 1981).

Information provided by several persons contacted in the preparation of this study suggests that a large number of the drilling crews have chosen to reside in the Middletown/Cobb area of Lake County. This suggestion appears to be corroborated by anecdotal comments recorded during preparation of the EIR for Aminoil's East Ford Flat development and by the information contained in a student survey conducted by the Middletown Unified School District in 1980. Evaluation of the student survey shows that nearly 31 percent of the student population whose parents were employed in geothermal occupations were employed by the various drilling companies (Cornelison, 1980).

Steam Field Maintenance Work Force

Once a geothermal power plant comes on line, it operates at full capacity all of the time unless there are technical or mechanical problems. Periodically throughout the lifetime of the power plant, the steam wells supplying the plant need to be redrilled to clear out obstructions or to regain full flow of the steam. Occasionally new wells must be drilled if an existing supply well cannot maintain an effective output.

The size of the work force involved in maintaining an adequate steam supply for each well field and power plant is the same as that involved in the initial, preplant steam field development. The representative of the state Division of Oil and Gas in Santa Rosa believes that the average number of drilling rigs active in The Geysers in the past two years will continue to be active for the lifetime of the geothermal resources in The Geysers. He also believes that their work will shift in emphasis from development of new steam supplies to maintenance of existing supplies (Stelling, September 1981). Based on the DOG staff information, the estimated 8 to 10 rigs necessary to maintain steam flow for power plant generation would require a continuing work force of 200 to 250. As discussed earlier, this work force is expected to be long-term residents of the local area.

Steam-Gathering System Construction Work Force

Once the wells have been developed and a power plant is nearly completed, construction begins on the steam collection system which carries the steam to the plant site. The work force involved in pipeline construction may include

plumbers, welders, pipefitters, foremen, and the laborers involved in preparing foundations and footings.

Generally, only about 20 workers are involved in the construction of the steam, gathering system for each power plant, and the work is completed within a three month period. The crews that construct the steam lines are different from those involved in the drilling for the steam or in constructing roads, pads, and power plant facilities. The crew generally are members of trade unions because the work on the steam lines requires very specialized skills (Stoleson, May 1981). The work force involved in construction of the steam gathering systems is less likely to be long-term local residents, since the duration of the work is short and, in the past, several months have elapsed between steam-gathering system projects.

POWER PLANT CONSTRUCTION WORK FORCE

The average length of the construction stage for a 55 MW or a 110 MW geothermal power plant in The Geysers is about 28 to 30 months of working time. However, site clearance and preparation or other construction activities involving earth movement cannot be conducted during the rainy season (generally November through March). Thus, the actual duration of the construction period could extend up to 36 months or more, depending upon weather conditions.

Construction of the power plant and related facilities is usually managed by one or more general contractors and several subcontractors. Construction of these facilities involves a succession of diverse tasks requiring equally diverse sets of job skills. Work tasks include construction of access roads; site clearance and preparation; placement of foundations and pads;

construction of the power plant buildings; placement of the generating unit(s) and associated piping and electrical work; construction of related facilities, e.g., hydrogen sulfide abatement systems(s), cooling towers and basins, and the switchyard and transmission system; and final site and facility finish work.

Work skills needed for these tasks include pipefitters, welders, electricians, iron workers, carpenters, painters, equipment operators, concrete workers and finishers, teamsters and laborers, other manual labor skills, and supervisory and quality control inspection personnel. Many of the work tasks throughout the construction period are of relatively short duration, ranging between a few weeks and a few months. Some of the craft skills required are very specialized, and the number of workers in the state who are qualified to perform the skilled tasks is relatively small. However, a worker with a wide range of abilities and a high degree of skill in each of those various areas could maintain relatively continuous employment on a progression of geothermal power plants (Clarey, October 1981).

As estimated by power plant developer/operators, the maximum number of workers involved in construction of a 110 MW geothermal power plant during the peak period ranges between 75 (PGandE, 1979b) and 215 workers (Occidental, 1981). The peak construction work force for a 55 MW power plant is generally within the same range, but the duration of the peak would be shorter.

During construction of the power plant, the peak work force is active on site after the foundations and pads are set and the work begins on installation of the generating unit(s) and all the necessary mechanical and electrical connections. Once the major equipment has been placed, construction continues

simultaneously on the rest of the power plant structure and related facilities.

During the power plant construction period, the majority of the work force is composed of electricians and pipefitters who are dispatched through union hiring halls (Phillips, September, 1981; Deorsey, October, 1981). The number of electrical workers active during the peak period usually ranges between 5 and 35 workers but has been as many as 55 workers on a single project (Clarey, October 1981). The number of pipefitters active during the peak period may range between 6 and 50 workers and has been as high as 110 workers (Springer, October 1981). Generally, this peak period extends out over one year, with the largest number of workers needed for six to eight months (Clarey, *ibid.*, Springer, *ibid.*).

Most of the work force involved in the construction of a power plant and related facilities maintains active membership in craft or trade unions. Table 17 lists the labor organizations which have members active in power plant construction in The Geysers KGRA. Many of these unions maintain local hiring halls in the Santa Rosa area. The hiring halls for several of the other unions are located throughout the San Francisco Bay area. When the construction contractors or subcontractors need workers with a specific skill, they call the appropriate union hiring hall and request the necessary number of workers. The unions then call workers from their out-of-work lists and send them to the project site. Local offices of the state Employment Development Department (EDD) do not maintain records on numbers of construction workers in The Geysers and generally have not administered unemployment claims for The Geysers construction workers (Wall, June 1981).

TABLE 17

LABOR ORGANIZATIONS WITH MEMBERS ACTIVE IN POWER PLANT CONSTRUCTION IN THE GEYSERS KGRA

<u>Organization</u>	<u>Location</u>	<u>Organization</u>	<u>Location</u>
1. Sonoma-Mendocino-Lake Counties Building and Construction Trades Council	Santa Rosa	14. International Union of Operating Engineers Local No. 3	Santa Rosa
2. United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the US and Canada	San Francisco	15. Brotherhood of Painters and Allied Trades of America Local No. 364	Santa Rosa
3. Carpet and Linoleum Layers Local No. 1235	San Francisco	16. Piledrivers Local Union No. 34	Oakland
4. International Brotherhood of Boiler-makers, Iron Ship Builders, Blacksmiths, Forgers, and Helpers Union No. 6	San Francisco	17. United Slate, Tile and Composition Roofers, Damp and Waterproof Workers Association Local No. 121	San Rafael
5. Bricklayers, Masons and Plasterers International Union Local No. 7	San Francisco	18. Sheet Metal Workers Local No. 104	Santa Rosa
6. Operative Plasterers and Cement Masons International Association Local No. 355	Santa Rosa	19. Sprinkler Fitters and Apprentices Local No. 483	Burlingame
7. International Brotherhood of Electrical Workers Union No. 551	Santa Rosa	20. International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers Local No. 980	Santa Rosa
8. Heat and Frost Insulators Local Union No. 16	San Francisco	21. Tile, Marble and Terrazo Local Union No. 19	San Francisco
9. International Association of Bridge, Structural and Ornamental Ironworkers Local Union No. 378	Oakland	22. Tile, Marble Finishers and Shopmen Local No. 7	San Francisco
10. Laborers International Union of North America Local No. 139	Santa Rosa	23. International Brotherhood of Electrical Workers, Line Electricians Local Union No. 1245	Walnut Creek
11. Laborers International Union of North America Local No. 371	Napa	24. Plumbing and Pipefitting Industry Local 38	Santa Rosa
12. Wood, Wire and Metal Lathers International Union Local No. 268	Santa Rosa	25. Steamfitters and Refrigeration Union Local 342	Concord
13. Millwrights Local Union No. 102	Oakland	26. United Brotherhood of Carpenters and Joiners of America Local No. 751 and Local No. 2056	Santa Rosa Lakeport

Source: Swinerton and Walberg, 1981

As the number of developer/operators and the number of geothermal power plants proposed or under construction in The Geysers have increased, there has been a corresponding increase in the number of construction contractors, subcontractors, and workers. To coordinate the construction activities and to ensure that all construction projects progress smoothly and efficiently, several of the power plant owner/operators and representatives of each of the trade unions involved in power plant construction signed a labor agreement in early 1978. This labor agreement entitled, "Project Labor Agreement for New Construction Work at The Geysers Power Plant," is administered by the consulting firm, Swinerton and Walberg. Following a renegotiation of terms and updating, this agreement was renewed in March 1981 and will remain in effect until the end of February 1984 (Phillips, September 1981).

As expressed in the agreement, its purpose is to:

- o Secure competent and capable workmen for the work undertaken by the various construction contractors and subcontractors and maintain a continuity of employment for such workmen;
- o Establish and maintain harmonious labor-management relations throughout the duration of the project;
- o Avoid strikes, lockouts, or delays in the execution of the work;
- o Record the applicable terms of the (labor) agreement with respect to rates of pay, hours of work, and other conditions of work which have been arrived at through collective bargaining (Swinerton and Walberg, 1981).

Due to the remote location of the power plant construction projects in The Geysers, the labor agreement provides transportation/travel pay and

subsistence allowance options to workers whose unions are party to the agreement. Workers either may accept the travel and subsistence allowances specified in their local union's bargaining agreement or they may take advantage of free commuter bus service. The bus service for construction workers is funded by the three power plant owner/operators who currently are signators of the agreement.* (1) Pacific Gas and Electric Company (PGandE), (2) Northern California Power Agency (NCPA), and (3) Sacramento Municipal Utility District (SMUD). Each worker using the free bus service also receives a daily travel and subsistence allowance. This allowance currently is \$15.50 and increases \$1 each year throughout the term of the agreement.

Workers not using the commuter bus service usually receive travel and subsistence allowances based on contracts negotiated by their union local. Such allowances are generally provided to union members who accept jobs located more than 40 miles from their union's hiring hall or local office. Each union has its own contract agreement, and the amount paid ranges from zero up to \$25 or \$30 per day. Amounts may also be paid per day worked or may be a guaranteed amount per week, no matter how many days are worked. One of the unions deducts the \$15.50 from the \$23 per day its members are guaranteed if the workers use the commuter bus service (Phillips, September 1981; Clarey, September 1981; Shasken, September 1981; Springer, October 1981).

The commuter bus service is operated by Patchett's Transportation Company in Santa Rosa. Bus schedules and passes are distributed by union representatives

*Current state law prohibits the state Department of Water Resources (DWR) from participating in such an agreement. There has been no official indication, to date, of whether Occidental Geothermal, Inc., plans to participate in the agreement during construction of its proposed Oxy No. 1 project.

or the construction subcontractors. Each day a worker rides the commute bus, he signs a roll sheet indicating his place of residence, union affiliation, and project assignment. The firm that administers the construction labor agreement in The Geysers tallies the daily ridership and sets up or withdraws routes and buses, depending upon usage. Each bus can carry 12 passengers and must have at least eight riders each day, or that route can be cancelled. Certain "basic" routes, however, may not be cancelled even if daily ridership is less than eight (Watkins, September 1981).

The bus service is primarily offered for an 8-, 9-, or 10-hour day shift and is generally provided only Monday through Friday. Occasionally, some buses have run seven days a week if the project schedule required full time service. The number of buses running each day has fluctuated between 13 and 22. In mid-September 1981, there were 16 buses running daily (Watkins, September 1981).

The buses originate in Santa Rosa, and the runs are made between specific pickup points and individual power plant construction sites. Routes which run from Santa Rosa (Sonoma County) and Cobb (Lake County) are considered basic routes and will be run each day regardless of ridership. Additional routes may begin scheduled pickups in Ukiah (Mendocino County) or Lakeport and Clearlake Highlands (Lake County) as long as there are a minimum of eight riders. If ridership drops below eight for three or more days, the route may be cancelled. Refer to Figure 6 for a map showing routes and pickup points for the commuter bus service (Watkins, September 1981).

In June 1979 the labor coordinator completed a survey of commuter bus usage between March 1977 and May 1979. This time period encompassed most of the

FIGURE 6: CONSTRUCTION WORKER COMMUTE BUS ROUTES

construction period of PGandE's Units 12 and 15, plus most of the civil engineering work on Units 13 and 14, and about one-fourth of the mechanical/electrical engineering work on Unit 13 (Swinerton and Walberg, 1979).

In this two-year period 1,025 bus passes were issued. In a tally of communities of residence named by bus riders, Santa Rosa had the most with 188 workers, next was Napa with 45, then Ukiah with 41, and Petaluma with 32. Although no single community in Lake County had more than 30 workers residing in it, the combined total of workers from throughout the county was 148 workers. A total of 23 workers claimed out-of-state residence. Of these 23 workers, 17 were picked up in the Santa Rosa/Healdsburg area, and the remaining six were picked up in the Middletown/Cobb area.

Although they are not identifiable from the tally of ridership data, a large group of workers apparently commutes to The Geysers development area for the work week and gets on the buses in Santa Rosa, Cloverdale, Cobb/Middletown, Calistoga, or Ukiah (Clarey, September 1981; Shaskan, September 1981; Springer, October 1981). (Refer to Chapter VI for additional discussion of construction worker residence choices.)

Based on analysis of the 1979 bus survey information and on conversations with the labor coordinator and representatives of some of the labor organizations whose members are active in The Geysers, some generalizations about the construction work force can be made:

- o Most workers involved in power plant construction in The Geysers apparently retain their existing permanent residence;
- o Many workers commute to their job in The Geysers each day, either in

individual vehicles, private carpools, or by individual vehicle to park and ride facilities or to contract bus service pickup points;

- o Many other workers commute to temporary residences (e.g., motels, weekly apartments, cabins, mobile homes, RV camps, etc.) for the work week and return to their permanent residence on weekends;
- o Some workers move to short-term residences in the local four-county area in the KGRA and remain as long as their job on a particular project continues; and
- o Some workers already resident in the local KGRA area have maintained relatively continuous employment on a series of projects in The Geysers development area.

POWER PLANT OPERATION AND MAINTENANCE

In the final months of the construction stage, personnel from the power plant developer/operator begin testing of equipment and systems in the new power plant. These personnel may include power plant operators, plant engineers, electricians, instrument repairmen, and maintenance workers. Once the power plant comes on line, the permanent operation and maintenance work force maintains routine operations. Periodically, this work force may be supplemented by additional outside workers for facility overhaul and maintenance activities.

The number of workers involved in the operation and maintenance of the power plant and related facilities varies with the power plant owner/operator. PGandE has operated geothermal power plants in The Geysers since the early 1960s and currently has 15 geothermal units in operation. PGandE's current

operation and maintenance work force for their Geysers Power Plant is about 130, and they add 4 to 6 more workers each time a new unit comes on line (Carter, September 1981). Since the units are relatively close to one another, PGandE has chosen to operate the various units by remote control from a single control point. Periodic checking of daily operations and necessary maintenance are performed by roving crews who are responsible for two or more units (PGandE, 1979b).

Beginning in 1982 several power plant developer/owners in addition to PGandE will begin operating new power plants in The Geysers. As first time operators in The Geysers, these developer/owners have estimated they will need an initial operation and maintenance work force of 10 - 20 workers per power plant. Fewer workers would be required to operate and maintain any subsequent power plants, since the basic work force would already be involved in their initial operation.

Based on previous regulatory case experience and information provided to the CEC by geothermal power plant owner/operators, it appears that the work force involved in routine daily operation and maintenance of the power plants and related facilities will be long-term residents of the local area. Although individual personnel may periodically change, the number would remain constant until new power plants come on line and then would increase gradually with each new power plant.

WORK FORCE INVOLVED IN PROVIDING SERVICES TO THE GEOTHERMAL INDUSTRY

In the analysis of the socioeconomic effects associated with the work force involved in development of a project, three groups of workers are identified

and evaluated: (1) direct, (2) indirect, and (3) induced. Using geothermal development as an example, the direct work force would be employed in jobs directly associated with development and use of the geothermal resource. The indirect work force would be involved in companies which provide materials or services to the geothermal developers. The induced work force would be involved in businesses which provide materials and services generally to all businesses and people, including those involved in geothermal development and use.

Indirect Work Force

This group of workers is involved in providing services to the geothermal developers, steam drillers, and power plant construction, operation, and maintenance companies. For the study, this group of geothermal workers is assumed to include the following types of geothermal-related services and skills: road and pad construction contractors, heavy equipment operators, drilling consultants, environmental analysis consultants, environmental monitoring consultants, landscape designers and maintenance workers, geothermal waste haulers, truck drivers, mechanics, engineering designers, and employee transport services.

A representative of the state Division of Oil and Gas in Santa Rosa estimated that there could be as many as 200 workers involved in these activities. A 1980 student survey conducted by the Middletown Unified School District (see Appendix C and Table C) indicated that the parents of over 12 percent of the "geothermal" students were employed in geothermal-related services (Cornelison, 1980). The work force associated with geothermal-related service

would tend to be long-term residents of the local area. Since these services would have been necessary (to some degree) throughout development of the geothermal resource in The Geysers, most of this work force is likely to already reside in the local area.

Induced Work Force

This group of workers would include employees of places such as banks, grocery stores, restaurants, providers of household items, providers of automotive supplies and services, etc. These workers and their employers provide services to the broader, general population of the area and do not rely wholly on geothermal development for their patronage.

CUMULATIVE WORK FORCE

This study focuses on the cumulative effects of the direct power plant work force on the four counties of The Geysers KGRA. The cumulative work force figures in this study include workers involved in (1) construction of the power plant and related facilities and (2) in operation and maintenance of the power plants and related facilities. The cumulative power plant work force data presented in this study cannot be compared to those provided to the CEC in previous utility applications without additional analysis. Previous figures for the peak work force in The Geysers included only workers involved in construction of the power plants and related facilities. For example, in its AFC for The Geysers Unit 18 project, PGandE identified a construction work force peak of 300 in 1978 (PGandE, 1979).

In order to make the PGandE figures for the peak in 1978 comparable to the work force data used in this study, CEC staff has made the following calculations:

- o During the 1978 peak period, approximately 300 workers were involved in power plant construction (PGandE, 1979b).
- o An additional 102 workers were involved in the operation and maintenance of existing facilities (PGandE, 1979b).

Thus, the cumulative total of these two work force groups was at least 402 during the third quarter of 1978. This previous cumulative peak work force of 400 will be used as a baseline peak for discussion and comparison throughout the remainder of this study.

Chapter VI

PROJECTION OF POWER PLANT WORK FORCE NEEDS

The four counties in The Geysers KGRA have been experiencing rapid growth in the past five years. Much of this growth is associated with movement away from the higher costs of living and housing in the metropolitan centers in the San Francisco Bay Area. Some portion of the growth may be associated with increasing development of the geothermal resource in The Geysers KGRA. To identify the contribution of geothermal development to future population increases in the four counties, staff estimated the employment requirements of future geothermal development and hypothesized associated changes in the local populations. To reasonably project the size, timing, and location of population changes related to geothermal development requires a number of assumptions about the limits of the geothermal resources and the location, timing, and size of future power plant projects in the KGRA.

DRY STEAM RESOURCE DEVELOPMENT SCENARIOS

There is considerable variation in professional opinion on the extent of the dry steam resource available for development. This study examines the potential cumulative impacts associated with a range of resource development scenarios developed by the CEC staff.

Scenario 1: 1,787 MW

This is a conservative development level based on information provided by the electric utilities. It consists of projects on line and planned projects with "proven"* steam resources (see Table 18). With one well completed and work on the second well just beginning, the steam resource for the NCPA No. 1 project is not yet considered proven. This project has completed its first phase of the CEC's regulatory review and is expected to enter the second phase sometime in 1982.

Steam developers expect that an additional 5 MW will be produced, starting in 1985, by the Magma Wild Well in Sonoma County. This would bring the total electrical output of The Geysers KGRA to 1,787 for Scenario 1.

Scenario 2: 2,447 MW

This development level is based on the assumption that additional projects included in utility resource plans will be constructed. To date there are no proven steam resources for these projects. The projects identified in Table 19 are anticipated under this development scenario.

*A geothermal resource is described as "proven" if a usable or salable amount of steam is present in a particular well or development field. The resource is also described as proven if the supplier has the equivalent of half the amount needed to supply a proposed power plant when that project proposal is undergoing regulatory review by the CEC.

TABLE 18
POWER PLANT DEVELOPMENT IN THE GEYSERS KGRA
SCENARIO 1: 1,787 MW

<u>Project</u>	<u>On-Line Date</u>	<u>County of Location</u>	<u>Capacity (MW)</u>	<u>Cumulative Capacity (MW)</u>
PGandE 1	1960	Sonoma	11	11
PGandE 2	1963	Sonoma	13	24
PGandE 3	1967	Sonoma	27	51
PGandE 4	1968	Sonoma	25	76
PGandE 5	1971	Sonoma	53	129
PGandE 6	1971	Sonoma	53	182
PGandE 7	1972	Sonoma	53	235
PGandE 8	1972	Sonoma	53	288
PGandE 9	1973	Sonoma	53	341
PGandE 10	1973	Sonoma	53	394
PGandE 11	1974	Sonoma	106	500
PGandE 12	1979	Sonoma	106	606
PGandE 15	1979	Sonoma	55	661
PGandE 13	1980	Lake	135	796
PGandE 14	1980	Sonoma	110	906
NCPA 2	1982(Sept)	Sonoma	110	1,016
PGandE 17	1982(Dec)	Sonoma	110	1,126
PGandE 18	1983(May)	Sonoma	110	1,236
PGandE 16	1983(Sept)	Lake	110	1,346
SMUD 1	1983(Dec)	Sonoma	72	1,416
DWR Bottle Rock	1984(June)	Lake	55	1,471
Occidental	1984(June)	Lake	80	1,551
Magma Wild Well	1985	Sonoma	5	1,556
DWR South Geysers	1985(July)	Sonoma	55	1,611
NCPA 3	1985(Nov)	Sonoma	110	1,721
NCPA 1	1986	Lake	66	1,787

Source: CEC staff report, Status of Proposed Geothermal Projects, August 1981. Updated February 19, 1982.

TABLE 19
POWER PLANT DEVELOPMENT IN THE GEYSERS KGRA

SCENARIO 2: 2,447 MW

<u>Project</u>	<u>On-Line Date</u>	<u>County of Location</u>	<u>Capacity (MW)</u>	<u>Cumulative Capacity (MW)</u>
PGandE 20 Modesto ID*	1985 (Dec)	Sonoma	110	1,897
MSR#1	1986(?)	Sonoma	55	1,952
MID/Shell	1986-7	Sonoma	55	2,007
SMUD 2	1987 (July)	Lake	55	2,062
PGandE 19	1988 (June)	Sonoma	55	2,117
PGandE 22	1988 (June)	Sonoma	110	2,227
PGandE 21	1988 (Dec)	Sonoma	110	2,337
PGandE 23	1989 (June)	Sonoma	110	2,447

Source: CEC staff report, Status of Proposed Geothermal Projects, August 1981.

*McKinney, February 1982.

Scenario 3: 3,000 MW

This development level is based on the assumption that further development, as yet unplanned, will occur either within the existing boundaries of the dry steam resource or to the northwest and southeast along the Mayacmas ridge where the resource limits are still undefined. Since projects to produce the remaining 553 MW are currently unplanned and unscheduled, staff must make a number of assumptions to complete the projection of employment and, consequently, the population changes associated with this level of resource development.

The first such assumption is that approximately one-half of the power plants needed to produce the added 553 MW will be 110 MW and the other one-half will be 55 MW. This ratio is based upon trends evident in historical and planned development in The Geysers between 1971 (when the technology for the use of

the dry steam resource stabilized) and 1985. Using this ratio to produce approximately 550 MW, four additional 55 MW plants and three 110 MW plants would be constructed.

The second assumption is that approximately two-thirds of these new power plants would be constructed in Lake County and the remaining one-third in Sonoma County. This distribution of projects using the dry steam resource is based upon a recent socioeconomic impact study prepared by Lawrence Berkeley Laboratory (LBL, 1980; page 43). This LBL study was prepared to assess the probable environmental and socioeconomic consequences of geothermal energy development in The Geysers-Calistoga KGRA. The study assesses the potential cumulative effects of two long-term development scenarios. These scenarios include the use of both dry steam and hot water resources and the use of geothermal resources for generation of electricity and for other, nonelectrical, direct uses.

The third assumption necessary to project population changes is the timing of new geothermal power plant development. Again using trends evident in the 1971 - 1985 period, there is an average of two new projects coming on line each year. Assuming that one 110 MW and one 55 MW power plant are built each year after 1989, development of the dry steam resource to its currently estimated full potential of 3,000 MW will occur before 1995.

Using this set of assumptions, the projects listed in Table 20 would be added under Scenario 3:

TABLE 20
POWER PLANT DEVELOPMENT IN THE GEYSERS KGRA
SCENARIO 3: 3,000 MW

<u>Project</u>	<u>On-Line Date</u>	<u>County of Origin</u>	<u>Capacity (MW)</u>	<u>Cumulative Capacity (MW)</u>
Geothermal A	1990	Lake	55	2,502
Geothermal B	1990	Sonoma	110	2,612
Geothermal C	1991	Lake	55	2,667
Geothermal D	1991	Lake	110	2,777
Geothermal E	1992	Sonoma	55	2,832
Geothermal F	1992	Lake	110	2,942
Geothermal G	1993	Lake	55	2,997

WORK FORCE NEEDS FOR RESOURCE DEVELOPMENT SCENARIOS

Development of the geothermal resource for use in electric power generation consists of three major stages: steam field development, construction of the power plant and related facilities, subsequent operation, and maintenance of these facilities. The work force required for each developmental stage varies with each power plant project and schedule. The total size and scheduling sequence for the work force required to maintain the steam supply over the lifetime of the power plant have been estimated.

Work force estimates for each development scenario are based upon the best available information on the number of workers required at the various stages of dry steam resource development and power production. To estimate the size of the work force needed for each of the three stages of resource development and use, staff has made a number of assumptions, taking into account these many variables. This set of assumptions is described below:

Assumptions

Steam Field Development and Maintenance--The average length of time needed to develop the steam supply for a power plant is approximately three years. To maximize efficient use of resources, the geothermal developers would prefer to time completion of the steam supply to coincide with the on-line date of the power plant receiving the steam. Throughout the lifetime of the power plant, the steam wells must be periodically cleaned out or replaced to maintain adequate steam for power plant operation.

Based upon information provided by the state Division of Oil and Gas, the number of drilling rigs necessary to develop and maintain steam in The Geysers is 8 - 10 rigs or 200 - 250 workers (Stelling, January 1982). Since these workers are not directly involved in construction, operation, or maintenance of the power plant and associated facilities, they have not been included in analyses in this chapter. Refer to Chapter V for additional discussion of the steam drilling work force.

Power Plant Construction--Construction of the power generating and transmission facilities includes a sequence of activities, each requiring a work force of varying size, for varying lengths of time. For those projects which have been or are being reviewed by the CEC, the size and the scheduling sequence of the work force are based on information provided by utility applicants in their NOI/AFC documents. For those projects which have not entered the CEC's regulatory review process or which are not yet planned, it was assumed that construction will begin in the second quarter of each calendar year. This should ensure that initial site preparation activities occur outside the rainy season.

Additional assumptions were needed to project construction work force requirements for those projects which have not yet entered the CEC's regulatory review process (Scenario 2) or which have not yet been planned (Scenario 3). For projected power plants of 110 MW (the PGandE Units 20 - 23 projects), the number of workers and scheduling pattern were assumed to be the same as that used for PGandE's Unit 18. For the SMUD Geothermal No. 2 and PGandE Unit 19 projects, the data for SMUD Geothermal No. 1 was used. Data for the NCPA No. 1 (66 MW) and the two MID (55 MW each) projects are based on those provided for the SMUD #1 project.

Power Plant Operation and Maintenance--Once a power plant is on line, only a minimal work force is needed to operate and maintain the facilities. As of March 1982, PGandE is the only operator of geothermal power plants and transmission facilities in The Geysers KGRA. The various units of their Geysers Power Plant are connected to a master control center located near Units 5 and 6. Since the operation of each power plant unit is primarily controlled through this center, PGandE estimates they need to add only four additional workers for each subsequent power plant unit in The Geysers (PGandE, 1979b).

Beginning in late 1982, new geothermal power plants will start coming on line. DWR estimates that they will need 15 workers to operate their Bottle Rock project (DWR, 1978). Later, when their South Geysers project comes on line in mid-July 1985, they anticipate that they will need an additional eight workers to operate the new power plant (Hockenson, 1981). NCPA estimates they will need 8 - 10 workers to operate their first project, NCPA No. 2 (NCPA, 1979a).

NCPA plans two additional projects in The Geysers, and they are assumed to each require an additional eight workers for operation and maintenance.

Work force data presented by SMUD and Occidental indicate that they will each need 20 workers for operation and maintenance of their first power plant project in The Geysers (SMUD, 1980; Oxy, 1981). This figure was also applied to the work force projections for the planned Modesto Irrigation District power plants, since they would be a "first-time operator" in The Geysers KGRA in 1986.

The unnamed, undefined geothermal projects which would be constructed under the Scenario 3 build-out to 3,000 MW in The Geysers were assumed to be operated by utilities already (or soon to be) active in The Geysers. Based upon this assumption and PGandE's experience with multiple units, staff has projected a need for only five additional workers to operate and maintain subsequent power plants.

WORK FORCE PROJECTIONS

When available, figures on the number of workers active in The Geysers throughout the earlier years of resource development have been quite varied and sometimes inconsistent. To minimize any potential errors caused by the uncertainty of earlier geothermal development work force data, population and work force analysis in this study begins with 1979 as the baseline year.

Based upon information provided by utility applicants and extrapolation of available data, quarterly geothermal work force totals were projected for all stages of geothermal development in The Geysers KGRA. The quarterly totals are based upon the project sequence provided in utility resource plans and are

current as of February 19, 1982. These projected work force totals will be updated for the final report on this study. The work force totals include the workers directly involved in construction of the power plant and related facilities and subsequent operation and maintenance of the power plant facilities. Estimated totals for each work force group and the cumulative totals are presented in a series of graphs, Figures 7 - 10. (Refer to the tables in Appendix B for the raw data used to develop these graphs.)

Each graph in the series represents one of the development scenarios, and each curve in the graphs represents the estimated total number of workers needed for each work force group. Within each graph, each of these work force curves is additive upon the others. For example, for Figures 7 - 9, for the beginning of the third quarter of 1982, the estimated power plant construction work force total is 485; then the estimated total operation and maintenance work force of 135 is added to this for the second curve, making a cumulative total of 620. The fourth graph, Figure 10, compares the cumulative power plant work force for each of the three development scenarios presented individually in Figures 7 - 9.

The work force figures presented below include only estimates of workers directly involved in construction, operation, and maintenance of geothermal power plants in The Geysers. The number of workers involved in steam development, steam drilling, and in indirectly related occupations or industries which provide goods and services to the geothermal industry has not been included in the projected work force totals. Refer to Chapter V for discussion on estimating the number of workers involved in such geothermal-related industries and services.

Work Force Needs for Scenario 1: 1,787 MW

Scenario 1 covers the time period from the development of the first geothermal power plant in The Geysers KGRA up through the estimated start-up date of all of the planned projects with proven steam. The scenario also includes two projects which are currently involved in the CEC regulatory review process, even though they do not yet have a proven steam supply.

In addition, the 1,787 MW total for Scenario 1 includes 5 MW which will be produced by harnessing the Magma Wild Well. The work force needed to construct power generation and transmission facilities for these 5 MW of power was assumed not to create a significant increase in the total number of workers needed to complete the remainder of the projects included in this development scenario.

Referring to the graph in Figure 7, the effect of simultaneous or overlapping schedules for construction of new power generation and transmission facilities is very clear. The cumulative total work force involved in the two stages of power plant development and operation will rise to a peak of 675 in the last quarter of 1982. Toward the middle of 1986 the work force involved in new power plant construction will taper off to zero, and only the operation and maintenance work force of 222 will continue for the life of the power plants.

Since this scenario includes all power plant projects currently in operation in The Geysers or involved in the CEC regulatory review process, the same cumulative work force totals are also included in the graphs developed for Scenarios 2 and 3. However, subsequent work force peaks associated with these

CUMULATIVE POWERPLANT WORKFORCE IN THE GEYSERS KGRA SCENARIO 1: 1787 MW

FIGURE 7

NOTE: TOTAL DO NOT INCLUDE THE ESTABLISHED WORKFORCE INVOLVED IN OTHER ASPECTS OF THE GEOTHERMAL INDUSTRY.
CURRENT ESTIMATES OF THE WORKERS INVOLVED IN THIS BASE ARE: RESOURCE DEVELOPMENT, 350; STEAM DRILLING,
200-250; PIPELINE CONSTRUCTION 20; AND GEOTHERMAL-RELATED SERVICES 200-300

development scenarios exceed the Scenario 1 peak of 675 for a period of six quarters from mid-1984 through late 1985.

Work Force Needs for Scenario 2: 2,387 MW

Scenario 2 represents the extension of Scenario 1 to include power plant projects identified in utility 20-year resource plans but for which there are no proven steam resources. Staff assumes that all such planned projects will be constructed according to the schedules outlined in the utility resource plans. Projects added for this scenario include PGandE's Units 19 - 23, SMUD Geothermal #2, and the two Modesto Irrigation District projects.

Referring to the graph in Figure 8, the effects of overlapping power plant construction schedules produce a series of cumulative work force peaks. The initial peak of 675 occurs in late 1982, the same as the Scenario 1 peak. Following a decline to a cumulative total of 628 workers in the first quarter of 1984, the work force total rises to 914 in the first quarter of 1985. After dropping back to a total of 582 workers in the first quarters of 1986 and 1987, the cumulative work force again rises to a final peak of 657 in the third quarter of 1987. Following this peak the work force total drops over the next three years and levels off at the 277 workers needed for operation and maintenance of the power generation and transmission facilities.

Work Force Needs for Scenario 3: 3,000 MW

Scenario 3 represents the extension of Scenarios 1 and 2 to the currently hypothesized ultimate build-out of the dry steam resource in The Geysers KGRA. As described earlier, the projects needed to achieve this build-out are currently undefined and unplanned by any of the utilities currently active in

CUMULATIVE POWERPLANT WORKFORCE IN THE GEYSERS K G R A SCENARIO 2: 2447 MW

FIGURE 8

NOTE: TOTALS DO NOT INCLUDE THE ESTABLISHED WORKFORCE INVOLVED IN OTHER ASPECTS OF THE GEOTHERMAL INDUSTRY.
CURRENT ESTIMATES OF THE WORKERS INVOLVED IN THIS BASE GROUP ARE: RESOURCE DEVELOPMENT, 350; STEAM
DRILLING, 200-250; PIPELINE CONSTRUCTION, 20; AND GEOTHERMAL-RELATED SERVICES, 200-300.

The Geysers. Based upon extrapolations of existing work force, plant size, and construction schedule information, an estimated seven additional power plants would be required to produce the 550 MW needed to reach the 3,000 MW potential of the resource. For this study these power plant projects have been designated Geothermal A - G, and it is assumed they would be constructed by utilities already active in The Geysers.

Referring to the graph in Figure 9, the addition of these seven projects would extend development activity in The Geysers another five years beyond Scenario 2 before the cumulative work force would taper off to the 312 workers needed for operation and maintenance of the power plant and transmission facilities. Construction of these projects would produce a third series of cumulative work force peaks, none of which would exceed the maximum Scenario 2 peak of 914 occurring in the first quarter of 1985. The pattern of work force requirements and peaks for Scenario 3 is the same as that for Scenario 2, up through the second quarter of 1987 when it begins to rise again. Additional peak periods under Scenario 3 would occur at the end of 1987 (707 workers) and the end of 1989 (697 workers)/beginning of 1990 (687 workers).

For comparison purposes an additional graph, Figure 10, was prepared. This graph represents the cumulative power plant work force totals from each of the three development scenarios shown in the graph in Figures 7 - 9.

POPULATION CHANGES ASSOCIATED WITH WORK FORCE NEEDS

When the number of jobs in a localized area exceeds the number of available workers in that area with the necessary skills, then workers outside the given area must commute or relocate in the area. Workers who commute can either commute daily to the job site from their permanent residence or commute to a

CUMULATIVE POWERPLANT WORKFORCE IN THE GEYSERS KGRA SCENARIO 3: 3000 MW

FIGURE 9

NOTE: TOTALS DO NOT INCLUDE THE ESTABLISHED WORKFORCE INVOLVED IN OTHER ASPECTS OF THE GEOTHERMAL INDUSTRY.
CURRENT ESTIMATES OF THE WORKERS INVOLVED IN THIS BASE ARE: RESOURCE DEVELOPMENT, 350; STEAM DRILLING,
200-250; PIPELINE CONSTRUCTION, 20; AND GEOTHERMAL RELATED SERVICES, 200-300.

CUMULATIVE POWERPLANT WORKFORCE IN THE GEYSERS KGRA DEVELOPMENT SCENARIO COMPARISON

FIGURE 10

NOTE : TOTALS DO NOT INCLUDE THE ESTABLISHED WORKFORCE INVOLVED IN OTHER ASPECTS OF THE GEOTHERMAL INDUSTRY.
CURRENT ESTIMATES OF THE WORKERS INVOLVED IN THIS BASE GROUP ARE : RESOURCE DEVELOPMENT, 350 ; STEAM
DRILLING, 200 - 250 ; PIPELINE CONSTRUCTION, 20 ; AND GEOTHERMAL - RELATED SERVICES, 200 - 300.

temporary residence near the job site for each work week. Those who choose to maintain a temporary residence in the local area would produce a series of weekly fluctuations in local populations. These fluctuations can produce short-term impacts on the communities in which the workers maintain temporary residence. Workers commuting daily to the job site would have less impact on communities near the job site than those commuting for the work week.

Workers who choose to relocate to communities nearer the job site may have a longer-term effect on the local area. Unlike the commuting group of workers, those who choose to relocate nearer the project area would tend to bring their families along with them. This influx of workers and their families initially would produce an increase in the population in the local communities where they chose to live. Later, depending upon the duration of the construction project, the local area's population would decrease as workers moved on to other jobs. The duration and the rate at which these changes occur can produce impacts on the area's into which the workers (and families) relocated and impacts upon the ability of the area's infrastructure* to provide services.

Many factors influence an area's ability to accommodate an influx of workers (and families) to a new development project. If the area subject to the influx is predominantly rural, or if it is relatively remote from large urbanized centers, there is a potential that a number of problems may arise related to such a population change. A number of previous studies have been done on the effects of major development projects on rural areas. Among these studies are two which pertain to the effects of large energy projects on the

*As used by community planners, the term "infrastructure" refers to the set of those life support and public facility systems which must be provided in order to enable the development of healthy human settlements.

more remote portions of the Western United States: (1) Construction Worker Profile (1975) by Mountain West Research, and (2) Boomtown Growth Management (1975) by Gilmore and Duff.

Briefly, the Construction Worker Profile examined 14 energy projects located in rural areas of the Western United States. Based on the analysis of the effects of these projects on local communities, the study proposes methods and modelling techniques for estimating population changes related to development of major projects in rural areas. The Boomtown Growth Management study also analyzes the effects of large-scale development projects on the infrastructure of small rural communities. The study then presents methods for identifying project-related problems and establishing locally-determined priorities for problem resolution.

Although the geothermal project development scenarios, associated population changes, and potential impacts of geothermal development in The Geysers are certainly not of the same magnitude as those of the energy projects described in these studies, some of the methods of analysis were generally applicable to The Geysers. Similarly, communities near The Geysers geothermal development area are not as remote or rural as some of the communities described in the studies, but they could potentially experience similar types of impacts.

Based on such similarities, CEC staff used the assumptions and methodologies in the Construction Worker Profile to provide a general estimate of the maximum number of workers who could be expected to move into the KGRA to meet the construction work force needs of geothermal power plant projects. The population change assumptions which staff had used in earlier evaluations of CEC regulatory cases included:

- o Of the workers with the necessary skills needed for construction of a particular energy project, approximately 40 percent would already reside in the local area and be willing to commute to the project site. Since these workers were already local residents, their employment in a project would not produce changes in local populations.
- o The remaining 60 percent of the work force having the necessary skills to meet the needs of a particular project would relocate to the local area and establish a new local residence for the duration of the project.
- o Of the 60 percent of the work force moving to the area, 50 percent would bring their families which would consist of a spouse and 1.5 children.

In earlier regulatory project analyses, these assumptions were used to derive an estimate of maximum potential population increase related to a project. However, during recent regulatory proceedings before the CEC, demographic and public service information was received from local agency representatives which indicates that more specific assumptions for analysis of The Geysers can be developed. The information which permitted the refinement of staff's methodology for estimating population changes in the KGRA included the following:

- o A limited response survey of parents' occupations conducted by the Middletown Unified School District (Lake County) in 1979. Results of this survey indicated that about 33 percent of the students in the district had parents who were involved in geothermal development in The Geysers.

the workers drove their own vehicles so they could leave for their home residence as soon after work as possible (Watkins, September 1981). Refer to the section in this chapter on "Residence Distribution of the Work Force" for additional information on the commuter bus service.

- o The Electrical Power Research Institute (EPRI) has sponsored an update of the Construction Worker Profile. The study was prepared by the Denver Research Institute and Browne, Bortz and Coddington, and was published in February 1982. The study is based on current energy project developments in the western region of the United States and again examines the population changes and infrastructure effects of a number of individual energy development projects. In the course of discussions with the EPRI project coordinator, it became apparent that the EPRI study was reaching a conclusion similar to that of this study: that the work force was quite willing to commute very long distances to work on the projects rather than relocate their residence and families to the project area (Wyzga, April, September, and October 1981).

The above information, derived from several diverse but knowledgable sources, provides a reasonable basis for assuming that the majority of the construction work force needed for each of the development scenarios would tend to retain their permanent residence and commute to the local area for the duration of the job. Those workers who commute to locations close to The Geysers development area and establish temporary residences would be distributed among a number of communities within the four-county KGRA.

Projected Changes in Local Population

As described in Chapter V, PGandE has identified a construction work force peak which occurred in 1978 (PGandE, 1979). Using estimates of the work force derived from geothermal power plant proposals submitted to the CEC for regulatory review, there was an estimated cumulative power plant work force of 402 active in The Geysers in the last quarter of 1978. Referring to the work force data shown in Figures 7 - 10, it is apparent that work has continued on several geothermal projects in The Geysers since the end of 1978. The data show the cumulative work force totals briefly dropping down to 207 for the first quarter of 1981 but rising again to 507 in the fourth quarter of 1981. Therefore, it seems reasonable to assume that all of the approximately 400 workers that were employed during the 1978 peak period still reside in the four counties of The Geysers KGRA or the surrounding metropolitan centers and that they are still available for employment on geothermal construction projects. Others who have been involved in the construction of the Warm Springs Dam will also be available. This dam project is located in Sonoma County, about 10 miles northwest of the community of Healdsburg, and is to be completed in late 1981 or early 1982.

Based on the data graphed in Figures 7 - 10, the 1978 cumulative work force peak of 402 would be exceeded by almost 275 in the peak period of Scenario 1 which occurs in the fourth quarter of 1982. The 1978 peak would be exceeded by nearly 512 in the peak periods of Scenarios 2 and 3 which occurs in the first quarter of 1985. During these projected peak periods the number of workers involved in power plant construction will exceed the 1978 peak of 300 by 240 and 400, respectively.

Residence Distribution of Work Force

In previous studies the estimates for the residence distribution patterns of geothermal workers and families have included the following ratios:

1. 75 percent Sonoma/25 percent Lake (PGandE, Geysers 18 AFC, 1979),
2. 67 percent Sonoma/33 percent Lake (CEC, Geysers 16 EIR, 1980), and
3. 50 percent Sonoma/50 percent Lake (Oxy, Geothermal No. 1 AFC, 1981).

Previous studies and estimates of residential distribution ratios have not included Mendocino or Napa Counties. However, using a limited survey of construction workers in The Geysers in 1979 as an indicator, it is apparent that a number of geothermal construction workers already reside in these counties. The survey was conducted by Swinerton and Walberg in 1979 and evaluated bus ridership records for the two years between March 1977 and May 1979. This period spans the first major peak of construction work in The Geysers and includes most of the work on PGandE's Units 12 and 15 and portions of the work on Units 13 and 14.

During the survey period, the commuter buses had pickup points in each of the four counties in The Geysers KGRA. For the Unit 12 project there were three pickup points in Sonoma County, four in Lake County, and two in Napa County. For the Unit 13 project there were three pickup points in Sonoma County, seven in Lake County, two in Napa County, and one in Mendocino County. For Unit 14 there were five pickup points in Sonoma County and three in Lake County. For the Unit 15 project there were five pickup points in Sonoma County, two in Lake County, and two in Napa County.

Except for the Unit 13 project, workers from Mendocino County caught the buses at either Sonoma or Lake County pickup points. Workers using the Napa County pickup points for these projects showed residence locations both within Napa County and in the Bay Area counties. Present basic commuter routes include the same Lake and Sonoma County pickup points and, depending upon ridership demand, may also include pickups in Napa and Mendocino counties (Watkins, September 1981).

Approximately 1,025 bus passes were issued to construction workers during this two-year survey period, but staff evaluation of the survey results showed data on a total of 888 riders. This difference can be accounted for by the fact that some riders may have received more than one pass in the survey period, since they may have worked on more than one construction project.

The survey data indicated where the riders caught the bus, which project the workers were working on, what job skill they had, and the location of their residence. A list of the California residence locations most frequently mentioned in the survey is presented in Table 21. It is not clear whether these locations were considered by the workers to be their permanent residence or whether these were temporary residences for the duration of the project work. Without further information on whether this differentiation was made, only preliminary conclusions can be drawn about the residence distribution of the geothermal construction work force.

Evaluation of the survey provided the following information:

- o Less than 3 percent (23) of the workers surveyed showed out-of-state residence; of these 23 workers, 17 caught the commute bus at Sonoma County pickup points and 6 caught the bus at Lake County points;

- o Approximately 72 percent (640) of the workers surveyed named one of the four Geysers KGRA counties as their residence location;
- o Of the 72 percent of the surveyed workers in the four KGRA counties, about 57 percent resided in Sonoma County, about 23 percent in Lake County, 11 percent in Mendocino County, and about 8.4 percent in Napa County;
- o Nearly 19 percent (164) of the surveyed workers named one of the seven counties surrounding the San Francisco Bay as their residence location;
- o Nearly 3 percent (25) of the surveyed workers named the major urbanized areas in four of the counties in the northernly portion of California's Central Valley as their residence location; and
- o The residence locations named by the remaining 4 percent (36) of the surveyed workers were scattered over another 16 counties in the state, ranging between Shasta, Lassen, Tehama, and Humboldt on the north to Fresno, Kern, and San Luis Obispo on the south.

Further analysis of the survey data, in conjunction with comments by craft union representatives, leads to the conclusion that the pickup point at which each passenger boarded the commute bus provides an indication of either (1) the area in which the construction worker has a temporary residence (for the work week or by the month), or (2) the point to which the worker commutes each day from his/her permanent residence. It appears that the greater the distance between the worker's listed residence and the pickup point, the greater the likelihood that the worker is commuting from the residence location for the work week and maintaining a temporary residence near the pickup point.

TABLE 21

CITIES AND COUNTIES OF RESIDENCE MOST OFTEN NAMED
DURING CONSTRUCTION WORKER BUS PASS SURVEY

March 1977 - May 1979

Number Surveyed = 888

<u>Cities (County)</u>	<u>Number</u>	<u>Counties</u>	<u>Number</u>	<u>Percent of Total</u>
Santa Rosa (Sonoma)	188	<u>Geysers KGRA</u>		
Napa (Napa)	45	Sonoma	365	41.1
Ukiah (Mendocino)	41	Lake	148	16.7
Petaluma (Sonoma)	32	Mendocino	73	8.2
Sebastopol (Sonoma)	29	Napa	54	6.1
Clearlake Highlands (Lake)	29			
		TOTAL	640	72.1
San Francisco (S.F.)	25	<u>Bay Area</u>		
Healdsburg (Sonoma)	22	Contra Costa	41	4.6
Lower Lake (Lake)	22	Alameda	39	4.4
Windsor (Sonoma)	21	San Francisco	25	2.8
Cobb (Lake)	18	Solano	20	2.3
Rohnert Park (Sonoma)	18	San Mateo	21	2.4
Lakeport (Lake)	16	Marin	12	1.4
Kelseyville (Lake)	16	Santa Clara	6	0.7
		TOTAL	164	18.5
Cloverdale (Sonoma)	15	<u>Central Valley</u>		
Oakland (Alameda)	13	Stanislaus	7	0.8
Middletown (Lake)	11	San Joaquin	6	0.7
Vallejo (Solano)	11	Tehama	6	0.7
Concord (Contra Costa)	10	Sacramento	6	0.7
		TOTAL	25	2.8
		<u>Other California</u>	36	4.1
		<u>Out of State</u>	<u>23</u>	<u>2.6</u>
		TOTALS	888	100.1

Without identification of the residence location given in the survey as either temporary or permanent, it is difficult to make any firm distribution of residence for the additional workers needed to meet the peak demand during 1983. However, based upon the bus survey information, discussions with craft union representatives, and discussion with local agency representatives, the following residence distribution for the additional construction work force is proposed:*

Sonoma County	50 percent
Lake County	30 percent
Mendocino County	10 percent
Napa County	10 percent

Therefore, under the Scenario 1 projections for additional construction workers over the 1978 peak level, the number of workers coming from or moving into the four counties would be:

Sonoma County	120
Lake County	72
Mendocino County	24
Napa County	24

Under Scenarios 2 and 3, the number of additional workers needed to meet the 1985 construction work force peak would be:

*These numbers are maximum totals based upon the assumption that the additional workers needed to meet the peak period demand currently reside in the four counties of the KGRA and do not commute daily to and from The Geysers area.

Sonoma County	200
Lake County	120
Mendocino County	40
Napa County	40

It is important to note here that these numbers are cumulative and represent the interactive effects of several geothermal development projects. The distribution pattern could vary considerably between individual power plant projects.

The variability of the distribution ratios used in this study and in previous studies points up the difficulty involved in predicting how people choose where they will live. The choice of temporary residence made by the commuting work force would be influenced by the same set of factors which affect a new-comer to any area. Such factors include:

- o Commute Distance--This is usually measured in miles but also is influenced by commuting time and amount of difficulty (e.g., traffic, road conditions, weather conditions, route circuitry) involved in the commute. Another factor in commute distance and time is the limitation of travel on the internal roads in The Geysers which have been developed and maintained by the geothermal developers. These roads are closed to general traffic, and only those with valid permits may pass through the locked gates. Permits to pass are issued by the developer, and the fees charged are used to defray the cost of initial road developments and continued maintenance.
- o Cost of Housing--In December 1981, the median sale price of homes in California was almost \$102,800. In the San Francisco Bay area the median

sale price was over \$131,800 and in the Northern Wine Country region, which includes Sonoma and Mendocino counties, the median sale price was over \$87,950 (CABR, 1981). The interest rate for prospective home buyers is currently at 16.5 percent. The high cost and interest factors would weigh very heavily in anyone's decision whether or not to move from their existing residence. The greater the disparity between the financing cost of the existing home and the financing cost of another comparable home, the less likelihood that the worker would relocate.

- o Available Housing--This includes kind of housing desired (e.g., single family, multi-family, mobile homes), whether the worker wants to rent or to buy, and whether there is anything vacant in the area desired. As indicated in Chapter IV, many locales in the four-county Geysers area are experiencing a significant shortage of available housing. This problem is due to a slow down in new construction and the inflation of interest rates for construction or for purchase.
- o Rural Versus Urban Character--This factor involves a great deal of subjective evaluation and personal preference. Sonoma County offers a wide diversity of social opportunities and employment alternatives in the urbanized area in and around Santa Rosa. It also offers closer accessibility to the metropolitan centers in the Bay Area. For those workers who would prefer to live in more rural surroundings, the three other counties offer a range of residential alternatives from individual farms, ranches, or cabins; to small towns or villages; and to small, slow-paced cities.
- o Duration of Employment--Many of the construction jobs requiring specialized skills may last less than six months. There also may not be enough

of an overlap in individual project schedules which would allow workers with these skills to move from one project to the next as they complete their phase of the job. Given the costs of new housing, workers would be less likely to relocate for short duration jobs.

- o Location of Workers First Job in The Geysers--Recent studies seem to indicate that resource development in the KGRA is shifting eastward into Lake County. Additional shifts may occur to the northwest or to the southeast along the Mayacmas ridge as the known limits of The Geysers field are explored. Development of the hot water resource for direct-use applications may also produce changes in the focal point of geothermal development. Since the KGRA is only about three or four miles across, these shifts in the focus of resource development may not be a significant factor in the residence choice of existing workers. For new incoming workers, the location of their initial job may exert some influence on their choice of residence.

Chapter VII

EFFECTS OF GEOTHERMAL DEVELOPMENT ON LOCAL GOVERNMENTS

There are a number of governmental entities which have jurisdiction over or are in some way involved in the various aspects of geothermal exploration and development in the Geysers KGRA. These entities include federal, state, and local government and they often have similar and overlapping responsibilities. These various agencies and their jurisdictional responsibilities have been briefly described in Appendix D.

It is the local governmental entities and the local population which are closest to the geothermal development activity. And it is the local governmental entities which must deal with both the positive and the negative effects of geothermal development. Throughout the years since resource development began in the Geysers, geothermal has benefited the local governments (primarily in Sonoma and Lake counties) by producing a variety of revenues.

REVENUES FROM GEOTHERMAL DEVELOPMENT TO LOCAL GOVERNMENTS

The general revenues of the counties in California are derived from a variety of sources. According to figures from the 1979-80 Fiscal Year, taxes account for 25 percent of general county revenues, with property taxes accounting for 80 percent of all taxes (see Figure 11). Statewide, approximately 60 percent of county revenues are obtained from federal and state governments. Charges for current services equal about 6 percent of the total, while revenue from the use of money and property accounts for about 4 percent of all revenues. Licenses, permits, fines, forfeits, and penalties, along with other miscellaneous revenues, account for the final 5 percent of the general revenues.

County expenditures, exclusive of county-owned enterprises and bond funds, are devoted primarily to providing public assistance and public protection services. These 2 categories account for 40 percent and 24 percent, respectively, of all county expenditures (Figure 12). Health and sanitation expenditures represent 11 percent of county budgets, while the expenditures on public ways and facilities account for 6 percent of those budgets. The remaining 18 percent is spent on miscellaneous items.

The revenues received during the 1979-80 Fiscal Year by each of the four counties (Lake, Mendocino, Napa, and Sonoma) in the KGRA are shown in Table 22 and are broken out by funding source. In Table 23, a summary is provided for each of the four counties showing the 1979-80 Fiscal Year general expenditures broken down by function and activity.

Rough estimates of the potential income that might be generated in Lake and Sonoma counties indicates that revenues from taxes on the power plants and steam fields could, in both counties, be substantial. Staff calculations

FIGURE 11
GENERAL COUNTY REVENUE--EXCLUSIVE OF
COUNTY-OWNED ENTERPRISES AND BOND FUNDS AS A
PERCENT OF TOTAL REVENUES

Fiscal Year 1979-80

FIGURE 12
GENERAL COUNTY EXPENDITURES--EXCLUSIVE OF
COUNTY-OWNED ENTERPRISES AND BOND FUNDS AS A
PERCENT OF TOTAL EXPENITURES

Fiscal Year 1979-80

SOURCE: State Controller's Office Annual Report 1979-80 —
 Financial Transactions Concerning Counties of California.

indicate that, with maximum development of The Geysers resource described under Scenario 3, Lake County, could be receiving approximately \$2 million dollars in taxes in 1985. This amount might increase to around \$4.3 million by 1992. In Sonoma County, taxes collected solely for county government use from geothermal power plants and steam fields might be generating around \$5.5 million tax dollars in 1985 and could increase to approximately \$8 million by 1992.

In addition to the revenues generated for the counties from property taxes on power plants and steam fields, there is additional income generated by the new permanent residents through the infusion of their money into the local economy. For example, resident employees in the geothermal industry in the KGRA contribute to local sales taxes, property taxes, income taxes, etc., which generate revenues that flow either directly to the county or indirectly by way of the state or federal governments. To a lesser degree geothermal workers who may only temporarily reside in the four counties of the KGRA also contribute to the local economy during the period(s) they are resident.

Revenues from Taxation of Geothermal Development

- o Property Taxes--Geothermal development in the KGRA has resulted in an increase in property taxes collected by the counties. Depending upon the type of property and its ownership, the method of taxation will vary. State and federal land, in addition to property owned by county governments and special districts, is exempt from taxation. Private property is assessed by the county assessor. Following passage of Proposition 13 in June 1978, all private properties in the state were assessed at 1 percent of their assessed value. If a property has been

built, sold, or substantially modified since 1975, it is assessed at 1 percent of its initial or current fair market value. Market value is usually established from recent sales of similar property in the area.

Property which is owned by utility companies (e.g., Pacific Gas and Electric Company), which are regulated by the California Public Utilities Commission (PUC), has a tax rate set by the state Board of Equalization. The market value of a geothermal power plant is appraised and its assessed value allocated to the county in which it is located. The state board prepares a list of all electric generating facility properties for each county. The county assessor then includes that figure with those of the remainder of the assessed property in the county and calculates the county tax rate.

Geothermal steam wells drilled on a property, in addition to their related production facilities, are regarded as improvements to the land and are subject to ad valorem (value added) taxes. If an exploratory well is successful, it is appraised based upon the amount of steam produced and the "going price" of that steam. The other factor which determines the amount of taxes to be paid on a geothermal well is the anticipated date that the well will begin to supply steam to a power plant. As the "start up" date for the power plant is approached, the assessed value of the wells increases. Wells on line are appraised at present steam prices.

TABLE 22
GENERAL REVENUES FOR THE KGRA COUNTIES

Amounts in Millions of Dollars								1979/80 Fiscal Year	
<u>County</u>	<u>Property Taxes</u>	<u>Misc. Taxes</u>	<u>Licenses, Permits, etc.</u>	<u>Fines, Penalties, etc.</u>	<u>From Use of Money and Property</u>	<u>From Other Government Agencies</u>	<u>Charges for Current Services</u>	<u>OTHER REVENUES</u>	<u>TOTAL REVENUES</u>
Lake	3.28	1.84	.55	.20	.80	8.18	.99	.32	16.19
Mendocino	5.98	4.94	.55	.27	1.97	16.99	1.39	.40	32.52
Napa	6.31	2.83	.53	.38	1.45	15.15	1.55	.40	28.63
Sonoma	22.25	7.11	1.66	1.15	4.02	54.33	5.57	.89	97.02

TABLE 23
EXPENDITURES BY THE KGRA COUNTIES
BY SELECTED CATEGORIES

Amounts in Millions of Dollars							1979/80 Fiscal Year	
<u>County</u>	<u>Public Protection</u>	<u>Public Ways and Facilities</u>	<u>Health and Sanitation</u>	<u>Education and Related</u>	<u>Public Assistance</u>	<u>General*</u>	<u>MISC.</u>	<u>TOTAL EXPENDITURES</u>
Lake	4.33	1.73	.99	.19	4.94	3.11	.26	15.45
Mendocino	5.78	4.79	2.37	.48	9.66	7.80	.14	31.02
Napa	7.88	3.03	2.81	.41	7.67	7.91	.36	30.07
Sonoma	22.66	9.15	11.16	1.33	31.02	12.01	1.20	88.53

*Includes financial, personnel, administrative, plant acquisition, and other costs.

- o Possessory Interest Taxes--Another source of geothermal property tax income for a county in the KGRA is based upon "possessory interest" in a property. This occurs when a private company leases government land (state, BLM, U.S. Forest Service, etc.) that was formerly tax-exempt. In this circumstance the developer is taxed on the value of the lease and then on any wells in the usual manner. Geothermal leaseholds on federal lands, when sold on a bonus bid basis (the price paid to secure the lease), have been taxed as possessory interests, whether or not there is any production of steam. Depending upon the circumstances under which the winning bid was awarded, county assessors have used the bonus bid price (or a portion thereof) as the value of the leasehold for taxation purposes. Geothermal leaseholds on private lands have not been taxed as possessory interests. They are taxed commencing only with discovery of the resource. Often, leases on private lands have not been recorded nor has there been a bonus bid price paid for the leases.

Revenues from Geothermal Development on Federal Lands (AB 1905)

The federal government administers large tracts of land in The Geysers KGRA. Geothermal revenues from federal lands are derived from three sources: (1) a one-time bonus bid (lease fee) which the highest bidder pays to the federal government for the right to exploit the geothermal resources on a specific parcel of land; (2) an annual rental payment on the property (usually a minimal amount, often 1 or 2 dollars an acre per year); and (3) a royalty payment of 12-1/2 percent on the amount of steam sold to a geothermal power producer.

Development of geothermal resources on federal lands in the KGRA has provided counties in the region with an additional source of revenue. Based upon the requirements set forth in the Geothermal Steam Act of 1970 (as amended) and the Mineral Lands Leasing Act of 1920 (as amended), the federal government retains 50 percent of the money received from geothermal leases on federal lands. The remaining 50 percent of federal mineral lease revenues is disbursed to the state of origin. The money received from the federal government is placed in the state's Geothermal Resources Development Account (GRDA). As mandated by the Bosco-Keene Act (AB 1905), the state then disburses a portion of this money to the counties. In accordance with AB 1905, money in this account is disbursed as follows: 40 percent to the county of origin where the revenue was generated (the bill specifies how the money may be spent); 30 percent to the California Energy Commission for the purpose of making grants to local jurisdictions possessing geothermal resources; and 30 percent to the state's Renewable Resources Investment Fund.

Moneys paid from the state's Geothermal Resources Development Account come from two sources: (1) a "payback" allocation amounting to almost \$2 million which will be paid in annual installments until 1985 (this payback amount is equal to the revenues earned by the state from geothermal leases and steam royalties between January 1, 1976, and June 30, 1980), and (2) all geothermal lease revenues and steam royalties earned after July 1, 1980.

In December 1980, the state made the first payment to the counties of origin in the KGRA. Sonoma County received approximately \$498,000; Lake County, \$324,000; and Mendocino County, \$2,000. Subsequent payments made to Sonoma, Lake, and Mendocino counties in early 1981 brought their total payments for

Fiscal Year 1980-81 to \$530,266, \$333,269, and \$2,174, respectively. On February 1, 1982, these counties received the following amounts toward their payments for Fiscal Year 1981-82: Sonoma County, \$521,876; Lake County, \$359,193; and Mendocino County, \$1,620. While Napa County is in the KGRA, it does not have any land on which bids were taken for geothermal development between January 1, 1976, and the present. Therefore, the county did not receive any funds, since it is not yet a county of origin.

The Geothermal Research, Information, and Planning Services (GRIPS) Commission estimated the amount of money Sonoma, Lake, and Mendocino counties will receive from AB 1905 for the Fiscal Years 1980/81 through 1985/86 (see Table 24). In addition, GRIPS estimated how much grant money the Energy Commission will be able to disburse in that same time period (Table 24).

TABLE 24
ESTIMATE OF AB 1905 FUNDS
AVAILABLE FY 1980 - 1986

<u>REVENUES TO COUNTIES OF ORIGIN</u>				
<u>Fiscal Year</u>	<u>Sonoma County</u>	<u>Lake County</u>	<u>Mendocino County</u>	<u>Energy Commission</u>
FY 80-81	\$587,000	\$330,000	\$2,400	\$690,000
FY 81-82	579,000	334,000	2,000	687,000
FY 82-83	601,000	351,000	2,000	715,000
FY 83-84	678,000	425,000	2,000	828,000
FY 84-85	517,000	370,000	1,200	666,000
FY 85-86	353,000	253,000	400	456,000

Source: GRIPS, 1979.

Agreements by Tax-Exempt Power Plant Operators

In California, publically owned utilities and governmental entities are not required to pay local property taxes. This fact has created an issue of concern in the KGRA because the counties believe that the power plants owned and operated by such entities are tapping a finite resource and requiring local public services but are contributing no local revenue. Currently, three such entities are constructing power plants in the KGRA. They are the California Department of Water Resources (DWR), Sacramento Municipal Utility District (SMUD), and the Northern California Power Agency (NCPA). A fourth, the Modesto Irrigation District, is developing plans for two 55 MW power plants in the Geysers, due to come on line in 1986-7.

The counties have negotiated with these entities to reach agreements for mitigation of specific effects of geothermal power plant construction and operation in the KGRA. Such agreements to date include the formation of a nonprofit corporation by NCPA which will make it liable for payment of property taxes on its power plant facilities in the KGRA; agreement by the state Department of Water Resources (DWR) to rebuild sections of the roads in Sonoma and Lake counties which it uses to transport material to its power plant sites; and agreement by DWR to build a flashboard dam below their facility on Kelsey Creek in Lake County.

Excise Tax on the Privelege of Generating Electricity from Geothermal Resources

In November of 1981, the voters of Sonoma County voted to approve and enact Measure A (Ordinance 2853-R). The purpose of Measure A is to create a special tax in Sonoma County on the production of electrical energy from geothermal

resources within the county. This tax is to be imposed upon persons or entities who are exempt from paying local property taxes. It would be the responsibility of the County Board of Supervisors to set the tax rate for this ordinance, but it could not exceed 6 percent of the market value of the electricity generated from geothermal resources within Sonoma County. The revenue from this tax would be appropriated annually by the Board of Supervisors for uses restricted to public safety and roads. Activities that would be eligible for funding would include law enforcement, fire protection, and road construction and maintenance in Sonoma County.

The rationale behind Measure A is to ensure that public entities which are exempted from paying property taxes by the California Constitution will still be required to contribute revenues if they construct geothermal power plants within the county. However, as soon as Measure A was passed by the voters, SMUD filed suit to block the enactment of the ordinance. It is SMUD's contention that the purpose of Measure A is to act as a substitute for property taxes. Since the California Constitution exempts public agencies from property taxation, SMUD believes that Measure A is unconstitutional. This is an issue which could conceivably end up being decided by the California Supreme Court.

Lake County is now thinking about enacting an ordinance modelled after Measure A. This proposed ordinance will be placed on the ballot for the residents of the county to vote on at the general election scheduled in June of 1982.

With the enactment of Measure A and now with Lake County's proposed ordinance, the issue of agreements between tax-exempt power plant operators and the counties, as well as the question of revenues generated for the counties

by geothermal development, become clouded. There appears to be no reason for a tax-exempt power plant operator to enter into a mitigation agreement with a county if a special tax is to be imposed upon them. If Measure A is found to be constitutional, the extent to which county revenues would increase is unknown.

Effects of Proposition 4 on Local Government's Use of Geothermal Revenues

Proposition 4, passed in 1979 by voters of the state, added a new Article to the Constitution which was designed to limit spending by the state and local governments. Each year the total annual appropriations of the state and local governments cannot exceed the appropriations of the prior year (adjusted for changes in the cost of living and population), unless so voted on and approved by the voters, or except in an emergency. The 1978-79 Fiscal Year was selected as the first base year.

With a rapid expansion of geothermal development which could generate significant new property taxes, a county might exceed its spending limit imposed by Proposition 4 if the cost of living and population growth were minimal during a given year. In this type of situation a county would have to return these excess appropriations within the following two fiscal years either through revisions in the tax rates or through revisions in fee schedules. Thus, a county might be placed in the position of not being able to utilize a certain amount of the tax revenues generated by geothermal development, while at the same time having to expend tax dollars for those geothermal facilities.

EFFECTS OF GEOTHERMAL REVENUES ON THE GEYSERS KGRA

The geothermal development in the KGRA has had a different impact upon each of the four counties. This is because of the differences in the amount of development that has occurred in each county and because of the different population and economic base possessed by each county. All four counties are examined separately because of the unique impacts that have occurred in each of them.

Sonoma County

The growth of the geothermal property tax base in Sonoma County increased slowly throughout the 1960s and at a more rapid pace in the 1970s. In the 1960/61 Fiscal Year, geothermal properties accounted for only 0.2 percent of all property tax levies collected in the county. This figure increased to 0.5 percent for 1965-66 and 0.9 percent in the 1970-71 Fiscal Year. Geothermal properties accounted for 3 percent of all property taxes in Sonoma County in the 1975-76 Fiscal Year, which increased to 4.2 percent in 1977-78, 6.7 percent in 1979-80, 7.6 percent in 1980-81, and approximately 11 percent in 1981-82. It can be expected that the percentage of property tax revenues derived from geothermal properties will continue to rise, at least in the short term. However, unlike the other three counties in the KGRA, Sonoma County's tax base is sufficiently diversified so that geothermal development would not be expected to dominate its tax rolls.

As a county of origin, Sonoma County has received about \$530,000 in AB 1905 funds for the 1980-81 Fiscal Year. In September 1981, the County Board of Supervisors decided how to appropriate the funds for the 1980-81 and 81-82

Fiscal Years. This information is contained in Table 25. In general, the expenditures were in three areas:

- o Annual maintenance and construction costs for the Geysers-Healdsburg Road.
- o Improvements and development of county parks.
- o Annual maintenance costs and repair of the Healdsburg Dam.

During the next three fiscal years the county will receive approximately \$600,000 per year in geothermal revenues disbursed through AB 1905. Revenues beyond the 1985-86 Fiscal Year will depend on how much steam is being produced at that time and what new leases have been negotiated. Since distribution of these funds to the counties was initiated by state legislative action, there is always a possibility that, as the political climate and fiscal condition of the state change, the funds could be redistributed.

Like Lake County, Sonoma County has attempted to reach agreement with public utility companies, which are constructing geothermal power plants in the KGRA, regarding what obligations they will assume in an effort to ameliorate the impacts of their generating facilities. However, because of the passage of Measure A, it is difficult to predict what, if any, agreements will be reached in the future between the counties and the public utilities.

Because of the continuing increase in the population of Sonoma County and the constant rise in the consumer price index, county appropriations, as regulated by Proposition 4, can continue to rise. County staff does not know at this time whether continued geothermal development will necessitate a cutback in county appropriations from other sources because of the limitations of Proposition 4 (Comalli, June 1981). This would occur if the appropriations

TABLE 25

SONOMA COUNTY ALLOCATION OF AB 1905 FUNDS

1980/1981 Fiscal Year

<u>Appropriations</u>	<u>Amounts</u>
Annual Maintenance Costs on Geysers-Healdsburg Road	\$260,000
Sheriff's Department Helicopter (portion of replacement costs)	50,000
Doran Park Sewer System	73,000
Doran Park Improvements	18,000
Westside Park Improvements	38,000
Keiser Park Development	20,000
Gualala Point Park Improvements	26,000
Stillwater Cove Park Residences	<u>42,267</u>
TOTAL	\$530,267

1981/1982 Fiscal Year

<u>Appropriations</u>	<u>Amounts</u>
Annual Maintenance Costs on Geysers-Healdsburg Road	\$300,000
Construction (Geysers-Healdsburg Road)	60,000
Spud Point Marina	30,000
Healdsburg Dam Repair	100,000
Raising and Lowering of Water Level in Healdsburg Dam	<u>40,000</u>
TOTAL	\$530,000

Sources: Sonoma County, Office of County Administrator; Gary Kovacovich, County Administrator's Office; Jim Moore, County Administrator's Office.

gained by the county from geothermal development rose at a faster rate than the appropriation rate allowed by increases in the county's population and the cost of living. Sonoma County would certainly be opposed to forfeiting the appropriations it would gain from geothermal development if those appropriations were curtailed by Proposition 4, since the county would still be required to provide those services required by geothermal development.

Lake County

The impact of geothermal development upon Lake County has been substantial, and it is expected that current and future expansion of geothermal facilities within the county will produce even greater impacts. In the 1973-74 Fiscal Year the assessed valuation of geothermal facilities in the county was roughly \$200,000, compared to the 1980-81 total of \$28,600,400. In the 1978-79 Fiscal Year geothermal property values represented approximately 3 percent of the county's property tax base. This figure grew to 9 percent in 1979-80, to 12 percent in 1980-81, and to approximately 20 percent in 1981-82. Longer-range projections prepared by the Lake County Tax Assessor's Office indicate that geothermal property values will continue to increase and comprise 27 percent of the county's property tax base in 1984-85 and 32 percent in the 1987-88 Fiscal Year (Strong, June 1981).

The amount of money received by Lake County from AB 1905 in 1981 totals over \$330,000. This is a substantial amount when compared to the approximately \$3.1 million in property taxes collected by the county during the 1979-80 Fiscal Year. So the revenues provided from the AB 1905 account have proved extremely important to the county in providing funds to be used in mitigating

the adverse impacts of geothermal development. Table 24 listed the amount of funds the GRIPS Commission expects Lake County will receive from AB 1905. The county believes these funds will become even more important as the extent and pace of geothermal development increases. To date the Lake County Board of Supervisors has allocated nearly \$350,000 of its first-year AB 1905 funds to a variety of recipients (see Table 26).

There is concern at this time in Lake County on the effects that Proposition 4 may have on the geothermal development that is taking place. Because of the large anticipated growth in geothermal property tax revenues in the mid-1980s, it appears as if the county may exceed the limitations in appropriations established by Proposition 4. This would occur because taxable property values would be increasing at a faster rate than the combined factors of population growth and the cost of living. Since the county anticipates dramatic growth of geothermal development in the next 5 to 10 years, the possibility exists that this growth may cause such an increase in the level of appropriations that a large percentage will have to be refunded.

Another potential problem for Lake County would be the construction of power plants by entities that are exempt from paying property taxes. The county has conducted negotiations with NCPA and DWR and has reached some agreements concerning what steps they will take to help mitigate the impacts caused by their developments. In the future, further negotiations may take place between the county and such tax-exempt entities concerning the question of what expenses they agree to pay in order to mitigate the impacts of constructing their geothermal power generating facilities. Much will depend on

TABLE 26

LAKE COUNTY ALLOCATION OF AB 1905 FUNDS, 1981

Date	Recipient	Use of Funds	Amount
3/24/81	Callayomi Water District, Middletown	Local matching funds for sewer collection and treatment facilities.	\$ 5,250
4/24/81	Middletown Unified School District	Cost of one-year's lease on four portable classrooms.	\$ 30,000
4/29/81	Lake County	Update of cost and revenue figures for the Pomo Dam project.	\$ 24,000
5/22/81	Kelseyville Fire District	Purchase of a second-hand fire truck to replace old truck.	\$ 27,000
	Lower Lake Water District	Development of new well and distribution lines	\$ 9,871
5/29/81	Konocti Unified School District	Cost of one-year's lease on four portable classrooms.	\$ 16,500
	Air Pollution Control District	Purchase of noise-monitoring equipment.	\$ 8,500
	Fish and Wildlife Advisory Committee	Study and start-up costs of a controlled burn program for enhancement of wildlife habitat.	\$ 5,000
7/1/81	County Road Department	Repair of 1.2 mile section of Butts Canyon Road	\$120,000
8/27/81	Lake County	County's share of funding for a joint study of effect of geothermal activities on water in Anderson Springs area, with Aminoil USA, Inc., and Occidental Petroleum, Inc.	\$ 15,000
6/1/81	County Sheriff's Department	Funding for additional deputy and necessary equipment for assignment to the Middletown area.	\$ 48,795
8/11/81	Loch Lomond Mutual Water Co.	Improvement of water system.	Grant \$ 14,000 + Loan \$ 20,000
Source:	Record-Bee March 1981 - April 1982. Kelly Cox, Board of Supervisors Office.		TOTAL \$345,916

whether Lake County voters adopt an ordinance allowing taxation of the production of electricity from geothermal resources within the county.

Mendocino County

The amount of geothermal resource development activity that has occurred to date in Mendocino County has been limited to the sale of leases on federal lands. The money received so far by the county through AB 1905 has been less than \$2,500. Because the county's planning department has expended more money in monitoring geothermal development than the county has received from AB 1905, these funds have been deposited into the county's general fund. At this time, according to the county assessor's office, there has been no property tax generated through the development of, or exploration for, geothermal resources (Clyburn, September 1981).

Napa County

To date, Napa County has received no money either from property taxes or from AB 1905 funds, since there has been no sale of leases for development of geothermal steam within the county. However, as the exploration for geothermal resources expands to surrounding areas outside the current development area, there is a possibility that geothermal facilities will be constructed in the northern part of Napa County. If this does happen, the extent of the development and its location will have an impact upon the county. The types of impacts are not possible, at this time, to predict. However, since Napa County possesses a small population (around 100,000) and has a small tax base (1979-80 total revenues of \$28 million), even moderate geothermal development might place large demands on a variety of county agencies and services.

COSTS OF GEOTHERMAL DEVELOPMENT FOR LOCAL GOVERNMENTS

All levels of government with jurisdictional responsibility at various stages of geothermal development incur some type and amount of costs in the exercise of their responsibility. For those entities whose responsibility is primarily regulatory, many of these costs are covered by fees which are charged back to the developers. For the governmental entities which are more directly involved in the physical aspects of geothermal development, the costs span a broader spectrum of kind, duration, and amount.

It is at the local government level that the effects of geothermal development may become most visible. For local governments the potential costs of geothermal development may include general administrative and service costs associated with permit processing and approval, project environmental review, and inspection and monitoring of project activities; costs related to providing increased services to new residents drawn to work on development of the resource; and costs related to construction and maintenance of local roads needed to provide access to the geothermal development area. Other costs may occur, but they tend to be more intangible and less measurable. This study is directed at the more tangible, measurable kinds of costs described above.

Administrative Costs

General administrative costs and service costs are incurred by the county governments in The Geysers because of time spent reviewing and commenting on geothermal development proposals, reviewing and monitoring environmental mitigation measures on geothermal developments, processing permits and proposals, etc. To drill a single new geothermal well in The Geysers area, on either

privately or state-owned lands, may require the geothermal developer to obtain as many as 10 state permits and 6 county permits (JPL, 1976). A well drilled on federal lands would require a comparable number of authorizations prior to development (JPL, 1976).

Using Lake County as an example, the different county departments that in some way interface with geothermal development can be identified. These departments often incur costs that can be categorized as administrative processing costs, general service costs, costs incurred in the field, and line costs.

- o County Planning Department--The work the planning department performs is paid for by fees charged to the applicant. In some instances they contract the work out to a private firm. That portion of the contractor's cost which exceeds the county's normal fee is also charged to the applicant. Because of the fees charged to geothermal applicants, the cost incurred by the planning department due to geothermal development is not considered significant. At this time, the county is charging geothermal developers \$2,600 for each application. The county averages about 11 such applications per year. However, the planning department believes their fees are too low and therefore is conducting a study to determine what expenses the department is actually incurring. When the study is completed and the new estimate determined, the fee rate will be adjusted. This will mean that the work performed by the planning department on geothermal-related items will continue to be funded by the applicant's fees and that the county will not incur any expenses (Borden, June 1981).

- o County Building Inspector--Work performed by this department is largely paid for by the building inspection fees and plan-checking fees they charge. The county representative anticipates that future inspection work on most geothermal facilities will be performed by private companies contracted with by the county and paid for by power plant developers. Thus, it does not appear as if the county will incur any additional expenses in this area. It can be expected that any work performed by the Building Department on geothermal facilities will probably be paid for by the fees they charge (Borden, June 1981).
- o County Counsel's Office--In the 1979-80 Fiscal Year the budget for the County Counsel's office in Lake County was \$188,000. The County Counsel's office estimated that they are spending roughly 10 percent of their time on geothermal-related issues (Reeves, September 1981). This amount of time might reasonably be expected to increase if geothermal activity within the county intensifies, as is expected under all three scenarios. Ten percent of the office's budget is \$18,800. This would be a liberal estimate of the cost of geothermal development to the County Counsel's office, since much of the budget represents a fixed cost which would still exist, irrespective of geothermal-related work.
- o County Tax Assessors Office--The Assessor's Office, like the County Counsel's Office, must also expend time on geothermal-related items but charges no fees to pay for their work. The County Assessor estimates that in the Assessor's Office the amount of time currently spent working on items directly connected with geothermal issues equals about 1 technical person from a staff of 23, per year, plus accompanying clerical

support (Strong, October 1981). The budget for this office during the 1979-80 Fiscal Year was \$327,000. A cost to the office for geothermal-related work can be approximated if an annual salary of \$15,000 for technical staff is assumed, plus 25 percent for benefits and \$5,000 for clerical support. This totals \$23,750. Again, this estimate would represent the probable upper limit of expenses directly related to geothermal development. This is because some portion of the estimated costs represents fixed costs that would be incurred even if there was no geothermal work performed by the office.

As geothermal activity increases in Lake County, the Assessor's Office may spend more time on this item. However, the increased work by the office with geothermal property has allowed them to gain greater expertise in the area and therefore work more efficiently. So it is possible that as geothermal activity in the county increases, with a corresponding increase in tax revenues, the costs incurred by the Assessor's Office may not necessarily rise at as rapid a pace, especially when considering the advantages of an economy of scale or in this case, a larger, more efficient operation.

- o County Clerk's Office--The County Clerk's Office is involved with geothermal development because it records geothermal leases and other documents. This cost incurred by the County Clerk is offset by the fees charged. The County Auditor-Controller must expend staff time on geothermal-related activities because this office issues warrants to county contractors performing work on geothermal facilities. The office estimates that it incurs a cost of approximately \$5 - \$10 for every

warrant they issue to geothermal contractors. They are currently averaging about 80 warrants per year. This amounts to about \$400 - \$800 per year.

- o County Board of Supervisors--The Board of Supervisors is directly involved in many geothermal-related issues. They determine how to distribute AB 1905 funds. They review geothermal applications when there is an appeal of a decision made by the Planning Commission regarding the issuance of a use permit or if there is disagreement between applicants and the Air Pollution Control District over ordinances regulating geothermal emissions.

It is difficult to estimate how much time the board devoted to geothermal-related items that, in fact, represent a definite cost to the county. The board members meet a minimum of one and one-half days per week and have fixed salaries. If one assumes that 10 percent of all board costs result because of work on geothermal-related items, (this is most likely a high estimate) then based upon the 1970-80 Fiscal Year budget of \$169,000, the cost generated by geothermal development would be \$16,900.

- o County Air Pollution Control District--The Lake County Air Pollution Control Office estimates that it is currently spending between 60 - 80 percent of its time on geothermal-related air quality issues. The budget for the office during the 1980-81 Fiscal Year was \$157,000. Of this amount approximately \$52,000 was paid from the state subvention funds received from the Air Resources Board. Approximately another \$76,000 was paid for by the permit fees charged by the office to various applicants. The office estimates that fees charged for work performed on transmission

lines and steam field wells are not adequate to offset the cost of the work they perform. Additionally, they believe that the air pollution control work performed because of power plants is even less self supporting through the fees charged for this type of work (Saderlund, September 1981).

When the state subvention funds and the permit fees are combined, they total approximately \$128,000. This leaves \$29,000 of the budget that the county is responsible for providing. If 60 - 80 percent of the office's time is spent on geothermal-related matters, a rough estimate of its cost to the county is \$17,400 - \$23,200.

The foregoing analysis was performed to arrive at the separate costs incurred by various county departments and is quite general. However, by attempting to be liberal in estimating the costs incurred by Lake County because of geothermal development, it seems reasonable that the county is not incurring more expenses than this estimate. When this figure is compared to the various revenues received by the county because of geothermal development, it can be estimated, in this one area, just how the county is faring financially.

Computing the estimated costs for the Lake County departments that incur administrative or general service costs because of their responsibilities related to geothermal development, a figure ranging between \$77,250 - \$83,450 is obtained. This cost then is the maximum amount staff would expect Lake County to spend on geothermal development because of administrative and general service costs. The property tax revenues generated by geothermal power plants and steam fields in Lake County will total approximately \$900,000 in the 1981-82 Fiscal Year. When these two figures are compared, it is

apparent that geothermal development more than pays the cost of the administrative and general county services it requires.

A similar breakdown of administrative costs and general service costs has not been done for Sonoma County. However, such a cost/revenue comparison for Sonoma County should produce results comparable to that developed for Lake County. Tax revenues from geothermal properties in Sonoma County should exceed any administrative and general service costs incurred by the county.

Public Service Costs

Local governments provide a number of services to the people who reside within their jurisdictional boundaries. Depending upon the number and distribution of the population, not all such services may be provided by a local government to all areas within their jurisdiction. The number and distribution of the local population also affects the ability of the governmental entity to provide these services and the quality of the service provided. A significant increase in service area population produces a corresponding need to increase available service. (Refer to Chapter IV for a discussion of existing public services available in the four counties in the Geysers KGRA.)

Among the services provided by local governments are water supply, disposal of waste waters and materials, education, police and fire protection, flood control, parks and recreational facilities, transportation facilities, and library services. Services which appear most immediately sensitive to population changes include education, water supply, waste water disposal, law enforcement, and fire protection.

Each public service entity providing such services has limits to its capability to reasonably meet the needs within its service area. For a water supplier, this service capacity can be measured in numbers of gallons of water available for consumption and the geographic and physical limitations of the distribution system. For a school district, the service capacity can be measured in numbers of students, teachers, classrooms, and other facilities. For a sanitation district, the service capacity could be measured in numbers of gallons of waste water, the extent of the collection system, and the capacity of treatment facilities. For protective services, service capacity is generally measured by the time needed to respond to a request for service.

When a local public service is at or near capacity, there would be a need to expand its services to accomodate demands associated with growth in its service area. For a water supplier this may mean they will need a new pump, a new storage reservoir, or a new well. For a school district it may mean the need for a new classroom, a new teacher, or even a new school. For a sanitation district this may mean an expansion of treatment facilities or an increase in sewage collection lines. For the protective services it may mean new deputies and patrol cars or new fire fighters and fire trucks.

The four counties in the KGRA have experienced very rapid rates of growth in the past 10 years and particularly in the past 5 years. In the 20-plus years since geothermal development in the Geysers KGRA began to increase, growth in this industry has undoubtedly produced some increase in local population. There are no data, however, on the exact amount, rate, and distribution of local population increase attributable to geothermal development. Likewise, there are no hard data on the portion of increase attributable to any single aspect of geothermal development. The number of workers involved

in power plant construction, combined with overlapping construction schedules, has the potential to produce short-term population fluctuations if these workers have moved their families into the four-county area. However, preliminary indications from the research for this study are that these workers and their families do not change their permanent residence.

As the four KGRA counties have grown in population and as geothermal development has increased, local governments have begun to experience noticeable impacts on public services. Based upon information gathered in the preparation of this study, it appears that the local public services most greatly affected to date by geothermal development are education and road maintenance. Each of these effects are a result of all aspects of geothermal development: steam resource exploration, development, and maintenance; and power plant construction, operation, and maintenance.

- o Geothermal Development Effects on Schools--An increase in local population which brings families with school-age children creates a corresponding need for additional space and educational services in the local schools. Following a series of legislative actions, court decisions, and voter mandates, schools have undergone serious financing constraints and often are not able to immediately respond to a rapid or large increase in student population. Recent action by the state executive office which froze appropriation of Leroy Greene Act funds has further reduced the local school districts' ability to respond to increased needs for educational facilities and services.

The primary source of school district operational revenues has been property taxes. Operational expenses include the costs of salaries,

supplies, utilities, and other such ongoing costs. Property taxes were collected by local governments and redistributed back to school districts as the monies were collected. Property taxes were based upon the assessed valuation of all property in each school district. The tax rate was determined by the amount needed to meet the needs of the district's budget for educational services and facilities. The assessed values, the tax rates, and the amount budgeted per student for services varied widely from district to district throughout the state.

Under the Serrano-Priest court decision in the early 1970s, school districts attempted to resolve some of the disparity between educational services available to students in districts with high assessed valuation and those with low valuation. At that time the districts set a revenue limit for expenditures per student. In 1972, the state adopted regulations for standardized calculation of allowable annual increases to these revenue limits. For some districts with low assessed valuations, the amount available through local property taxes was not adequate to provide a desirable minimum level of service per student. The state provided a supplemental allowance to these districts so they could achieve and maintain their allowable revenue limit.

Prior to the passage of the Jarvis-Gann Initiative (Proposition 13) in June 1978, school districts could raise additional money for construction of school buildings and for other capital outlay expenses by selling bonds. The voters had the authority to authorize the issuance of the bonds and the payment of the bond debt through tax-override increases in local property taxes. Following passage of Proposition 13, property tax

increases for the purpose of paying for construction bonds became unlawful. Also, the limitation on the base tax rate substantially decreased the amount of local property tax revenue available to local governments and, therefore, to the school districts (Pullmann, 1981).

Under the new post-Proposition 13 funding system, school districts receive from the state only the amount of money sufficient to provide them with the difference between local tax revenues allocated to school districts and the annually adjusted "revenue limit" per student. Any increase in local property tax revenues, therefore, only serves to reduce the amount the state contributes to meet the "revenue limit" (Pullmann, 1981).

Neither the revenues from the local property taxes nor the supplemental funds from the state can be used for capital outlay costs. Capital costs include such things as land for new school sites, bus transportation for students, new construction, remodelling, and new buses and equipment or facilities.

In 1976 the state Legislature adopted the Leroy F. Greene State School Building-Lease Purchase law. Initially directed at providing capital cost assistance for new facilities in very rapidly developing school districts in Southern California, this act was amended to generally apply to any district experiencing difficulties in acquiring capital needed to meet increased service and facility demands (Merrill, December 1981). Thus, a district which could not get voter authorization for the sale of bonds to finance the cost of building new schools or buying new buses could apply to the state Allocation Board for Leroy Greene Act funding.

Requests to the Allocation Board for Greene Act funding are made, reviewed, and approved in three sequential phases (Merrill, December 1981).

The state Allocation Board has established a priority rating system to assist it in allocating the funds available each year to the most needed projects. The state also has established space-per-student-per-facility requirements for sites, facilities, and projects which will receive Greene Act funds. One of the key determinants in the priority rating system and in the space per student requirements is the average number of students attending classes during the school year and the projection of anticipated enrollment increases necessitating the project. There generally is much competition for the Greene Act funds, and processing the three phases of an application may take over two years before any funds are released for a project.

Following passage of Proposition 13 in 1978, the state Legislature further amended the Greene Act with the "Emergency School Classroom Law of 1979." This law provides for portable classrooms for short-term use. Applications for classroom funding under this law can be processed in about eight months, and the funds are released relatively rapidly (Eckhardt, 1981). Also in response to the constraints that passage of Proposition 13 has put on local government funding, the state Legislature earmarked a portion of the state's revenues from tideland oil leases to be used for Greene Act project funding requests.

In October 1981 the Governor signed Executive Order B-87-81 which retracted, at least temporarily, the allocation of \$200 million in Greene

Act funds which the Legislature had previously allocated, although not appropriated. Thus, school districts which had project proposals pending before the state Allocation Board now are unlikely to receive funding for any phase of their project (Eckhardt, 1981).

This action has had a particularly severe effect on several Lake County school districts which had Greene Act applications being reviewed by the board. The Middletown Unified School District was anticipating Phase 3 approval of their application to construct the new Cobb Elementary School in the Cobb Mountain area. This school was expected to alleviate many of the problems associated with overcrowding of the existing school in Middletown and to reduce the number of bus trips carrying students between Cobb and Middletown.

The Middletown Unified School District was the first district in the Geysers KGRA to conduct a survey of the parents of its students to determine how many are employed in some aspect of geothermal development. Results of a limited survey in 1979 indicated the parents of nearly 34 percent of the students were employed in geothermal development (Cornelison, 1980). In 1980 the percentage was about 33 (Cornelison, 1981). In 1981 the number of geothermal students remained the same, but the percentage of the total dropped below 30 due to an increase in total enrollment in the district (Merrill, December 1981).

All school districts in Lake County and possibly some districts in Sonoma County will be conducting surveys to determine the percentage of their students whose parents are involved in geothermal development or geothermal-related industries. Results of the Lake County surveys are due some-

time in early 1982. There is no information available from Sonoma County regarding when or in which districts their surveys will be conducted or when the results would become available. However, the preliminary results of the survey conducted by the Middletown district during 1979 - 1981 student registrations do indicate that geothermal development has had a significant impact on their facilities and ability to provide educational service.

Road Maintenance Costs

The impact upon the roads in the KGRA caused by geothermal development has been significant. A number of large trucks may be used to haul the building materials and equipment to each power plant site or to haul waste materials from well drilling and power plant operations. By necessity, the loads hauled are quite heavy and therefore have a deleterious effect upon the roads as development increases.

Geothermal-related traffic also includes construction and operation personnel, water trucks, construction equipment, oversized load transports, and material transports. The number and frequency of trips to and from the various geothermal development sites depend upon the phase of development, the size of the loads and the vehicles, the size of the work force needed, and the number of persons per vehicle per trip.

- o Access to The Geysers--The most direct access to the Geysers KGRA from the west side of the Mayacmas Mountains is from Sonoma County via U.S. Highway 101 to State Highway 128 near the Alexander Valley (Jintown) and thence to the Geysers-Healdsburg Road or the Pine Flat Road. The

KGRA is also accessible via the Geysers-Cloverdale Road, off State Highway 101 near Cloverdale. Refer to Figure 6 for the location of major access roads.

The Geysers-Healdsburg Road is a 14-mile long, narrow, and winding road. The road is a two-lane county road and provides primary access for traffic entering the Geysers KGRA from the east side. In some sections, the roadway has poor alignment, sharp curves, and short sight distances. The pavement structure, although fair in most parts, is damaged and in need of repair in other parts (CEC, 1981c). The road is county-owned and maintained up to the vicinity of the Union Geothermal Company gate at the former Geysers Resort.

The Pine Flat Road is a 12-mile long, narrow, winding, steep mountain road. Although the first 11 miles of this road have been paved, the road surface is deteriorating and is infrequently maintained. This road provides alternative access to the southern end of the Geysers KGRA and is not too often used by geothermal traffic. The road is county-owned and maintained up to the vicinity of the Union Geothermal Company's locked gate located near the site of PGandE's future Geysers Unit 18.

The Geysers-Cloverdale Road is a 14-mile long, narrow and winding, steep mountain road. Although paved at one time, the roadway has been difficult to maintain, since it crosses several areas which are subject to chronic landslides. The surface is extremely rough, sight distances are inadequate, and heavy trucks have difficulty negotiating some of the sharp curves. There is a one-lane bridge over Squaw Creek which may be inadequate for heavy loads, and erosion of the roadway in some sections

has narrowed the road to allow just barely enough room for a single lane of traffic (CEC, 1981c). The road is county-owned and maintained up to the vicinity of the Union Geothermal Company's gate at the former Geysers Resort.

The most direct access to the Geysers KGRA from the east side of the Mayacmas Mountains is from Lake County via State Highway 175 to the Socrates Mine Road near the community of Anderson Springs. The initial 1-1/2 miles of this road are paved, but the remaining 3-1/2 miles are not. The road is narrow, steep and winding, with erosion from some of the embankments causing increased turbidity in local streams. The road has generally poor alignment and does not meet minimum county standards in many places. Most parts of the road are too narrow and lack adequate shoulders or guardrails. There are two bridge structures located on tight curves, and they are in poor condition because of excessive use (CEC, 1981c). The Socrates Mine Road is owned and maintained by Lake County up to the vicinity of the Aminoil geothermal lease near PGandE's Units 13 and 16.

The Ford Flat Road also provides limited access into the KGRA from the east side. This is a 3-mile long, narrow dirt road which winds through mountainous terrain. It connects the Socrates Mine Road to the Whispering Pines/Cobb area in Lake County. The road could also serve as a short cut route to State Highway 175 and Bottle Rock Road, leading to the geothermal waste disposal site in Kelseyville (CEC, 1981c). The road is county-owned and maintained up to the vicinity of the Union Geothermal Company gate near the proposed site of PGandE Geysers Unit 19.

Bottle Rock Road in Lake County provides access to the DWR "Bottle Rock" project site and to the proposed site of the NCPA No. 1 project site. Bottle Rock Road is a paved, two-lane winding road through mountainous terrain. The road is owned and maintained by the county.

- o Access Within The Geysers--Within the Geysers development area, most of the roads providing access to the various geothermal leaseholds, steam wells, and power plant sites, have been developed and are maintained by several of the geothermal developers. As the developer which has been active in the Geysers the longest, Union Geothermal Company owns the majority of these roads. Refer to Figure 13 for a map of the roads within the Geysers.

The increasing development of the geothermal resource has produced an increase in both traffic volume and in the frequency of heavy loads on the roads, producing a corresponding need for maintenance of the private roads. To help defray the costs of increased road maintenance, Union has set up a fee permit system for use of their roads. Union has placed locked gates across four of its roads leading into the Geysers development area (See Figure 13). To enter the Geysers through these gates, the utilities, contractors, other developers, workers, and industry services must pay a fee and secure a permit. This permit system was initiated about three years ago, and user permits are issued only to companies, not to individuals (Snow, September 1981).

Fees charged for these permits are based upon number of users, duration of use, and size of vehicles being used (Snow, September 1981). Implementation of the user fee/permit system has produced some changes in

ROAD SYSTEM WITHIN THE GEYSERS DEVELOPMENT AREA

traffic flow into and within the Geysers. Several of the power plant developer/owners which have chosen not to pay the required fees have experienced some amount of inconvenience because of road closures, since their employees and their contractors can only reach their project sites from the east side. Currently, the Socrates Mine Road in Lake County provides the only access to the Geysers KGRA which does not require use of a Union Geothermal Company permit.

- o Roads Outside The Geysers--Another road located in the vicinity of the Geysers development area that has been subjected to increasing amounts of geothermal traffic is the Butts Canyon Road in Lake County. This road provides access to the Middletown geothermal waste disposal site located about 7 miles southeast of Middletown. This paved road is owned and maintained by the county. Frequent use of the road by heavy geothermal waste disposal trucks has caused the road surface to fail in several locations. The base, pavement, and drainage of this road are not adequate for heavy traffic.

Summary of Road Costs

The counties in the KGRA have been concerned that the increased construction of geothermal power plants, combined with increased geothermal resource development, would cause the rapid deterioration of certain roads. Due to declining state, federal, and local revenues for highway and roadway maintenance, compounded by increased maintenance and construction costs, the counties would be unable to adequately repair such rapid deterioration. Because of their fiscal concerns, Lake County and Sonoma County have both expressed their belief that companies involved in geothermal development in

the KGRA should help mitigate the effects that heavy truck traffic has upon the county roads serving the various geothermal development sites.

Because of the very high cost of road construction and maintenance, the possibility exists that if geothermal development is responsible for the significant deterioration of particular county roads, the counties will be adversely effected economically, even when the property taxes these geothermal facilities must pay the counties are considered. Based upon this possibility, both Lake County and Sonoma County have negotiated with several of the companies involved in geothermal development and power production in the area. In these negotiations, both counties have requested that the companies help pay for the repair and maintenance of certain roads in an effort to mitigate the effects of heavy truck traffic.

- o Lake County--In Lake County three county roads have to date been the most heavily used and, therefore, the most adversely affected by the geothermal developers. They are Socrates Mine Road, Bottle Rock Road, and Butts Canyon Road (refer to Figures 2 or 6 for location).

An agreement has been reached between Lake County and the Department of Water Resources whereby DWR will spend \$2 million to repair portions of the Bottle Rock Road. The county has also reached agreement and signed a contract with Aminoil for repair of the Socrates Mine Road. Aminoil has, in turn, arranged for four other geothermal development companies and utilities to participate in the agreement with them. These four companies are Occidental Geothermal Company, Shell Oil Company, NCPA, and SMUD. The parties involved will spend \$4 million to reconstruct and rebuild 4 miles of the road. Once the road has been rebuilt, these firms have also agreed to pay for those annual costs of maintaining the

road which are over and above that of normal maintenance. Discounting use by the geothermal industry, the county estimated these additional annual maintenance costs to be \$3,000 (in 1981 dollars). This figure will be readjusted as necessary to account for inflation. The head of the county's Public Works Department believes that this agreement will free the county, as far as Socrates Mine Road is concerned, from any fiscal burden caused by geothermal development (Collins, September 1981).

The Lake County Board of Supervisors, in July 1981, allocated \$120,000 of the county's AB 1905 funds to be used to repair and rebuild about 1.2 miles of the Butts Canyon Road. An additional \$42,000 in AB 1905 funds were allocated in August 1981. The county would like to spend another \$255,000 to put an asphalt surfacing on the road.

In the 1979-80 Fiscal Year the county expended \$1.74 million on public ways and facilities. While it is not possible to determine the cost to the Lake County road system caused by geothermal development, it does appear as if the county, through its negotiations with the developers, has, at least for the immediate future, ensured that geothermal development will not cause the county to suffer fiscally from the cost of maintaining the local road system. While future development might affect other roads, the way in which the county is economically affected depends in large part on what future agreements are reached between the county and developers. At this time, however, it appears as if the geothermal developers are taking steps to mitigate some of the adverse impacts they are having upon the county's road system.

- o Sonoma County--In Sonoma County the road most heavily used by geothermal developers is the Healdsburg-Geysers Road. The Cloverdale-Geysers Road is also sometimes used. The county recently estimated that to improve both roads to present-day standards so they could both adequately and safely accommodate truck traffic would cost approximately \$7 million for the Healdsburg-Geysers Road and \$10 million for Cloverdale-Geysers Road (Morelli, June, 1981). Considering that in the 1979-80 Fiscal Year Sonoma County spent \$8.52 million on all the county public ways and facilities, the \$17 million cost for the Geysers road would require the entire public ways and facilities budget for two years. No information was available on the current cost-per-mile for maintenance of these two roads.

Sonoma County, like Lake County, has been negotiating with the geothermal developers. A tentative agreement has been reached between the Department of Water Resources and the county, whereby DWR will pay the county \$900,000 for the rebuilding and repair of portions of the Geysers-Healdsburg road. The county is also negotiating with other developers in an attempt to secure more money so the adverse effects upon those roads affected by geothermal development can be mitigated.

While it is not possible to determine the fiscal impact upon the Sonoma County road system, it does appear as if the county could incur sizable expense in road maintenance and repair costs because of geothermal development. However, the cost to the county will depend in large part upon what agreements are reached with the developers. The recent passage of Measure A may affect the number and type of agreements the county can reach with geothermal developers regarding road maintenance.

The potential certainly exists that future agreements may relieve the county of much of the burden for repairing those roads used by geothermal developers. If this does happen, then the county may not suffer any adverse impacts, especially when one considers that geothermal power plants and the related facilities add greatly to a county's tax base, thus generating income which can be spent on any item in the county's budget.

CHAPTER VIII
MITIGATION OF GEOTHERMAL DEVELOPMENT EFFECTS ON LOCAL PUBLIC
SERVICES AND RESOURCES

A number of alternatives exist for the mitigation of the effects of geothermal development on local public services. Due to funding constraints and the limited fiscal flexibility of local governmental entities, it is most beneficial for mitigation measures to be implemented before impacts to local public services occur. The completion of negotiations and the provision of financial compensation and/or needed supplies or equipment relieve the burden of acquiring funds for initial capital costs from the local government. Such mitigation measures can and should be required for project impacts from all aspects of geothermal development, including road and well pad construction and maintenance; prefer to use; here, too steam field exploration and development; steam drilling; and power plant construction and operation.

The California Energy Commission has the jurisdictional authority to require mitigation only of impacts related to the construction and operation of the geothermal power plants and related facilities. Where impacts are clearly attributable directly to the construction and operation of a specific power plant project, the CEC has required appropriate mitigation measures to be

implemented by the project applicant. Other state, federal, and local agencies have jurisdictional authority over the other aspects of geothermal development not related to the power plant. In the interest of equity, amelioration of impacts clearly attributable directly to these other aspects of geothermal development should likewise be required of a project developer during review and processing of necessary authorizations by the other regulatory agencies.

Chief among the mitigation alternatives available to local governmental entities is the allocation of local geothermal revenues to those public services experiencing identifiable geothermal impacts. Other mitigation options include:

1. Assessment of the project developer for identifiable costs of specific geothermal development projects;
2. Mitigation agreements among geothermal developers and operators or between developers, operators, and local governments;
3. Formation of assessment districts which would include the lands leased for geothermal development within the district boundaries and which, therefore, would include the geothermal developer(s) in the assessments made for services or improvements; and
4. Application to the CEC for allocation of a portion of its AB 1905 funds for mitigation of geothermal development effects not directly attributable to a specific geothermal project.

ALLOCATION OF LOCAL GEOTHERMAL REVENUES

As discussed in Chapter VII, three of the four counties in the Geysers KGRA receive some amount of revenue from geothermal development within their jurisdictional limits. The majority of such geothermal revenues have accrued to Sonoma and Lake counties, since they contain the majority of the development to date. It appears that the geothermal revenues accruing to these local governments cover the general service and administrative costs of geothermal development.

The local geothermal revenues currently also appear to cover the immediate costs of increased demand for all public services associated with geothermal development except education and road maintenance. In the case of roads, the amount of revenues is far lower than the estimated cost of rebuilding and repairing those roads in the county that have been impacted by geothermal development. Negotiations and agreements have been completed for some degree of mitigation, either through assessment of a geothermal developer for mitigation of impacts directly attributable to their project or through multi-party agreements among several developers which are not associated with a specific development project.

In the case of mitigation of impacts on educational services, the mitigation focuses on the need for additional facilities due to increased enrollment. Based upon California Law, school districts cannot use local property tax revenues to fund the capital improvements costs of new school buildings or classrooms. Local revenues accruing from federal lease lands per AB 1905 are allocated at the discretion of the governing county Boards of Supervisors, and the school districts have no authority over them. As shown in Table 27, the

TABLE 27

FINANCING MECHANISMS AVAILABLE TO CALIFORNIA SCHOOL DISTRICTS

Income Sources

State School Fund includes
 federal program funds
 County Property Taxes
 apportioned per AB 8, Calif.
 Admin. Code Section.....

Revenue Limit* may
 not be exceeded

*Revenue Limit = 1972-3 expenditure per student,
 times allowable % annual increase
 set by state Legislature, times
 last year's Average Daily Attendance

State: Leroy Green School Building Lease-Purchase Law

State: Emergency Classroom Act

State: CEC Power Plant Certification, mitigation
 requirements

Local: Sales and rentals of excess properties

Local: Developer's Fees, per SB 201 (generally
 only available if local government adopts
 ordinance specifying standardized charges)

Local: Supplemental funding at discretion of local
 governmental jurisdictions

Allowable Expenditures

Operation and Maintenance Cost:
 existing facilities & equipment,
 existing staff, new staff

Capital Improvement Costs: new sites,
 remodelling of existing facilities, new
 classrooms, new facilities

Lease/purchase of temporary classrooms

Agreed upon by developer and impacted
 school districts; specified in AFC
 proceedings and decision

Operation and Maintenance Costs and/or
 Capital Improvement Costs

Capital costs of new facilities (recent
 court interpretation apparently limits
 expenditure to interim temporary sites
 and classrooms)

Specified by governmental entity providing
 supplemental funds

school districts have a number of potential funding mechanisms available to them for financing capital costs.

In practice, however, the districts currently have no viable recourse for capital costs except assessment of developers for enrollment increases directly attributable to their projects. The Leroy Green Act funds were frozen by state Executive Order in 1981 and are underfunded for the amount of eligible proposals; the Emergency Classroom Act funds apply only to temporary facilities to be used while projects funded by Leroy Green Act are being approved and completed; the districts in Lake County, in particular, have no excess facilities available; the counties have not enacted an ordinance as required by SB 201 so standardized developer's fees cannot be charged; and the county Board of Supervisors has not committed themselves to continue distribution of their discretionary funds for direct impacts of geothermal development.

ASSESSMENT OF THE DEVELOPER FOR IDENTIFIABLE COSTS OF PROJECT DEVELOPMENT

The assessment of the developer for costs directly attributable to project development has typically been applied to mitigation of impacts on air, water, land, and biological resources. This type of mitigation measure can also be applied to project impacts on public services by determination of "units of impact" and calculation of service costs per unit of impact. For a water supplier, the units of impact would be related to the number of new customers in its service area which are directly involved in a particular geothermal development project. The service cost per unit of impact would be the proportionate share of the cost to the supplier for new service facilities. For

a school district, the units of impact would be related to the number of new students in the district whose parents are directly involved in a particular geothermal project.

Assessment of public service costs attributable to a project has been recommended in two recent geothermal power plant projects undergoing CEC regulatory review: the DWR South Geysers project and the Occidental Geothermal No. 1 project. In the case of DWR's South Geysers project, DWR negotiated separate agreements with the Lake County Office of Education and with Sonoma County for the mitigation of socioeconomic effects of the South Geysers project. Per the agreement with the Lake County Office of Education, DWR agreed to provide \$4,250 for each student in Lake County school districts who has at least one parent directly employed in its South Geysers project. Each such student is considered to be a student unit (or "unit of impact"), and the \$4,250 paid per student unit is the service cost per unit of impact.

The agreement between DWR and the Lake County Office of Education also provides for mitigation of indirect project impacts on the school districts. Each student who has at least one parent employed by a company providing services to construction contractors or subcontractors for the South Geysers project counts as 0.05 of a student unit for mitigation purposes. DWR will pay the fractional portion of the \$4,250 per student unit, equivalent to the number of students whose parents are only indirectly involved in the South Geysers project, multiplied times 0.05.

Payment will be made to the districts in one \$50,000 lump sum prior to the start of construction. Each year the school districts will conduct student surveys to identify those students whose parents are employed in construction

of the DWR project. Based upon the number of "South Geysers" students identified in the survey, funds will be disbursed from the school mitigation account each year. After the first year, disbursements will be made only for the number of "South Geysers" students in excess of the initial year's count. In other words, the per student amount will be paid only once and will increase only if the number of students increases.

The term of the mitigation agreement between DWR and the Lake County Office of Education is 10 years. At the request of either party, the mitigation payment formula can be evaluated in the fourth and the eighth years. If necessary, the payment formula can be adjusted. If the initial \$50,000 payment is exhausted, DWR will supplement it, as needed. At the end of the 10-year term of the agreement, any unused money remaining from the initial \$50,000 payment will be refunded to DWR.

The greatest advantage of this mitigation agreement is that it provides "up-front" funding for the school districts when they have their greatest need to provide additional services to their expanded enrollment. Another benefit of the annual student surveys is the information which will be provided on the number of local residents involved in geothermal development, the distribution of the geothermal work force within the counties, and an indication of changes in geothermal employment patterns.

The agreement negotiated between DWR and Sonoma County covers mitigation of a broader range of potential socioeconomic effects associated with the South Geysers project. Under the terms of the Sonoma County agreement, DWR will provide the following funds:

- o \$900,000 for repairs and improvements to certain portions of the Geysers-Healdsburg Road;
- o Reimbursement to the county for unrecoverable costs of emergency situations related to the project;
- o Payment to the county for unspecified, indirect socioeconomic impacts of the project, according to a formula based upon the number of workers times the family size times the current average cost to the county of providing services to residents.
- o Payment to impacted school districts of an annual mitigation fee, according to a formula based upon the number of children of South Geysers project workers enrolled in district schools times an average cost of education for students in the county schools. Payment will also be made for children who have parents employed by companies providing services indirectly to the South Geysers project.

Also written into this agreement was a provision related to the special tax measure passed by Sonoma County voters in the November election. If Tax Measure A survives court challenge and remains law, then DWR would be reimbursed by the county for any payments made as a result of Measure A, up to the amount DWR agreed to pay for road repairs and indirect socioeconomic impacts. If any portion of the moneys collected from DWR under the new tax measure were applied to mitigation of school impacts, then DWR would likewise be reimbursed for these amounts.

In early January 1982, Occidental Geothermal, Inc., completed negotiations with the Lake County Office of Education (which negotiated on behalf of

several potentially impacted Lake County school districts), regarding mitigation of impacts from the Oxy Geothermal Project No. 1. Occidental has agreed to make mitigation payments to affected school districts which have students whose parents are involved in the Oxy No. 1 project. As with the DWR agreement, the payment would be based upon the number of "Oxy No. 1" students times the cost of school construction per square foot times the square feet required per student. Using this formula, Occidental agreed to pay \$4,575 per student. The number of students will be determined by annual student surveys. Unlike the DWR South Geysers agreement, Occidental will make no payment until after the number of "Oxy No. 1" geothermal students has been determined. Another difference between the two agreements is the fractional amount allowed for students indirectly related to the Oxy No. 1 project is 0.04, rather than 0.05.

Occidental Geothermal, Inc., also completed negotiations with Lake County in late December 1981 on an agreement to mitigate potential project impacts to the water district which supplies the community of Anderson Springs. Occidental has agreed to provide a 65,000 gallon storage tank for the district. Occidental also will contribute \$78,000 toward the installation of upstream monitoring equipment which will automatically shut off intake valves if water quality drops below a preset minimum standard (Record-Bee, December 23, 1981). This agreement to mitigate a local public service impact was negotiated outside the CEC's regulatory process and required a transformation of an existing private water company into a county service district. The negotiations, however, were much facilitated by CEC staff efforts in identifying the potential impacts and proposing mitigation alternatives.

As the only geothermal developer/operator working in the area affecting this water district, Occidental is bearing the initial public service mitigation costs. However, as other developers expand their development activities in the impact area, they will be required to reimburse Occidental for their pro-rata share of the cost and/or be required to contribute an additional amount based upon their pro-rata share of impacts on the service district.

MITIGATION AGREEMENTS AMONG DEVELOPERS, OPERATORS, AND/OR THE COUNTIES

This mitigation option has been used for joint funding of construction and maintenance of access roads into and within the Geysers development area. Under an agreement negotiated between Aminoil and Lake County, a consortium of developer/operators in the Geysers will rebuild and repair the Socrates Mine Road. The consortium represented by Aminoil includes SMUD, NCPA, Occidental, and Shell. The Socrates Mine Road is the primary access into the Geysers development area from the Lake County side of the KGRA. It is also the only access road into the Geysers which is not subject to user permit fee requirements. Under the agreement, the consortium will rebuild the road to meet certain minimum safety design standards set by Lake County.

The Bottle Rock Road, which provides access to the northern portion of the Geysers development area in Lake County, is to be rebuilt and repaired in certain sections by the state Department of Water Resources. This repair project is part of a negotiated agreement between DWR and Lake County for DWR's Bottle Rock project. Subsequent geothermal developer/operators also using the road will be required to contribute a pro-rata share of the initial cost to DWR and/or a pro-rata share toward its continued maintenance.

This mitigation option has also been used to provide joint funding for environmental monitoring programs to identify and mitigate cumulative project impacts on wildlife habitat and on watersheds and water resources in and downstream from the Geysers development area.

FORMATION OF ASSESSMENT DISTRICTS

An assessment district can be established to provide a funding mechanism for a specific purpose, in a specifically delineated area. The action to establish an assessment district can be initiated either by the county Board of Supervisors or by a petition signed by 60 percent of the landowners in the proposed district. If a district is proposed by a petition of the landowners and then opposed by a majority of the voters in an election, the Board of Supervisors can overrule the voters with a 4-1 vote of their own. Formation of a new assessment district requires approval by owners of 60 percent of the land in the proposed district. Before the election, the type of service or improvements and the rate of assessment must be established.

State law sets forth what types of services and improvements may be financed by special assessments, including road construction or improvement, installation of curbs and gutters, and installation of street lighting or landscaping. Use of assessment districts to fund schools and other educational services is not allowed under state law.

Use of assessment districts in the Geysers could be advantageous in the mitigation of impacts related to geothermal development, since the property owners are assessed the cost of the services or improvements. Inclusion of portions of the Geysers development area in an assessment district's boundaries would ensure that the steam developers and power plant operators active within the

district would be assessed their share of the cost of services or improvement provided by the district.

The use of assessment districts falls within the jurisdiction and authority of local governmental entities. The Energy Commission cannot require the formation of an assessment district as a mitigation measure for geothermal projects in the Geysers. However, the Commission could advocate negotiation between local governments and Geysers developers for use of assessment districts for mitigation wherever appropriate.

APPLICATION TO THE CEC FOR ALLOCATION OF ITS AB 1905 FUNDS

As discussed in Chapter VII, the state passed the Bosco-Keene Act (AB 1905) in early 1980. This act established a distribution formula for the state's revenues from geothermal development on federal lands. Under the terms of AB 1905, 30 percent of these revenues are deposited in the state's Parklands and Renewable Resources Investment Fund. Another 40 percent of the funds are immediately disbursed back to the counties of origin.

The amount disbursed to the counties in the Geysers KGRA in 1981 ranged from the \$2,500 received by Mendocino County, to the \$345,000 received by Lake County, and to the \$530,000 received by Sonoma County. Since no federal lands in Napa County have yet been leased for geothermal development, Napa has not received any AB 1905 funds.

Both Sonoma and Lake counties have allocated their local shares of the AB 1905 funds to a variety of projects (refer to Tables 25 and 26). Local funds have been allocated for repair and maintenance of county roads deteriorating from geothermal traffic, purchase of additional police and fire protection equipment, planning studies and improvements for water and sewer service districts,

leases for portable classroom units, improvements at park and recreation facilities throughout Sonoma County, and partial funding for a controlled burn program to enhance wildlife habitat in the Geysers.

Under the distribution formula established by AB 1905, the remaining 30 percent of the state's revenues from geothermal leases on federal lands are annually deposited with the California Energy Commission (CEC). These funds are disbursed to counties having geothermal resources and may only be used for purposes specifically identified in AB 1905. As described in Section 3823 (b) of AB 1905, the funds can be used for the following types of projects in counties where the geothermal resource has already been developed:

- o Administrative costs incurred by the local jurisdiction that are attributable to the development or production of geothermal resources.
- o Monitoring and inspecting geothermal facilities and related activities to assure compliance with applicable laws, regulations, and ordinances.
- o Identifying, researching, and implementing feasible measures that will mitigate the adverse impacts of such development or production.
- o Planning, constructing, providing, operating, and maintaining those public services and facilities that are necessitated by and result from such (geothermal) development or production.
- o Undertaking projects demonstrating the technical and economic feasibility of geothermal direct heat and electrical generation applications.
- o Undertaking projects for the enhancement, restoration, or preservation of natural resources, including, but not limited to, water development,

water quality improvement, fisheries enhancement, and park and recreation facilities and areas.

Under procedures set up by the CEC, geothermal counties may apply for the funds through a grant application procedure. Following a series of statewide public workshops, the CEC staff proposed a set of criteria to be used in evaluation of grant applications. In October 1981, the Energy Commission voted to adopt the grant evaluation criteria and established a policy for allocation of its AB 1905 funds. The CEC policy is to provide grants which encourage development of geothermal resources as an alternative energy technology. In addition, approximately one-third of the AB 1905 funds available for CEC grants each year can be allocated for mitigation of geothermal development impacts not directly attributable to specific geothermal power plant projects.

Of the 58 counties in the state of California, 46 have some type of geothermal resources with the potential for development and use. Thus, the competition for the AB 1905 funds available through the CEC grant program is very keen. The availability of local AB 1905 funding is a factor to be weighed in considering requests for the CEC's funds, to the extent that the CEC grant application manual states that applicants must demonstrate there are no other funding sources available. Another factor which would receive consideration in the CEC's evaluation of funding requests would be the acknowledgement of the need for such funding by some level of matching funds provided by the grant applicant.

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APPENDIX A
LAKE COUNTY WATER SUPPLIERS
WITH OVER 200 CUSTOMERS

APPENDIX A

LAKE COUNTY WATER SUPPLIERS OF OVER 200 CUSTOMERS

Appendix A provides a brief summary of the service status for the 14 Lake County water suppliers having 200 or more active customers. The letters identifying each supplier correspond to those used in Figure 10 (Chapter II) of this study. For a more complete discussion of facilities and service capabilities, refer to "Working Paper #1: Public Facilities and Service," prepared in 1980 by Sedway/Cooke for the Lake County General Plan Update.

- a. Callayomi County Water District (210 active hook-ups): supplies water for residential and commercial use and for fire protection; system capacity now is 325 to 350 gallons per minute (gpm); with a reservoir and a back-up pump the system could serve up to 500 - 550 hook-ups. In March 1981 the County Board of Supervisors authorized disbursement of \$5,250 from the county's AB 1905 account for the district to conduct initial studies on the costs and feasibility of the district also providing sewer services for Middletown.
- b. Cobb Mutual Water Company (275 active hook-ups): This company is comprised of 5 separate systems formerly providing service to seasonal

Figure A Lake County Water Distribution Systems [over 200 connections]

LAKE COUNTY, CALIFORNIA

This map shows generalized data. Detailed maps are on file with the Lake County Planning Department.

Source: Lake County General Plan Update, Working Paper Number 1

recreational developments which are now becoming full-time year-round residences. A recent engineering study recommended \$1.5 million in improvements and expansion, and the company is evaluating study recommendations.

- c. Stonehouse Mutual Water Company: Although listed in the Sedway/Cooke Working Paper #1 and shown on the map in Figure A, no additional information on this water district was on file with the Lake County Special Districts Office.
- d. Lower Lake County Water District (553 active hook-ups): system operates at capacity throughout summer peak demand period and sometimes has problems meeting the demand; existing distribution system inadequate to handle fire flows without losing pressure; new well due to come into service this summer and district is negotiating with a developer to get a 1 million gallon storage tank. In May 1981 the County Board of Supervisors authorized disbursement of \$10,000 from the county's AB 1905 account to the district to help fund a new well and distribution system.
- e. Highlands Water Company (2,000+ active hook-ups): currently providing 0.5 million gallons per day (mgd) and anticipates future demand of 1.7 mgd; upgrading purification plant and adding new 2 million gallon storage tank; relatively unlimited service potential.
- f. Knocti County Water District (1,235 active hook-ups): peak summer demands of 300 - 325 gpm are nearly equivalent to current maximum capacity; district has proposed to improve service capacity by adding a new clarifier, using the old clarifier for storage and modification of the pipe system to bring maximum capacity up to 600 gpm.

- g. Mt. Konocti Mutual Water Company (450+ active hook-ups): provides service to 2,980 parcels in the Clear Lake Riveria subdivision and to a golf course in the summer; current summer peak demand is 250,000 gpd, and capacity is 400,000 - 430,000 gpd.
- h. California Cities Water Company (1,950+ active hook-ups): Average demand over past 3 years has been 730,000 gpd; storage capacity is 701,000 gpd, and pumping capacity is 1,008,000 gpd.
- i. Clear Lake Oaks County Water District (3,000+ active hook-ups): provides water and sewer service; system pumping capacity of 500 gpm is about equal to current summer peak demand; district plans to increase storage capacity with new 400,000 gallon tank; future expansion of water system is also limited by capacity of sewer system; sewer system currently operating at 55 percent capacity.
- j. Lucerne Water Company (1,100+ active hook-ups): supplies water for residential and commercial users and fire protection; pumps currently operate daily at capacity during the summer peak period; there is a limitation on new hook-ups of 2 per month; district has applied for a loan to build a new treatment plant with a 500 gpm capacity.
- k. Nice Mutual Water Company (600+ active hook-ups): could sell as many as 1,000 shares but could not exceed current service levels without increasing storage capacity.
- l. Upper Lake County Water District (288 active hook-ups): provides water and fire protection; meeting current demand but cannot provide additional

service without increasing storage capacity; proposes to improve service by adding extra well, pump, and reservoir.

- m. City of Lakeport (3,688 population in 1980): main well became very low during 1977 drought; needs to develop additional supply to serve demands of growing community; seeking financing for interim additional supply from Clear Lake; has hired engineering firm to develop a water master plan through 2025.
- n. Kelseyville County Water District (690+ active hook-ups): district lost 2 of its 4 wells in drought in 1977 and has replaced 1; the district has pumped over 15.6 million gallons per day during summer peak periods; district has current storage capacity of 260,000 gallons and feels that 500,000 gallon capacity is needed to better serve its customers.
- o. Buckingham Park County Water Company (280+ active hook-ups): provides water for residential use and fire protection; service area includes over 300 vacant parcels which must be served when they are developed; recent improvement project is expected to allow the company to provide adequate water supplies to all parcels in its service area.

APPENDIX B
RAW DATA
ON WORKFORCE REQUIREMENTS

ESTIMATED POWERPLANT CONSTRUCTION WORKFORCE REQUIREMENTS IN THE GEYSERS K G R A 1979-1995

	PGandE 12-15, 17, 18	PGandE 16	NCPA 2	DWR B.R.	SMUD 1	OXY 1	DWR S.G.	NCPA 1	NCPA 3-A&B	SCENARIO 1 TOTALS	PGandE 20	Modes to 10 MSR Shell	SMUD 2	PGandE 19	PGandE 22	PGandE 21	PGandE 23	SCENARIO 2 TOTALS	Geo. A	Geo. B	Geo. C	Geo. D	Geo. E	Geo. F	Geo. G	SCENARIO 3 TOTALS		
1979 M	290									290								290								290	M 1979	
J	200									200								200								200	J	
S	220									220								220								220	S	
D	280		30							310								310								310	D	
1980 M	200		10							210								210								210	M 1980	
J	160		25							185								185								185	J	
S	150		70							220								220								220	S	
D	90		90							180								180								180	D	
1981 M	25		50	10						85								85								85	M 1981	
J	140		50	20	35					245								245								245	J	
S	230		50	30	70					380								380								380	S	
D	215		60	40	70					385								385								385	D	
1982 M	195		30	45	85					355								355								355	M 1982	
J	195		15	40	105	30	65			450								450								450	J	
S	155	20	55	125	75	45				485								485								485	S	
D	85	35	70	125	175	50				540								540								540	D	
1983 M	20	20	85	100	215	25				465	20							485								485	M 1983	
J		70	85	75	215	45		25		475	35							510								510	J	
S		85	95	50	180	30		30		470	20							490								490	S	
D		105	75	25	105	35	25	35		405	30	35						470								470	D	
1984 M		85	50		40	25	30	50		280	85	70						435								435	M 1984	
J		85	15			20	25	35	130	335	105	70	35					545								545	J	
S		105					25	50	140	320	85	85	70					560								560	S	
D		65					10	130	135	340	85	105	70	35				635								635	D	
1985 M		50					140	115		315	105	125	85	70				700								700	M 1985	
J	25						16	135	75	251	65	125	105	70				616								616	J	
S								115	20	135	50	100	125	85	20			515								515	S	
D								75	10	85	25	75	125	105	35			450								450	D	
1986 M								20		20		50	100	125	20	20		335								335	M 1986	
J								10		10		25	75	125	35	35		335								335	J	
S												50	100	70	85	20	20	345								345	S	
D												25	75	70	105	30	35	340								340	D	
1987 M													50	85	85	85	20	325								325	M 1987	
J													105	105	85	105	30	350								350	J	
S													125	105	85	85	85	408		20						420	S	
D													125	65	85	105	105	380	35	35						450	D	
1988 M													100	50	105	85	85	340	70	20						430	M 1988	
J													75	25	65	85	250	340	70	30						350	J	
S													50		50	105	205	395	85	85		20				395	S	
D													25		25	65	115	395	105	105	35	35				420	D	
1989 M																		50	125	85	70	20				350	M 1989	
J																		125	85	70	30					335	J	
S																		100	105	85	85		20			395	S	
D																		75	65	105	105		35	35		420	D	
1990 M																		50	50	125	85	70	20			400	M 1990	
J																		25	25	125	85	70	30			360	J	
S																				100	105	85	85			395	S	
D																				75	65	105	105		35	385	D	
1991 M																				50	50	125	85	70			375	M 1991
J																				25	25					340	J	
S																					100	105	85			290	S	
D																						75	65	105			245	D
1992 M																						50	50	125			275	M 1992
J																						25	25				175	J
S																										160	S	
D																										75	D	
1993 M																										58	M 1993	
J																										25	J	
S																												S
D																												D
1994 M																												M 1994
J																												J
S																												S
D																												D
1995 M																												M 1995
J																												J
S																												S
D																												D

POWER PLANT OPERATION WORKFORCE REQUIREMENTS IN THE GEYSERS KGRA
1979-2000

	Scenario 1: 1727 MW							Scenario 2: 2387 MW					Scenario 3: 3000 MW								
	PGandE 1-11	PGandE 12-18	NCPA 1-3	DWR BR&S.G	SMUD 1	OXY 1	TOTAL	PGandE 19-23	SMUD 2*	MODESTO MSR	I.D. SHELL	TOTAL	Geo A*	Geo B*	Geo C*	Geo D*	Geo E*	Geo F*	Geo G*	TOTAL	
1979	102	10					112					112								112	
80	102	20					122					122								122	
81	102	20					122					122								122	
82	102	25	8				135					135								135	
83	102	30	8	0	20		160					160								160	
84	102	30	8	13	20	20	193					193								193	
85	102	35	16	21	20	20	214					214								214	
86	102	35	24	21	20	20	222	5		20		247								247	
87	102	35	24	21	20	20	222	5	5	20	5	257								257	
88	102	35	24	21	20	20	222	20	5	20	5	272								272	
89	102	35	24	21	20	20	222	25	5	20	5	277								277	
90	102	35	24	21	20	20	222	25	5	20	5	277	5	5						287	
91	102	35	24	21	20	20	222	25	5	20	5	277	5	5	5	5				297	
92	102	35	24	21	20	20	222	25	5	20	5	277	5	5	5	5	5	5		307	
93	102	35	24	11	20	20	222	25	5	20	5	277	5	5	5	5	5	5	5	312	
94	102	35	24	21	20	20	222	25	5	20	5	277	5	5	5	5	5	5	5	312	
95	102	35	24	21	20	20	222	25	5	20	5	277	5	5	5	5	5	5	5	312	
96	102	35	24	21	20	20	222	25	5	20	5	277	5	5	5	5	5	5	5	312	
97	102	35	24	21	20	20	222	25	5	20	5	277	5	5	5	5	5	5	5	312	
98	102	35	24	21	20	20	222	25	5	20	5	277	5	5	5	5	5	5	5	312	
99	102	35	24	21	20	20	222	25	5	20	5	277	5	5	5	5	5	5	5	312	
2000	102	35	24	21	20	20	222	25	5	20	5	277	5	5	5	5	5	5	5	312	

* Assumes that plants will be operated by existing utilities and therefore need minimum additional personnel for operation (similar to PGandE for new Geysers Power Plant units).

CUMULATIVE POWER PLANT WORKFORCE DATA
SCENARIO 1: 1787 MW

YR/Q	PPC	O&M	TOTAL	YR/Q	PPC	O&M	TOTAL	YR/Q	PPC	O&M	TOTAL
79 M	290	112	402	85 S	135	214	349	92 M	0	222	222
J	200	112	312	D	85	214	299	J	0	222	222
S	220	112	332	86 M	20	222	242	S	0	222	222
D	310	112	422	J	10	222	232	D	0	2222	222
80 M	210	122	332	S	0	222	222	93 M	0	222	222
J	185	122	307	D	0	222	222	J	0	222	222
S	220	122	342	87 M	0	222	222	S	0	222	222
D	180	122	302	J	0	222	222	D	0	222	222
81 M	85	122	207	S	0	222	222	94 M	0	222	222
J	245	122	367	D	0	222	222	J	0	222	222
S	380	122	502	88 M	0	222	222	S	0	222	222
D	385	122	507	J	0	222	222	D	0	222	222
82 M	355	135	490	S	0	222	222	95 M	0	222	222
J	450	135	585	D	0	222	222				
S	485	135	620	89 M	0	222	222				
D	540	135	675	J	0	222	222				
83 M	465	160	625	S	0	222	222				
J	475	160	605	D	0	222	222				
S	470	160	630	90 M	0	222	222				
D	405	160	565	J	0	222	222				
84 M	280	193	473	S	0	222	222				
J	335	193	528	D	0	222	222				
S	320	193	513	91 M	0	222	222				
D	340	193	533	J	0	222	222				
85 M	315	214	529	S	0	222	222				
J	251	214	465	D	0	222	222				

KEY: YR/Q = Year/Quarter
PPC = Power Plant Construction
O&M = Power Plant Operation and Maintenance

CUMULATIVE POWER PLANT WORKFORCE DATA
SCENARIO 2: 2447 MW

YR/Q	PPC	O&M	TOTAL	YR/Q	PPC	O&M	TOTAL	YR/Q	PPC	O&M	TOTAL
79 M	290	112	402	85 S	515	214	729	92 M	0	277	277
J	200	112	312	D	450	214	664	J	0	277	277
S	220	112	332	86 M	335	247	582	S	0	277	277
D	310	112	422	J	335	247	582	D	0	277	277
80 M	210	122	332	S	345	247	592	93 M	0	277	277
J	185	122	307	D	340	247	587	J	0	277	277
S	220	122	342	87 M	325	257	582	S	0	277	277
D	180	122	302	J	350	257	607	D	0	277	277
81 M	85	122	207	S	400	257	657	94 M	0	277	277
J	245	122	367	D	380	257	637	J	0	277	277
S	380	122	502	88 M	340	272	612	S	0	277	277
D	385	122	507	J	250	272	522	D	0	277	277
82 M	355	135	490	S	205	272	477	95 M	0	277	277
J	450	135	585	D	115	272	387				
S	485	135	620	89 M	50	277	327				
D	540	135	675	J	25	277	302				
83 M	485	160	645	S	0	277	277				
J	510	160	670	D	0	277	277				
S	490	160	650	90 M	0	277	277				
D	470	160	630	J	0	277	277				
84 M	435	193	628	S	0	277	277				
J	545	193	738	D	0	277	277				
S	560	193	753	91 M	0	277	277				
D	635	193	828	J	0	277	277				
85 M	700	214	914	S	0	277	277				
J	616	214	830	D	0	277	277				

KEY: YR/Q = Year/Quarter
PPC = Power Plant Construction
O&M = Power Plant Operation and Maintenance

CUMULATIVE POWER PLANT WORKFORCE DATA
SCENARIO 3: 3000 MW

YR/Q	PPC	O&M	TOTAL	YR/Q	PPC	O&M	TOTAL	YR/Q	PPC	O&M	TOTAL
79 M	290	112	402	85 S	515	214	729	92 M	225	307	532
J	200	112	312	D	450	214	664	J	175	307	482
S	220	112	332	86 M	335	247	582	S	100	307	407
D	310	112	422	J	335	247	582	D	75	307	382
80 M	210	122	332	S	345	247	592	93 M	50	312	362
J	185	122	307	D	340	247	587	J	25	312	337
S	220	122	342	87 M	325	257	582	S	0	312	312
D	180	122	302	J	350	257	607	D	0	312	312
81 M	85	122	207	S	420	257	677	94 M	0	312	312
J	245	122	367	D	450	257	707	J	0	312	312
S	380	122	502	88 M	430	272	702	S	0	312	312
D	385	122	507	J	350	272	622	D	0	312	312
82 M	355	135	490	S	395	272	667	95 M	0	312	312
J	450	135	585	D	395	272	667				
S	485	135	620	89 M	350	277	627				
D	540	135	675	J	335	277	612				
83 M	485	160	645	S	395	277	672				
J	510	160	670	D	420	277	697				
S	490	160	650	90 M	400	287	687				
D	470	160	630	J	360	287	647				
84 M	435	193	628	S	395	287	682				
J	545	193	738	D	385	287	672				
S	560	193	753	91 M	375	297	672				
D	635	193	828	J	330	297	627				
85 M	700	214	914	S	290	297	587				
J	616	214	830	D	245	297	542				

KEY: YR/Q = Year/Quarter
PPC = Power Plant Construction
O&M = Power Plant Operation and Maintenance

APPENDIX C
MIDDLETOWN UNITIED SCHOOL DISTRICT
STUDENT SURVEY (1980)

MEMORANDUM

TO: Bill Reany, California Energy Commission

FROM: Bill Cornelison, Superintendent, Middletown Unified School District

RE: Students in Middletown schools whose parents are employed in geothermal occupations.

The attached data is compiled from the registration cards filled out by each student enrolling in school as of December 19, 1980. I have indicated the name of the employer, the occupation of the parent, the grade in school of the child and whether the student is new to the Middletown schools as of September, 1980. I have also included a listing of other occupations that may be directly or indirectly involved with the geothermal industry. The data given is simply copied from the registration card completed by the parent; no interpretation is given to the data, (e.g., all children of PG&E employees are indicated unless it was clear from the card that PG&E employment is related to local utility service rather than geothermal). The data is presented first for the elementary school (grades K-8) and then for the high school (grades 9-12)

The following is a summation of the data:

	<u>TOTAL PUPILS ENROLLED 12/19/80</u>	<u>GEO THERMAL OCCUPATIONS</u>	<u>GEO THERMAL RELATED OCCUPATIONS</u>
Grades K-8	<u>412</u>	<u>96</u>	<u>51</u>
Grades 9-12	<u>162</u>	<u>22</u>	<u>19</u>
Total	574	118	70

In regard to new students enrolling in the Middletown schools for the first time in 1980, the following figures are applicable:

	<u>TOTAL NEW STUDENTS</u>	<u>GEO THERMAL RELATED OCCUPATIONS</u>	
Grades K-8	108	36	(33%)
Grades 9-12	<u>17</u>	<u>2</u>	
	125	38	

In regard to the high school new student enrollment, the figure is inflated due to the transfer of ten students living in Pope Valley who chose to attend Middletown High School instead of St. Helena High School. The elementary figure better indicates new residents with children of whom one-third are directly related to geothermal occupations.

If I can be of any further assistance, please do not hesitate to call on me. The attached information is considered to be open to public access and you are free to reproduce, duplicate or interpret this information as you see fit.

December 30, 1980

GEO THERMAL

	<u>COMPANY</u>	<u>JOB</u>	<u>GRADE</u>	<u>CHECK IF NEW IN 1980</u>
1.	Smith & Breazeale	Pipeline operator	6	
2.	Smith & Breazeale	Pipeline operator	5	
3.	Aminoil	Geo Operator II	8	
4.	PG&E	Machinist	7	x
5.	PG&E	Power Plant Operator	7	x
6.	PG&E	Machinist	7	
7.	PG&E	Elec. Tech	6	
8.	Atlantic Oil	Derrickman	8	x
9.	McCulloch	Supervisor	4	
10.	PG&E	Power Plant Operator	4	
11.	Loffland Bros.	Derrickman	K	x
12.	Montgomery Drilling	Roughneck	4	
13.	Montgomery Drilling	Roughneck	7	
14.	Loffland Bros.	Driller	1	
15.	Union Oil	Heavy Equipment Operator	6	x
16.	Loffland	Motorman	2	x
17.	Loffland	Derrickman	K	x
18.	Jackson's Rig Service	Roustabout Foreman	6	
19.	Jackson's Rig Service	Roustabout Foreman	8	
20.	Jackson's Rig Service	Roustabout Foreman	Spec. Ed.	
21.	Montgomery Drilling	Floorhand	4	
22.	PG&E	Heavy Equipment Operator	8	
23.	PG&E	Heavy Equipment Operator	Spec. Ed	
24.	PG&E	Heavy Equipment Operator	Spec. Ed	
25.	PG&E	Sub Foreman	6	
26.	Loffland	Roughneck	3	x
27.	Loffland	Roughneck	6	
28.	"	"	1	x
29.	"	Driller	1	
31.	"	"	5	
32.	PG&E	Machinist	5	
33.	"	"	K	x
34.	"	Rigger	1	
35.	"	"	3	
36.	"	Power Plant Operator	3	
37.	"	"	1	
38.	Loffland	Driller	2	
39.	PG&E	Field Clerk	1	
40.	PG&E	Field Clerk	4	
41.	Monterey Drilling	Tool Pusher	7	
42.	PG&E	Line Driver	6	
43.	PG&E	Power Plant Operator	4	x
44.	PG&E	Foreman - Construction	5	
45.	PG&E	Foreman - Construction	K	x
46.	Loffland	Rig Superintendent	2	
47.	Monterey Drilling	Driller	4	x
48.	PG&E	Operating Foreman	6	
49.	Montgomery Drilling	Floor Hand	7	
50.	Union Oil	Welder	1	

	<u>COMPANY</u>	<u>JOB</u>	<u>GRADE</u>	<u>CHECK IF NEW IN 1980</u>
51.	Union Oil	Welder	3	
52.	PG&E	Power Plant Operator	1	x
53.	PG&E	Instrument Repairman	3	x
54.	"	"	3	x
55.	"	Instrument Foreman	5	
56.	"	Instrument Foreman	6	
57.	Montgomery Drilling	Driller	5	
58.	PG&E	Power Plant Operator	1	
59.	CII Company	Truck Driver	K	x
60.	PG&E	Power Plant Operator	4	
61.	"	Electrician, Unit #12	K	x
62.	Jackson's Rig Service	Roustabout Foreman	5	
63.	"	"	K	x
64.	PG&E	Power Plant Operator	3	
65.	"	"	K	x
66.	Atlantic Oil	Derrickman	1	
67.	Aminoil	Welder	5	
68.	Environmental Systems	Data Taker	6	
69.	PG&E	Welder	4	
70.	Loffland	Driller	3	
71.	Loffland	Driller	1	
72.	PG&E	Electrical Foreman	8	
73.	"	"	5	
74.	Atlantic Oil	Derrickman	4	x
75.	"	"	3	x
76.	"	"	3	x
77.	"	Driller	K	x
78.	PG&E	First Plant Clerk	5	x
79.	Aminoil	Craftsman I	6	
80.	Prombo Corp.	Operating Engineer	6	
81.	Loffland Bros.	Steamfield Worker	1	
82.	PG&E	Welder	K	x
83.	"	"	K	x
84.	"	"	3	x
85.	"	Journeyman Welder	5	x
86.	Loffland Bros.	Driller	3	x
87.	Loffland Bros.	Driller	2	x
88.	PG&E	Senior Power Plant Operator	2	
89.	"	"	K	x
90.	"	Operations Foreman	1	
91.	Environmental Systems	Field Tech	5	x
92.	Environmental Systems	Field Tech	3	x
93.	Environmental Systems	Field Tech	K	x
94.	Smith & Breazeale	Cat skinner	7	
95.	Smith & Breazeale	Roughneck	1	
96.	Smith & Breazeale	Construction	1	

GRADES 9-12

1.	PG&E	Journeyman Welder	12
2.	Aminoil	Craftsman	10
3.	Aminoil	Craftsman	9

	<u>COMPANY</u>	<u>JOB</u>	<u>GRADE</u>	<u>CHECK IF NEW IN 1980</u>
4.	Aminoil	Craftsman	11	
5.	Aminoil	Not specified	11	
6.	PG&E	Foreman	12	
7.	"	Electrical Foreman	12	
8.	Environmental Systems	Data Taker	10	
9.	"	"	9	
10.	Aminoil	Welder	9	
11.	Valley Engineers	Laborer	10	
12.	Aminoil	Computer Operator	12	
13.	PG&E	Foreman	9	
14.	Monterey Drilling	Tool Pusher	12	
15.	PG&E	Superintendent	10	
16.	Loffland Bros.	Driller	11	

POSSIBLE GEOTHERMAL RELATED OCCUPATIONS - GRADES K-8

Carpenter - self employed = 5
 * Truck driver - IT Corporation = 1
 Contractor - self employed = 12
 * Construction Foreman - Valley Engineers = 2
 * Pipefitter - no employer indicated = 1
 Construction laborer = 1
 Equipment Operator - Gardner Construction = 1
 Equipment Operator - Moore Construction = 1
 Carpenter - Carver Construction = 1
 Teamster - Piambo Construction = 1
 * Truck Driver, Lynn's Trucking = 2
 * Truck Driver, Red Archer (GII) = 2
 Carpenter, DeMac Construction = 1
 Heavy equipment, self employed = 1
 Welder - self employed = 6
 * Driller - unemployed = 1
 * Laborer - Valley Engineers = 2
 * Laborer - IT Corporation = 2
 * Office Manager, Fegles Power Service = 1
 Mechanic - OCLI = 1
 Carpenter - Moore Construction = 3
 Electrician - unemployed = 3

NOTE: After consultation with board members, it appears that the geothermal related occupations marked with an asterisk are definitely involved in geothermal activities.

POSSIBLE GEOTHERMAL RELATED OCCUPATIONS - GRADES 9-12

* Drilling consultant - self employed = 2
 Truck driver - Pellico Trucking = 1
 Mechanic - OCLI = 1
 Contractor - self employed = 1
 Heavy Equip. Operator - self employed = 1
 * Supt. of construction - Fegle's Power Service = 1
 Laborer, C.R. Fredricks = 1
 Electrician, CED = 1
 Carpenter - Young American Homes = 1
 Equip. Opr.-Hitchcock Bros. = 1
 Carpenter-Butts Construction = 1

Carpenter, Paul Wright Inc. = 1
 Carpenter, self employed = 1
 Laborer, employer not identified = 3
 * Heavy equipment - self employed
 (Gaysers) = 1

TABLE C
STAFF ANALYSIS OF
1980 MIDDLETOWN STUDENT SURVEY

Total Students Surveyed = 574

GEO THERMAL EMPLOYERS

Total Students = 111

Developers

Aminoil	9
McCulloch (MCR Geoth.)	1
Union Geothermal	3
	<u>13</u>
	111 = 11.7%

Steam Drilling

Atlantic Oil	6
Loffland Bros.	17
Montgomery Drilling	8
Monterey Drilling	3
	<u>34</u>
	111 = 30.6%

Power Plant Operators

PGandE Operation & Mtce.	31
PGandE Construction	17
Superv. etc.	
	<u>48</u>
	111 = 43.2%

Geothermal Services

Jackson's Rig Service	5
Smith & Breazeale	5
C II Company	1
Environmental Systems	6
Prombo Corporation	1
	<u>18</u>
	111 = 16.2%

GEO THERMAL-RELATED EMPLOYERS

Total Students = 70

Definite Geothermal-Related

Valley Engineers	5
IT Corporation	3
Fegles Power Service	2
Lynn's Trucking	2
Red Archer (G II) Trucking	2
Self-employed:	
drilling consult.	2
heavy equipt.	1
Unemployed-driller	1
No employer listed	1
	<u>19</u>

Other Possible Geothermal- Related

This group covers a variety of employers and occupations which the school district has determined may be indirectly involved in geothermal. This group includes 51 students.

	<u>Number</u>	<u>%</u>
Total Students in District	574	100
Definite Geothermal Employers	111	19.3
Definite Geothermal-Related Employers	19	3.3
Possible Geothermal-Related Employers	51	8.9
Total Geothermal Students in District	181	31.5

APPENDIX D
GOVERNMENTAL JURISDICTION
OVER GEOTHERMAL DEVELOPMENT

APPENDIX D

GOVERNMENTAL JURISDICTION OVER GEOTHERMAL DEVELOPMENT

There are a number of governmental entities which monitor and control the various aspects of geothermal exploration and development in The Geysers KGRA. These entities include federal, state, and local agencies, and they often have similar responsibilities. The agency identification and brief descriptions presented here are intended to help clarify the interrelationship of responsibility for geothermal development for the various governmental levels and entities.

Land ownership or management responsibility is one of two primary criteria that determines which level of government is responsible for controlling a specific aspect of geothermal development and use. The other primary criterion is the ownership of the subsurface mineral rights which the courts have determined to include geothermal steam. Secondary criteria for determining levels and extent of responsibility are related to the developmental phase being controlled. The third level of criteria is related to the type and number of permits and environmental clearances required for each developmental phase.

Federal Government

The federal government administers about 14 percent of the land in The Geysers KGRA. Currently, all of the federal lands in the KGRA on which geothermal exploration and development have occurred are within the jurisdiction of the Bureau of Land Management (BLM). Prior to leasing these lands for geothermal development, the federal government prepared an Environmental Impact Statement (EIS) on the lease program. Following completion of the EIS in 1973, tracts of land became available for lease and development.

Potential geothermal developers bid competitively on the various leases, and the highest bidder is awarded use of the lease for development. The money generated from the lease is split 50:50 between the federal government and the state government. As the result of AB 1905 passed in 1980, 40 percent of the state's share of the money produced by sale of the leases is now returned to the county in which the lease is located. As an example of the value of such leases, the forthcoming sale of geothermal leases in The Geysers KGRA is expected to generate as much as \$16 - \$20 million in bids (San Francisco Examiner, October 1981).

The United States Geological Survey (USGS) works closely with the BLM on the entire lease management program. Once the land is leased, the geothermal developer must prepare a proposed Plan of Operation which must be approved by the USGS, in consultation with BLM. This plan is prepared, submitted, and reviewed in stages based upon geothermal developmental stages. The plan details the work that will be followed in preparing the well pads, in drilling the wells, in the exploration for a viable steam resource, and eventually, in the use of the resource. The USGS consults with BLM in reviewing the plan and, after making any necessary changes, approves it. When reviewing the

plan, the USGS also carefully considers any state or local ordinances which may be pertinent and ensures that the geothermal developer's plans will comply with these, as well as the federal government's regulations.

Within The Geysers KGRA there are lands which are now owned and occupied by private individuals but for which the federal government retains the subsurface mineral rights. These lands comprise about 8 percent of the KGRA and were acquired by private landowners under the 1916 Stock Raising and Homestead Act. By court interpretation, private acquisition of surface rights under this act did not include ownership of the geothermal steam. The right to explore and develop the steam on these lands is thus subject to the same management and controls as that on other federal lands in The Geysers. The BLM and the USGS have the same responsibilities, and the lease bid revenues are subject to the same 50:50 distribution to the federal and state governments.

Before any kind of development was undertaken on these lands, the federal government prepared an EIS on the proposed use of the lands for geothermal development. The federal government determined that the decision to lease the land constituted a major action under the terms of the National Environmental Policy Act (NEPA). Before individual lease tracts are released for bid and development, an Environmental Assessment Report (EA or EAR) is prepared. This report more specifically describes potential environmental concerns and mitigation considerations for the specific lease tract. The USGS also requires that an environmental baseline study be conducted throughout the one-year period prior to operation of a power plant on the geothermal lease lands. Once operations commence, a regular environmental monitoring program must be maintained (USGS, 1970).

State Government

- o State Lands Commission--Approximately 7 percent of the land in The Geysers KGRA is owned and administered by the state. The State Land Commission (SLC) acts as a landlord for all state-owned lands and is responsible for leasing tracts of state land for the exploration and development of geothermal resources. The SLC sets additional requirements for public lands concerning environmental protection, multiple use, and development plans and carries out the bidding and leasing activities.

The separate environmental documents are prepared by two co-lead agencies for geothermal development projects. One is prepared for the exploration phase and one for the power plant construction phase. The California Energy Commission is the lead agency for siting geothermal power plants and related facilities on both state and private lands. For geothermal exploration on state lands, the SLC may either prepare an environmental document as the lead agency or adopt the environmental document prepared by the county for a large leasehold area which contains a parcel of state land. For geothermal exploration on private lands, the county acts as the lead agency responsible for the preparation of an environmental document as a condition of its use permit.

- o Department of Conservation, Division of Oil and Gas--The Division of Oil and Gas (DOG) sets the operating regulations for developing geothermal resources anywhere in the state. On private land holdings, which make up 70 percent of The Geysers KGRA, the responsibility for ensuring that proposed exploratory drilling operations are environmentally acceptable

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California Energy Commission--The California Energy Commission (CEC) has state regulatory responsibility for the siting of all thermal power plants rated at 50 MW or greater. As shown in Tables 18, 19, and 20, all new geothermal power plants proposed or planned for The Geysers KGRA exceed 50 MW and thus come under the CEC siting jurisdiction. Technically, the CEC does not have jurisdiction over developments on federal lands. However, the federal and state agencies with siting jurisdiction signed a memorandum of understanding, agreeing to work together in

responsibility as the lead agency. For full field development the county has CEQA responsibility also changes. Full field development phase, then the environmental review responsibility shifts from the exploratory drilling phase into the resource development phase. When geothermal developer usually desires to continue developing additional wells to gather sufficient steam to supply a power plant. Should the exploratory drilling prove successful, the geothermal developer usually desires to continue developing additional wells to full field development phase, then the environmental review responsibility shifts from the exploratory drilling phase into the resource development phase. For full field development the county has CEQA responsibility as the lead agency.

rests with the DOG. This agency ensures that exploratory well pad construction and the wells themselves comply with the regulations of the California Environmental Quality Act (CEQA). As mandated by AB 2644 in 1979, the Division of Oil and Gas has CEQA responsibility as the lead agency on all exploratory drilling projects where the land or the mineral rights are not under the jurisdiction of the federal government. Any CEQA document processed by the the Division of Oil and Gas is commented upon by the county in which the exploratory well is to be located. Additionally, this document is used by the county during its conditional use permit hearing on an exploratory well.

their required review processs to minimize duplication of effort and permitting time. In the first two CEC regulatory proceedings for geothermal power plants to be sited on federal lands, the responsible federal agencies participated in the CEC process and incorporated the CEC's findings and recommendations into their own regulatory documentation.

Under CEQA requirements the Energy Commission is the lead agency for preparing the EIR for proposed geothermal power plants and related facilities. In the Geysers development area, the capping of the Magma Wild Well and the use of its steam to produce approximately 5 MW of power was an exception to this requirement. The CEQA responsibility for this project went to the county in which the well is located. For the two geothermal facilities located on federal lease land, the responsible federal agencies joined the Energy Commission in the preparation of environmental documentation necessary to meet the requirements of both NEPA and CEQA.

Many state agencies are involved in reviewing the environmental documents prepared by the lead agencies for geothermal projects. Under the CEQA definitions they are considered responsible agencies because they have approval power over a particular part of a project. These responsible agencies include State Lands Commission, Division of oil and Gas, Regional Water Quality Control Boards, Department of Fish and Game, Local Air Pollution Control Boards, Solid Waste Management Board, and the California Energy Commission. Depending upon circumstances, these responsible agencies may sometimes be the lead agency for a proposed project.

All of these agencies consider the environmental documentation before granting their approval. They are required by law to certify the adequacy of the environmental document which describes the environmental impacts of each geothermal project. This is true whether they be a lead or responsible agency. To accomplish this goal each agency applies its own standards and requires specific information necessary to satisfy its own regulations and permit requirements. It then approves the final environmental document.

Local Governments

At the local level the counties are the governmental entities which exercise jurisdiction over geothermal development in The Geysers KGRA. This is accomplished primarily through land use designations and air pollution control.

Counties regulate the use of privately owned land, although in The Geysers KGRA they have not chosen to specifically zone land for geothermal development. Rather, through the issuance of various conditional use permits, counties can choose to exercise authority over the different phases of geothermal development. Conditional use permits are issued on a project-by-project basis for exploratory and developmental drilling. Additionally, during each phase of geothermal development, the counties issue grading and building permits for roads and construction not related to the power plant facilities. All the permits issued require that developers conform to all county regulations governing geothermal operations.

The county acts as a lead agency in the preparation of environmental documentation for proposed development of a full field of geothermal wells producing

steam sufficient to supply a power plant. They assume this CEQA responsibility only on privately owned lands, whether or not the federal government retains mineral rights to the steam. The county acts as a responsible agency in meeting its CEQA responsibilities for exploratory drilling and power plant development on state and privately owned lands.

If a geothermal developer wishes to proceed from exploratory drilling to full field development, the county holds a hearing under the auspices of the planning department, to determine if a negative declaration or an EIR is needed. If all that is required is a negative declaration, only one additional meeting may be necessary. At this meeting the negative declaration is reviewed, and, following this review, a conditional use permit may be granted. However, if an EIR is needed, a minimum of two additional meetings are required. The first of these involves the review of the EIR that has been written, and the second is a hearing on whether a conditional use permit should be granted.

- o County Planning Departments--The county planning departments, because of statutory requirements, perform the majority of the regulatory and administrative work related to geothermal development for those counties in the KGRA. The responsibilities of the planning departments, as well as the other county agencies involved with geothermal development, depend upon both the surface and mineral ownership of the land on which the development occurs.

For projects where the surface and mineral rights are the property of the federal government, the county planning departments do not issue use permits. They do not function as a responsible agency, and they are not

involved in the regulatory process during any phase of geothermal development, including exploratory drilling, steam field development, and power plant development. However, federal law does require that the USGS and other federal agencies adhere to applicable county regulations and ordinances concerning geothermal development.

If the property is within private ownership, the county planning department issues conditional use permits, even though the federal government retains title to the mineral rights. Conditional use permits are also issued for other different combinations of land and mineral rights ownership in the KGRA. At this time, however, it is not clear whether the counties would have regulatory authority over land where the surface and mineral rights rest with the state.

The counties usually do not issue building permits for the construction of the geothermal power plants and related facilities which are under the jurisdiction of the CEC. However, they usually participate in the Energy Commission's siting proceedings, and their local requirements are incorporated into the Commission's decision. Following approval of a geothermal power plant, the county building inspector and other representatives of the planning department may monitor some of the construction activities while the project is in progress.

- o County Air Pollution Control District--The State Air Resources Board has delegated some types of emission control rule making and monitoring to the local air pollution control districts. For each of the various phases of geothermal resource development and use, the county APCD establishes the emissions limitations which must be met by the geothermal developers and users.