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(CUMULATIVE IMPACTS STUDY OF THE GEYSERS KGRA

PUBLIC SERVICE IMPACTS OF GEOTHERMAL DEVELOPMENT:

FINAL STAFF REPORT
CALIFORNIA ENERGY COMMISSION
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DISCLAIMER

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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 two 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 these costs 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 presented for calculating mitigation costs for school and road impacts.

PREFACE

The Warren-Alquist Act provides the California Energy Commission (CEC) with regulatory authority over the siting of new geothermal power plants (50 megawatts or greater) and requires that project-related impacts be adequately mitigated. The CEC recognized that a number of the potential impacts associated with development of a single power plant in the Geysers-Calistoga KGRA would be common to the development of additional power plants, and the impacts of several power plants could, cumulatively, compound the effects of each individual power plant. A committee of two Commissioners was assigned to gather information on the potential cumulative impacts related to geothermal development in the Geysers KGRA. The CEC staff was directed to evaluate the potential for cumulative impacts on biological resources, water resources, the geothermal reservoir in the Geysers, air quality and public health, local roads and highways, and local agencies and public services. This study examines the impacts of geothermal development on local governments and public services.

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 growth in the 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 CEC.

The CEC first released the study entitled Cumulative Impact Study of the Geysers KGRA: PUBLIC SERVICE IMPACTS OF GEOTHERMAL DEVELOPMENT in May 1982 as a staff draft (CEC Publication P700-82-005), and copies remain available from the CEC's Publications Office. The CEC distributed copies of the draft study to representatives f federal, state, and local agencies with a special interest in, or with jurisdicational authority over, the geothermal development in the Geysers KGRA. The draft study was also distributed to representatives of the geothermal developers, power plant developers/operators, construction craft labor unions, planning consultants, and interested members of the public. Copies of the draft study were also placed in county branch libraries in Santa Rosa (Sonoma County), Lakeport (Lake County), Ukiah (Mendocino County), and Calistoga (Napa County).

Recognizing that the demographic and fiscal data and the project schedule and work force information were subject to periodic change and variation, the CEC encouraged reviewers of the draft study to provide the CEC with comments, new information, and more current data. In early June 1982 the CEC's Geysers Cumulative Impact Committee held a public hearing to receive comments on the recommendation in the draft study that project-related impacts on local school districts be mitigated and on the proposed algorithm for calculation of the mitigation fees. Comments were also received on the overall draft study and on the mitigation options for geothermal-related impacts on local roads and highways. In late July 1982 the CEC staff sponsored a public workshop to respond to reviewers' questions and to receive comments on the draft study. Additional written comments were received following distribution of the draft and again after the public hearing and the workshop.

The comments received on the draft study ranged from suggestions for minor changes in wording, to revisions of data, to recommendations for revisions in the contents of specific sections, to significant differences of opinion on the appropriateness of assessing mitigation fees. The majority of the comments related to the proposed algorithms to be used for calculating the mitigation fees to be paid by power plant developers whose projects undergo CEC regulatory review. These fees would provide mitigation for project-related enrollment increases in local school districts which are at or over enrollment capacity. Areas of concern most frequently addressed were the need for additional mitigation fees, the inclusion of the geothermal-related work force in the calculation of mitigation fees, and whether the mitigation fees should be used to provide temporary or permanent school facilities.

During preparation of the final study, the draft study underwent substantial revision based upon comments received, the availability of new demographic and fiscal data, and revisions in the proposed power plant development schedules and work force projections. Since the revisions to the draft study occurred throughout all chapters, including the References and Appendices, there has been no attempt made in the final study to specifically identify where words, text, or numerical data have been changed. For the final study, the demographic data were drawn from United States Census reports published in early 1982; the fiscal data were updated wherever possible to the 1982-83 fiscal year; the employment data were current through the end of 1982; the school enrollment data and capacities were current through the fall of the 1982-83 school year; and the geothermal power plant development schedules and work force projections were current as of January 3, 1983.

The final study includes two new appendices which contain the algorithms for calculating the fees needed for mitigation of project-related impacts on local school districts and local roads and highways. Appendix A presents the CEC staff policy regarding the mitigation of school enrollment impacts. This policy is based upon the information gathered and presented in the draft study and the policy recommendations presented in the Executive Summary of the final study. Appendix A is available as a separate document from the CEC's Publications Office (CEC Publication P700-82-009).

Appendix B to the final study presents the CEC staff policy regarding the mitigation of Geysers road impacts. Appendix B is also available from the CEC's Publications Office (CEC Publication P700-82-010). The policy recommendations in Appendix B are based upon an assessment of local roads and highways

in the Geysers development area, traffic patterns on those roadways, and maintenance needs and schedules. The California Department of Transportation, District 4, conducted the local road assessment under contract to the CEC. The contracted study, entitled "Transportation Study for the Geysers Geothermal Resource Area" (CEC Publication P700-81-034), was distributed in December 1981.

In addition to presenting an assessment of the existing road, traffic, and maintenance situation in the Geysers area, the contract study provided a preliminary discussion of optional methods for financing repairs and ongoing maintenance which geothermal development necessitates. The CEC evaluated the financing options in the contract study and narrowed them down to a proposed algorithm for assessing mitigation fees to provide for the costs of extraordinary maintenance and possible reconstruction of local roadways impacted by geothermal-related traffic. Following public review and comment in CEC hearings, the CEC further refined the algorithm to provide for the identification of the extraordinary costs of road maintenance associated with specific power plant projects and the method for calculating the mitigation fees.

Although the final study has the same title as the draft study--Cumulative Impact Study of the Geysers KGRA: PUBLIC SERVICE IMPACTS OF GEOTHERMAL DEVELOPMENT--it has a different publication number (P700-83-004) and, because of the revisions in the data and the text, contains different information. The first copy of the final study is free and a fee of $6.85 will be charged for each additional copy. Comments and revisions to the final study should be addressed to Kathryn M. Matthews, California Energy Commission (MS-40), 1516 Ninth Street, Sacramento, CA 95814, (916) 324-3592.

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EXECUTIVE SUMMARY

The purpose of this study is twofold. First, the study represents a compilation of current information available in literature and from numerous individuals and governmental agencies knowledgeable about socioeconomic impacts associated with geothermal development in the Geysers-Calistoga Known Geothermal Resource Area (KGRA). Second, this study provides policy recommendations for the California Energy Commission's (CEC) regulatory proceedings on geothermal power plants.

The demographic and socioeconomic information compiled for this study has been used in the preparation of CEC staff analyses of proposed geothermal projects which have undergone or are undergoing CEC regulatory review. This information provides a necessary and invaluable foundation on which to develop policy recommendations. These recommendations establish a consistent 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:

- o The impact of cumulative geothermal development on the demand for local public services,
- o The extent to which accrued local geothermal revenues provide mitigation of geothermal impacts, and
- o 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.

IMPACT OF CUMULATIVE GEOTHERMAL DEVELOPMENT ON THE DEMAND FOR PUBLIC SERVICES

Changes in the demand for public services are 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, or legal constraints.

The four counties (Sonoma, Lake, Mendocino, and Napa) in the Geysers-Calistoga KGRA have each experienced very rapid rates of growth and development in the past 10 years. As discussed in Chapter II, this growth resulted from a number of factors but was primarily caused by outward expansion from the San Francisco Bay Area. Considerable technological advances in the use of geothermal steam for power generation also occurred in the 1970s. During this period the number of power plants operating in the Geysers grew from 4 to 13 units. 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 involving 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 residing in the four counties of the KGRA. However, some of the work tasks involved in geothermal development are relatively specialized, and the availability of such jobs drew workers from outside the four counties.

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

- 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.

- 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 which local governments provide 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. While some of these services, such as water supply, waste disposal, and hospitals, are funded to some extent by user

*By consensus among professionals involved in urban planning and economics, long-term residence in California refers to maintaining a permanent residence in the same census district for five years or more (Quigley, January 1983).

fees, funding for most public services is derived from local property tax revenues and transfers of funds from state and federal government. Local public services which appear most immediately sensitive to changes in population include education, water supply, wastewater disposal, law enforcement, and fire protection.

As the four counties in the KGRA 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 V, the revenues from geothermal development currently 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 V). These sources include:

- Property taxes on the steam wells, pipelines, power plants, and other facilities on privately owned lands;
- Taxes on a developer-operator's possessory interest in facilities developed on federal lands;
- Redistribution of a portion of steam royalty payments from leased federal lands to the county in which the steam originated (AB 1905, the Bosco-Keene Act of 1980);
- Agreements made with local jurisdictions by tax-exempt power plant operators;
- Revenues from permit fees and renewals (generally used to cover costs of administration, monitoring, and inspection); and
- County yield taxes on electricity generated from geothermal resources by tax-exempt power plant operators (Sonoma County Ordinance No. 2853-R and Lake County Ordinance No. 1228).*

Local governmental entities also experience a number of fiscal effects related to geothermal development. These fiscal effects include (1) administrative costs involved in reviewing, processing, and monitoring geothermal development projects and (2) costs of providing public services to the resident population, including the work force involved in all aspects of geothermal development.

*The tax-exempt power plant developers have viewed this yield tax on geothermal steam as being unlawful, and county representatives expect to be challenged in court when they begin collecting the yield tax. Pending court resolution, this tax may or may not remain as a source of geothermal revenue for Sonoma and Lake counties.

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 even an assumed "worst-case" situation, the geothermal revenues cover the maximum reasonable expenditure for administrative costs.

Revenues from geothermal development currently also cover the immediate costs of meeting local public services' needs related to geothermal growth in all but two 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 road impact mitigation in Sonoma and Lake counties. Methods of mitigation included:

- o Exactions imposed on steam developers or power plant developers-operators during geothermal project review and approval by responsible governmental agencies, for mitigation of impacts 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 testified 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 current 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 Mendocino 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 VI. Each of these mitigation alternatives has been considered or applied in one or more of the geothermal development projects in the Geysers. The following sections summarize these mitigation options.

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 geothermal revenues have been produced by property taxes and by AB 1905 funds. In 1981-82 the revenue from property taxes on geothermal developments accounted for 11 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 rose to 19.6 percent in 1981-82.

The other major source of local geothermal revenues is 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 on private lands for 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 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 and 96 percent of its 1981-82 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 and 94 percent of its 1981-82 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 the district's 1972-73 budget, plus state-determined allowable increases, plus increases based on the previous year's Average Daily Attendance (ADA). 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 (Greene) 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 remaining $208 million in Leroy Greene Act funds were frozen by state Executive Order, and no further applications were funded through the end of fiscal year 1981-82. Without the freeze, there would only have been $150 million available as of July 1, 1982, to fund a $500 million backlog of eligible applications. During the preparation of the 1982-83 state budget the Legislature redistributed the Greene Act funds remaining after the freeze. In July 1982 the Legislature agreed to release $114 million for eligible school projects which had completed their Board of Allocation processing and were ready for funding. Late in 1982 the Legislature passed special legislation (AB 28X, Robinson) which required those districts which had received a portion of the $114 million allocated in July immediately to return any unspent or uncommitted funds. Those districts which had already spent or committed their portion of the $114 million were required to repay the funds with state school bonds as soon as the bonds were sold.

In the November 1982 statewide election, the voters authorized the state to sell up to $500 million in bonds to fund school construction. Up to $150 million of these funds could be used for restoration of existing facilities. The State Allocation Board would disburse the funds, but there currently is no mechanism for determining priority of need among applicant school districts. A representative of the Allocation Board estimated that, under normal circumstances, the first funds would not become available for disbursement until June or July of 1983, even if bonds were sold soon after the election. However, the first bonds were not sold until April 1983, and the uncertainty of the state's current fiscal situation is expected to further slow down the sale of the state's bonds. Therefore, although the sale of the bonds has been authorized, it seems unlikely that they would be available to provide funding in the near future. Also, as required by AB 28X, nearly $125 million of the $500 million authorized by voters must be used to repay the funding the Legislature provided in July 1982.

In 1977 the state legislature passed SB 201 (sponsored by Smith-Dunlap-Holden-Ayala and now enrolled as Chapter 4.7, Division 1, Title 7, California Government Code). This law provides a means for local governments to address the need for interim classroom facilities for enrollment increases which result from new residential development in school districts. When the governing board of a school district can demonstrate that conditions of overcrowding exist in the district and there is no feasible method for reducing such conditions, it can present these findings to the city council or county board of supervisors. If the council or board concurs, it can adopt an ordinance that

requires the dedication of land, the payment of fees in lieu of land dedication, or a combination of both, for interim classroom facilities as a condition of approval of a new residential subdivision and development. In lieu of fees or dedicated land, the developers can, at their option and expense, provide interim facilities at the place designated by the impacted school district. The funding available under the terms of SB 201 is available only during local approval of new residential subdivisions.

As shown in Chapter VI, 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 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 Konocti 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. As defined by the board, such effects are those which cannot be directly attributed to a specific geothermal project. In 1982 the board allocated $14,000 to the Middletown District and $8,250 to the Konocti District to cover a portion of annual lease payments, but again stated that such funding extensions would not automatically occur each year.

As discussed in Chapter VI, 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:

- The Leroy Greene Act funds for new sites and permanent facilities were frozen in October 1981 and remained frozen through June 1982.
- Even if the Leroy Greene Act funds had been unfrozen, eligible projects exceeded available funds.
- Although the state Legislature released $114 million in July 1982 for Greene Act-eligible projects, it later passed AB 28X, which required that unspent and uncommitted funds be returned immediately and the remainder returned as soon as state school bond money is available.
- While the state released some bonds for sale in April 1983, only $25 million were applied toward school project financing. Another $100 million in school bonds were sold in May 1983, so the funding repayment required by AB 28X has now been made. Additional bond sales must be authorized before any new, eligible projects could be financed.
- The Emergency Classroom Act funds are for relocatable facilities.
- The Lake County Office of Education has no excess properties.

- Lake County has no ordinance for implementing developer's fees as allowed under SB 201, and the Board of Supervisors refused the Office of Education's request to adopt such a law. Even if such a fee system were enacted, it would apply only to local approval of new residential subdivisions.

- 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 toward the needs of a "nonlocal" agency.

- 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, i.e., impacts which are not associated with a specific development of project.

- 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.

- The AB 1905 funds became available by legislative action and are a discretionary distribution which could be withdrawn if needed to help resolve the state's current fiscal problems.

- Although the state has been authorized to issue up to $500 million in bonds for school construction, the first $125 million in bond sale revenues is earmarked for the repayment of project funding required by AB 28X. Additional bonds to provide funding for new, eligible projects may not be released for sale until the state's fiscal situation is stabilized.

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 exactions imposed on the geothermal developers for the costs of enrollment increases clearly attributable to their projects.

Exactions Imposed on Project Developers for Mitigation of Impacts Attributable to a Specific Project

The CEC or local agencies could require exactions for mitigation during their respective regulatory review and approval of proposed geothermal development projects. Recent CEC geothermal power plant siting decisions have included the requirement that project applicants provide mitigation for identifiable project impacts on local public services.

State Department of Water Resources (DWR), South Geysers--During the CEC's regulatory proceedings on the DWR South Geysers Application for Certification (AFC), 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 Lake County school districts. The conditions of these agreements were incorporated into the CEC's decision on the South Geysers project.

Occidential Geothermal, Oxy No. 1--Under the agreement between the Lake County Office of Education and Occidental Geothermal, Occidental will provide mitigation funding to Lake County school districts for enrollment increases which are attributable to construction and operation of its power plant. In separate negotiations with Lake County, Occidental also agreed to provide funding for a water storage tank, water quality monitoring equipment and automatic shut-off valves, and funding for mitigation of project-related impacts on the water supply for the community of Anderson Springs in Lake County. Occidential also agreed to participate with a group of road users, headed by Aminoil, in the reconstruction of the Socrates Mine Road in Lake County. The conditions of these various agreements were incorporated into the CEC's decision on the Oxy No. 1 project.

Occidental's agreement to provide school mitigation funding also extends to cover 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 steam field permit. According to a school district representative, the Board of Supervisors has applied such school impact mitigation requirements to permits for other geothermal and non-geothermal developments in Lake County where an identifiable project impact can be shown (Merrill, March 1982).

Northern California Power Agency (NCPA), NCPA 3--During the CEC's regulatory proceedings on the NCPA 3 power plant project, NCPA negotiated separate agreements with representatives for school districts in Sonoma and Lake counties. These agreements are based on the one negotiated between Lake County school districts and Occidental Geothermal. The agreements provide mitigation funding to those county school districts which are at or over capacity and which can show enrollment increases which are attributable to construction and operation of the NCPA 3 project.

NCPA also participated in the reconstruction of the Socrates Mine Road in 1981-82. During the CEC's proceedings on the NCPA 3 project, NCPA negotiated an agreement with Sonoma County to mitigate project-related impacts on the Geysers-Healdsburg Road, to the extent that the road is used during project construction and operation. The conditions of the road and schools agreements were incorporated into the CEC's decision on the NCPA 3 project.

Pacific Gas and Electric Company (PGandE), Geysers Unit 20--Another set of agreements were negotiated between PGandE and representatives of the school districts in Sonoma and Lake counties during the CEC's regulatory proceedings on the PGandE Unit 20 project. These agreements are nearly identical in content to those negotiated with NCPA and quite similar to Occidental's agreement on the Oxy No. 1 project. The conditions of the schools agreements were incorporated into the CEC's decision on the PGandE Geysers Unit 20 project. For further discussion of the schools agreements, see Chapter VI.

In March 1983 PGandE completed negotiations on an agreement with Lake County for mitigation of impacts to the Socrates Mine Road. Under the terms of the agreement, PGandE will provide funding (up to a maximum of $227,500) for the county to design and construct run-away truck escape ramps on this road. In April 1983 PGandE, Union Oil Company of California, and GRI Operator Corporation signed a memorandum of understanding to accomplish reconstruction and

improvements to specified sections of Geysers-Healdsburg Road and the Geysers-Cloverdale Road. Under the terms of the memorandum, the county and the industry participants will annually consider budgeting a specified amount for the capital costs of these road improvements. The industry participants will match the county's budgeted share (not to exceed the specified amount), and the industry's share will be apportioned among industry participants. PGandE's participation in this agreement is considered to provide the necessary mitigation of project-related impacts on the Geysers-Healdsburg Road and such other roads as are used during construction and operation of the proposed Unit 20 project. Under the terms of the final CEC decision on the Unit 20 project, these negotiations with Lake and Sonoma counties had to be completed at least 30 days prior to the start of any construction on the Unit 20 project.

Mitigation Agreements Among Geothermal Developers, Operatcrs, and Local Governments for Impacts Not Associated with a Specific Project

Another geothermal mitigation measure which the local governments implemented is agreements between geothermal resource developers, power plant developers, and power plant operators. Such agreements, to date, have taken place primarily outside the CEC's regulatory proceedings on power plants and within the local government's regulatory jurisdiction over the 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 Road, Butts Canyon Road, and Socrates Mine Road in Lake County and portions of the Geysers-Healdsburg Road in Sonoma County.

Formation of an Assessment District Which Includes Lands Leased for Geothermal Development

Formation of assessment districts can be initiated either by a petition of 60 percent of the property owners within the potential district's boundaries or by action of the county board of supervisors. Under the state Streets and Highways Code an assessment district is generally formed to accomplish a specific purpose related to local roadways 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 Road and the Geysers-Cloverdale Road, but there was concern that the property owners in the Geysers development area were unlikely either to initiate a petition for district formation or to support a board of supervisors' action to establish a district. Although potentially useful in distributing the costs of specific roadway mitigation measures among property owners and users benefiting from the improvements and/or services, this mitigation alternative lies within the jurisdictional authority of the local governments rather than the CEC.

Formation of a Community Facilities District

In September 1982 the Governor signed into law the Mello-Roos Community Facilities Act of 1982. A community facilities district can be set up to provide

an alternative method of financing public capital facilities, especially in areas which are developing rapidly or which are undergoing rehabilitation. The district can be formed to provide additional police protection, including jails, detention facilities, and juvenile halls; fire protection and suppression and provision of ambulance and paramedic facilities and services; local park, recreation, and parkway facilities; elementary and secondary school sites and structures; libraries; and any other governmental facilities authorized by law.

Formation of a community facilities district can be initiated either by a petition of 10 percent of the registered voters within the boundaries of the proposed district or by action of the legislative body with jurisdiction over the area within the proposed district. Unless protested in writing by 50 percent or more of the registered voters in the proposed district, the formation of the proposed district is put to a vote after completion of public hearings. The formation of a community facilities district and any subsequent levies of assessment taxes or decisions to incur bonded indebtedness must be approved either by a two-thirds majority of the registered voters in the boundaries of the proposed district or, if there are less than 12 registered voters in the district, by the owners of two-thirds of the acreage in the district. The need for a two-thirds majority to approve formation of a community facilities district and any subsequent fiscal matters is probably the greatest hurdle to be overcome in use of this mitigation option. The enabling legislation is recent enough that none of the local governments have yet attempted to use this option for mitigation of geothermal development impacts on public services.

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

Under the terms of AB 1905, the CEC 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 the Lake County Board of Supervisors adopted in September 1981, the CEC's policy precludes the use of AB 1905 funds for mitigation of impacts clearly 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 currently also cover the costs of local public service demands related to geothermal development, except in the case of road maintenance and education.

The issue of geothermal impacts on roads and potential mitigation measures is discussed to some degree in this study. However, the roads issue was also the subject of a separate CEC evaluation and the policy recommendations and an algorithm for calculation of mitigation fees have been incorporated into this

document as Appendix B. Included in the study of the road issue is a discussion of the impact of geothermal development in the Geysers on local public roads and options for mitigation of these impacts. The study of the road issue also includes the algorithm which staff recommends the CEC require as a condition of certification if a power plant applicant and an impacted county are unable to complete negotiations on a formal mitigation agreement.

The issue of providing mitigation for geothermal development effects on local schools is extremely convoluted due to the complexities of school financing. 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 operational costs comes from the state and may not exceed a state-controlled 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 redistributing students by busing, renting classroom space, instituting double sessions or year-round sessions, and converting administrative offices and student activity areas to classrooms. Such alternatives have been used as interim measures while additional classroom space is under construction but are generally not encouraged as long-term solutions.

By state law, financing for the capital costs of improving or increasing educational facilities currently may not be funded by local property taxes. Of the various financing mechanisms available for the costs of capital improvement of schools, only one currently proves to be actually and practically available to mitigate the impacts of geothermal development--exactions imposed on geothermal project developers for the cost of mitigation for enrollment increases 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 the impacts of enrollment increases 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 power plant developer and the impacted school districts are encouraged to negotiate a mutually satisfactory mitigation agreement outside the CEC's regulatory process. If such agreement has not been reached 20 days prior to the start of evidentiary hearings on the proposed project, staff will request that the issue be adjudicated and that the staff's algorithm be used to calculate the necessary mitigation fees. This algorithm is further discussed in Appendix A and in the "Policy Recommendations for CEC Regulatory Proceedings" section.

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. As described in Chapter III, the work force categories include:

- o Geothermal developers,
- o Steam field drillers and developers,
- o Steam field maintenance workers,
- o Steam-gathering system construction workers,
- o Power plant (and related facilities) construction workers,
- o Power plant operation and maintenance personnel,
- o Personnel providing geothermal-related services and supplies, and
- o Personnel providing other induced services and supplies.

Based upon figures geothermal industry representatives provided, there currently are at least 1,550 persons employed in the Geysers KGRA either in some aspect of geothermal development or in geothermal-related services. There are no data available regarding the number of workers employed in the "induced services" category. Since this group of workers also provides services to nongeothermal industries and 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 tend to have long-term, full-time jobs. Those groups of workers with long-term jobs 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 residing in the four counties of the KGRA.

Of the 1,550 geothermal workers described in Chapter III, approximately 570 workers, or about 37 percent, were involved in the construction of geothermal power plants and related facilities in the last quarter of 1982. As is evident from the figures in Chapter IV and in the raw data charts in Appendix D, 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 IV, the number of construction workers active in power plant construction was expected to peak at 595 workers in the first quarter of 1983 under both the 2,487 MW and the 3,000 MW development scenarios. Under the 3,000 MW scenario, there will be a second peak of 555 workers in early 1988. These figures are based upon estimated project development schedules which were current as of January 3, 1983. 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 a commuter bus survey completed in 1979, 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 of 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 unions 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 remained on call for future geothermal work assignments following their nongeothermal assignments.

Conclusions

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 led staff to conclude that, overall, the percentage of new local long-term growth attributable solely to the power plant construction work force may not be significant although there may continue to be localized effects associated with individual power plant projects. Construction workers commuting to/from temporary local residences for the duration of their short-term employment in the Geysers development area will produce fluctuations in the resident population. Such fluctuations will be similar in local impact to the population fluctuations caused by tourists and recreational users in the four KGRA counties.

POLICY RECOMMENDATIONS FOR CEC REGULATORY PROCEEDINGS

The CEC has jurisdiction over the siting of geothermal power plants with a rated capacity of 50 MW or greater and over any other facilities related to such power plants. The power plant developer-operator has the responsibility for identifying potential project impacts and proposing mitigation measures. The identification of project impacts should also include a discussion of the potential cumulative effects of several concurrent power plant projects and the potential cumulative effects of power plant development and operation and the exploration and development of the steam resource.

The CEC has the responsibility to require mitigation of impacts attributable to those aspects of geothermal development within its jurisdictional authority. During the CEC's regulatory review process, the project's potential impacts and suggested mitigation measures are evaluated. Drawing upon the information the various parties presented during its regulatory proceedings, the CEC places conditions on its approval of the proposed project and incorporates the requisite mitigation measures into its final decision on the project.

As indicated in this study, the two areas of local public services currently most measurably impacted by geothermal development are education and roads. Based upon the analyses in this study the staff recommends that those public service impacts attributable to a specific geothermal power plant be mitigated by the power plant developer-operator. Consistent with this recommendation, several recent CEC decisions on geothermal power plants included conditions which required mitigation of general socioeconomic effects and project impacts on specific types of public services. The negotiations leading toward the mitigation agreements took place outside of the CEC's regulatory proceedings, but the terms of the agreements were incorporated into the CEC's final decisions.

The policy recommendations which follow are made as a guide to staff, to power plant developers-operators, and to intervening parties involved in the CEC's regulatory proceedings on proposed power plant developments. Staff recommends that the negotiations toward mitigation agreements for road and school impacts continue to take place outside the CEC's proceedings and only be brought into the regulatory process for resolution if the negotiations reach an impasse.

Identification of General Public Service Impacts

- All significant adverse impacts on local public services which are attributable to a specific power plant project should be mitigated by the project applicant.

- 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.

Mitigation of General Public Service Impacts

- Since potential impacts on local public services are generally mitigated through provision of funding for additional services, facilities, or materials and since local government's fiscal flexibility to respond to changes in service needs has been seriously constrained by the passage of Proposition 13, the project proponent is encouraged to provide mitigation funding in advance of the project's impacts on local public services.

- Prior to the end of the evidentiary hearings on the applicant's AFC, the mitigation agreement(s) must be submitted by the applicant to the CEC committee for the regulatory proceedings on the AFC.

Identification of Impacts on Schools

- Significant adverse impacts on schools 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 accommodating the excess enrollment.

- 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.

- Each school district shall identify project-specific and geothermal-related students by means of an annual student survey. The survey shall also establish the date of residency in the school district for each student.

- The determination of impacts attributable to a specific project should be identified in the project applicant's AFC analysis.

- 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.

- 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.

- 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 Impacts on Schools

- 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.

- 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 attributable to the project.

    - Such negotiations should commence no later than the proponent's submital of the project's AFC to the CEC for regulatory review.

    - Such negotiations should continue in good faith between representatives of the project proponent and all potentially affected local governmental entities providing services.

- The applicant and the school districts should use the standardized algorithm* prepared by the CEC as a foundation to seek agreement on (1) the date of the annual student survey; (2) the basis for identifying project-specific students; (3) the basis for identifying geothermal-related students; (4) the adjustment factor to be used for geothermal-related students; (5) the school district's average capital construction costs per square foot of classroom space; (6) the mitigation fee to be paid per student; (7) the basis for computing district enrollment; (8) the basis for a determination that the school district is at, or in excess of, planned capacity; (9) the schedule for periodic re-evaluation of the impact mitigation agreement; and (10) the timing of funding, including, if necessary, a provision for the return of funds not used within a specified period of time.

- An applicant shall only pay a mitigation fee for the number of new students in excess of the highest previous survey.

- 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.

Identification of Impacts on Roads

- o The Geysers-Healdsburg Road, Geysers-Cloverdale Road, and Socrates Mine Road currently are the county roads most severely affected by geothermal development. Additional county roads which are expected to experience impacts as the geothermal development area expands include Pine Mountain, Pine Flat, Bottle Rock, Highland Springs, Dry Creek, and Western Mine roads. Private roads which may experience impacts are High Valley and "Seven Mile" roads.

- o Most existing roads were designed for light-duty traffic and not designed for heavy truck traffic. These roads have required extraordinary maintenance and repair costs in excess of planned costs for these types of roads.

- o Extraordinary maintenance for both Lake and Sonoma counties is defined as any maintenance required over and above the countywide average cost for maintaining paved roads.

- o Local county roads shall be considered to require extraordinary maintenance until the roads have been reconstructed to meet acceptable standards for industrial use.

- o The annual cost of extraordinary road maintenance shall be calculated by each affected county based upon the actual recorded costs of ordinary and extraordinary maintenance for the previous year for each affected road.

* Refer to Appendix A for the algorithm.

- o A power plant developer-operator has the responsibility for mitigation of adverse road impacts attributable to the construction, operation, and maintenance of the proposed power plant and related facilities.

- o The determination of impacts attributable to a specific project should be identified in the project applicant's AFC analysis.

- o The project applicant shall determine the total number of project-related trips generated over the hypothetical lifetime of the project for each road (or portion thereof) expected to be affected by the project.

- o Lack of agreement between the power plant developer-operator and the local government on the cost of extraordinary maintenance, number of project-related trips, or roads expected to be affected by project-related traffic should be the focus of testimony before the CEC during regulatory proceedings on the project applicant's AFC.

Mitigation of Impacts on Roads

- o Several approaches are available to cope with extraordinary maintenace costs, including formalized agreements, county use permits, and performance bonds. As discussed in the algorithm paper (Appendix B), the formalized agreement for payment of extraordinary maintenance costs is the preferable method of mitigating the adverse impacts of geothermal development on the roads in the Geysers KGRA.

- o The formalized agreement for payment of extraordinary maintenance costs for project-related impacts on local county roads should be reached prior to the submittal of the project applicant's AFC to the CEC for regulatory review.

- o The formalized agreement should include the following:

  - The estimated number of project-related trips which would occur throughout the estimated lifetime of the project,

  - The estimated distribution of use of each local county road potentially used by project-related traffic,

  - The estimated portion or length of each local county road potentially used by project-related traffic, and

  - The method to be used by the county for determining the cost of extraordinary maintenance for local county roads potentially used by project-related traffic.

- o All projects subject to a road maintenance agreement should be surveyed by the county annually on July 1. Bills for extraordinary maintenance fees should be mailed on or before September 1 of the same year.

- o County public works departments in counties with roads potentially impacted by geothermal traffic shall be responsible for maintaining accurate maintenance cost records and for calculating the annual mitigation fee due from each participating project applicant.

- o If a road maintenance agreement between a power plant applicant and impacted county has not been negotiated 20 days prior to the start of the evidentiary hearings before the CEC, the staff will request that the matter be adjudicated as an issue during these hearings.

- o The CEC staff algorithm for calculation of extraordinary maintenance fees will be proposed as a condition of certification in the CEC power plant siting proceedings if agreement cannot otherwise be reached between the applicant and an impacted county.

CONCLUSIONS

The CEC has regulatory review responsibility and jurisdictional authority over the siting and operation of thermal power plants of 50 MW or greater. The power plant developer-operator has the responsibility for identifying potential project-related impacts and also for determining their significance in a broader, cumulative context. The power plant developer-operator has mitigation responsibility for impacts associated with the construction, operation, and maintenance of the power plant and related facilities. The power plant developer-operator also shares in the mitigation responsibility for impacts associated with the other aspects of geothermal development, such as development of the steam resource, well drilling, and construction of well pads, access roads, and steam transport lines.

The CEC has the responsibility to require mitigation of impacts attributable to those aspects of geothermal development within its jurisdiction. During the Energy Commission's regulatory review process, the CEC staff, the project applicant, and interested parties analyze the project proposal and present information on potential impacts and recommended mitigation measures. Relative to potential socioeconomic impacts of geothermal projects in the Geysers, the most measurably apparent effects of geothermal development on the local governments have been enrollment increases in school districts already experiencing capacity problems and accelerated deterioration of local roads due to increased use and oversized loads.

This study presents an evaluation of mitigation alternatives and recommends staff policy which will guide power plant developers-operators, CEC staff, and intervening parties involved in the CEC's regulatory proceedings on proposed geothermal power plant developments. Currently, staff's policy recommendations include an algorithm for mitigation of impacts on school districts experiencing project-related enrollment increases (Appendix A) and an algorithm for mitigation of geothermal development impacts on local roads (Appendix B). The policy recommendations and methods for calculating mitigation fees could be adapted as necessary for mitigation of other public service impacts.

The impacts on local public services currently being experienced in the Geysers KGRA are not solely related to the construction, operation, and maintenance of the geothermal power plants. The primary jurisdictional responsibility for ensuring mitigation of impacts attributable to development of the steam resource, well drilling, and construction of well pads, access roads, and steam transport lines lies with the respective counties, the state Division of Oil and Gas, and responsible federal agencies. It is hoped that

those agencies with jurisdictional authority over these other aspects of geothermal development will recognize the extent of the public service impact problems and respond to the urgency of the local road departments' and school districts' needs with comparable mitigation requirements when considering approval of discretionary land use permits associated with geothermal development.

Chapter I

INTRODUCTION

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 local governments' ability to finance increased 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 California Energy Commission (CEC) in developing policies and programs to facilitate an orderly development of the geothermal resource. The information which this study presents provides a relatively current background for analysis of the socioeconomic effects of geothermal development in the Geyers. Using this document as a foundation, the CEC analysis can be further refined as new information and demographic data become available.

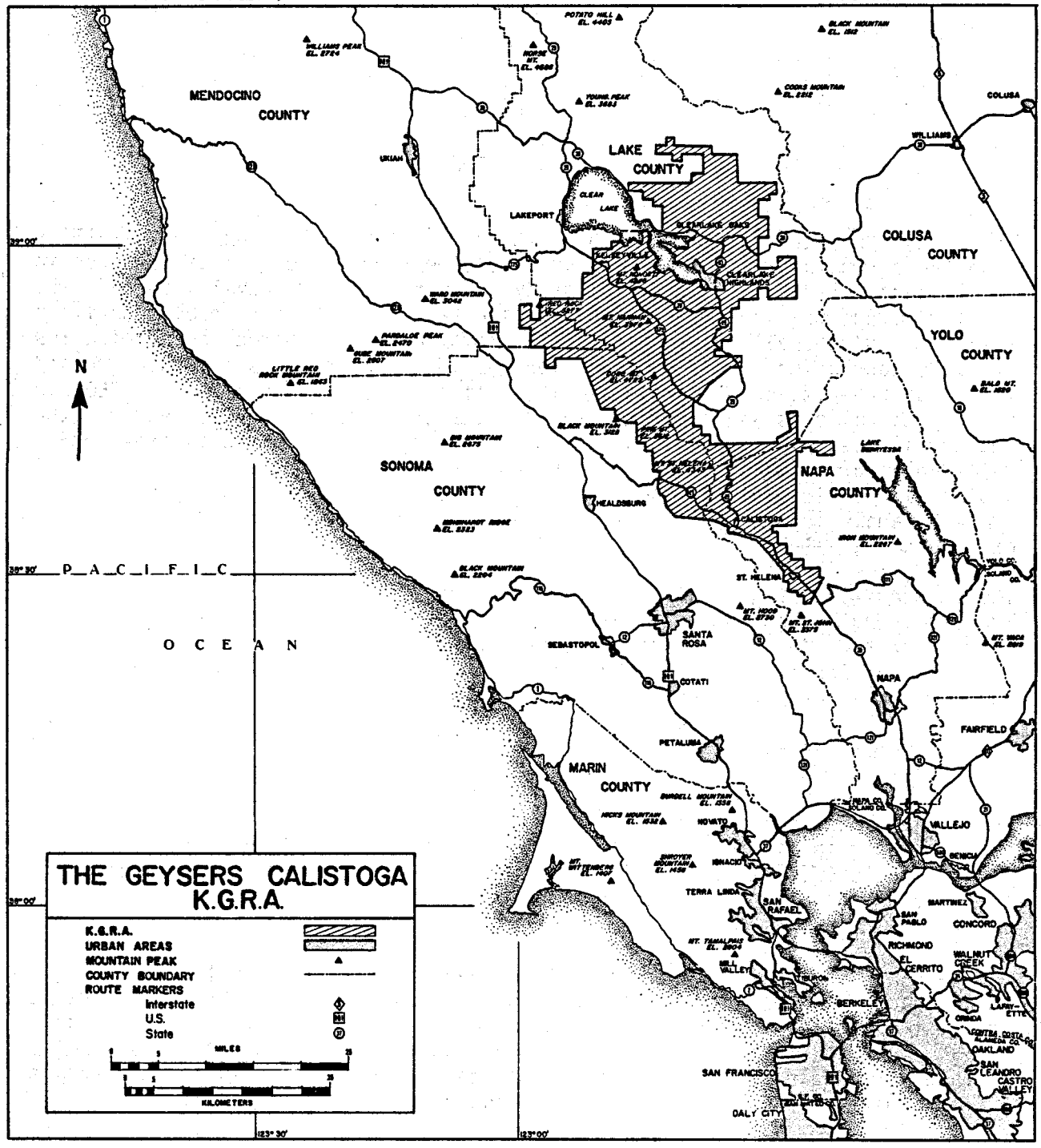
The Geysers-Calistoga KGRA is located approximately 75 miles north of San Francisco and encompasses an area of nearly 600 square miles. The major portion of the KGRA is located in Lake County, but it also extends into the counties of Sonoma, Napa, and Mendocino (see Figure 1). The majority of the geothermal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

*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.

FIGURE 1: THE GEYSERS-CALISTOGA K.G.R.A.



Analysis of socioeconomic impacts most often focuses on a particular development's fiscal effects on local governments because local governments have the responsibility for providing basic services and amenities to residents within their jurisdictions. Some of the public services that local governments may provide are water supply, collection and disposal of liquid and solid wastes, education, medical and emergency services, police and fire protection, flood control, parks and recreational facilities, transportation facilities, and library services. Generally, the public services which changes in population most immediately affect are education, water supply, wastewater 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 of new equipment and/or construction of service facilities, most of which require substantial capital outlay. This initial capital cost can significantly drain local fiscal resources. In the long term, a new residential, commercial, or industrial development may 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 78 megawatts (MW) of power. During the 1970s the number of power plants increased by 9, and the power produced increased by 589 MW. Current estimates for the 1980s indicate an additional 19 power plants are expected to come into operation, producing an additional 1,638 MW of power. Projections for the 1990s indicate another 7 power plants could come on line, producing an additional 513 MW.

As described in Chapter III, the analysis in this study is based upon two scenarios for development of the steam resource in the Geysers KGRA. Development Scenario 1 includes all existing power plants in operation or under construction and all power plant projects undergoing regulatory review or identified in current utility resource plans. Under Scenario 1, the eventual estimated output of the steam resource in the Geysers area is 2,487 MW. Development Scenario 2 is based upon the estimated maximum potential output of the Geysers steam resource (3,000 MW) and a series of hypothetical projects not yet described in current resource plans.

To date, all development of geothermal power plants in the Geysers KGRA has occurred in Sonoma and Lake counties. The projected limits of the steam resource extend to the northwest into Mendocino County and to the southeast into Napa County. Although Napa and Mendocino counties have not indicated that they have experienced noticeable socioeconomic impacts related to development in the Geysers, these two counties have been included in this study to provide an information base line against which any potential future impacts can be measured.

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 stressed the local governments' abilities to provide public services. The increasingly noticeable effects of geothermal development on local roads and some types of public services further compounded the stresses on local government resources.

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

*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.

Chapter II

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 resource is more dispersed than the dry steam resource and covers 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 18 operating units (PGandE Units 1 through 15, PGandE Units 17 and 18, and the NCPA 2 power plants) and a total generating capacity of 1,237 MW. In addition, construction is now under way on 6 new facilities, which will have a combined capacity of 472 MW. These facilities include PGandE's Units 16 and 18; Occidental Geothermal's, Oxy No. 1 project; the Sacramento Municipal Utility District's (SMUD) SMUDGEO #1; and DWR's Bottle Rock and South Geysers facilities.

All of the existing generating facilities, except PGandE's Unit 13, are located on the western slope of the Mayacmas Mountains (see Figure 3). Since the mid-1970s, however, 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) and construction of three others (PGandE Unit 16, DWR Bottle Rock, and Occidental Geothermal's Oxy No. 1). One additional project proposed in Lake County (NCPA 1) completed the Notice of Intention (NOI) phase of regulatory review by the CEC, but the project has been removed from NCPA's current resource plan, and the leasehold has been acquired by MCR Geothermal Corporation.

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

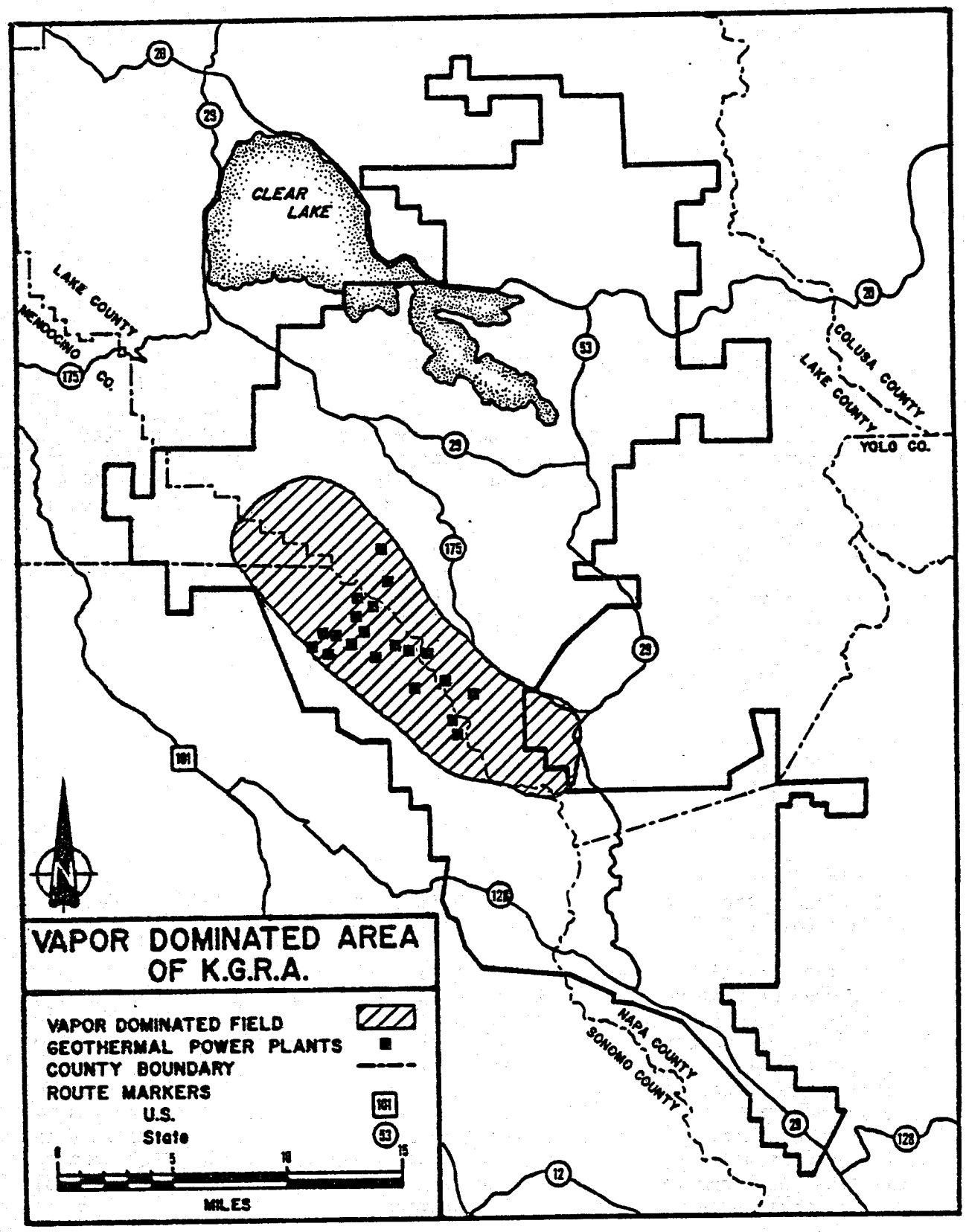
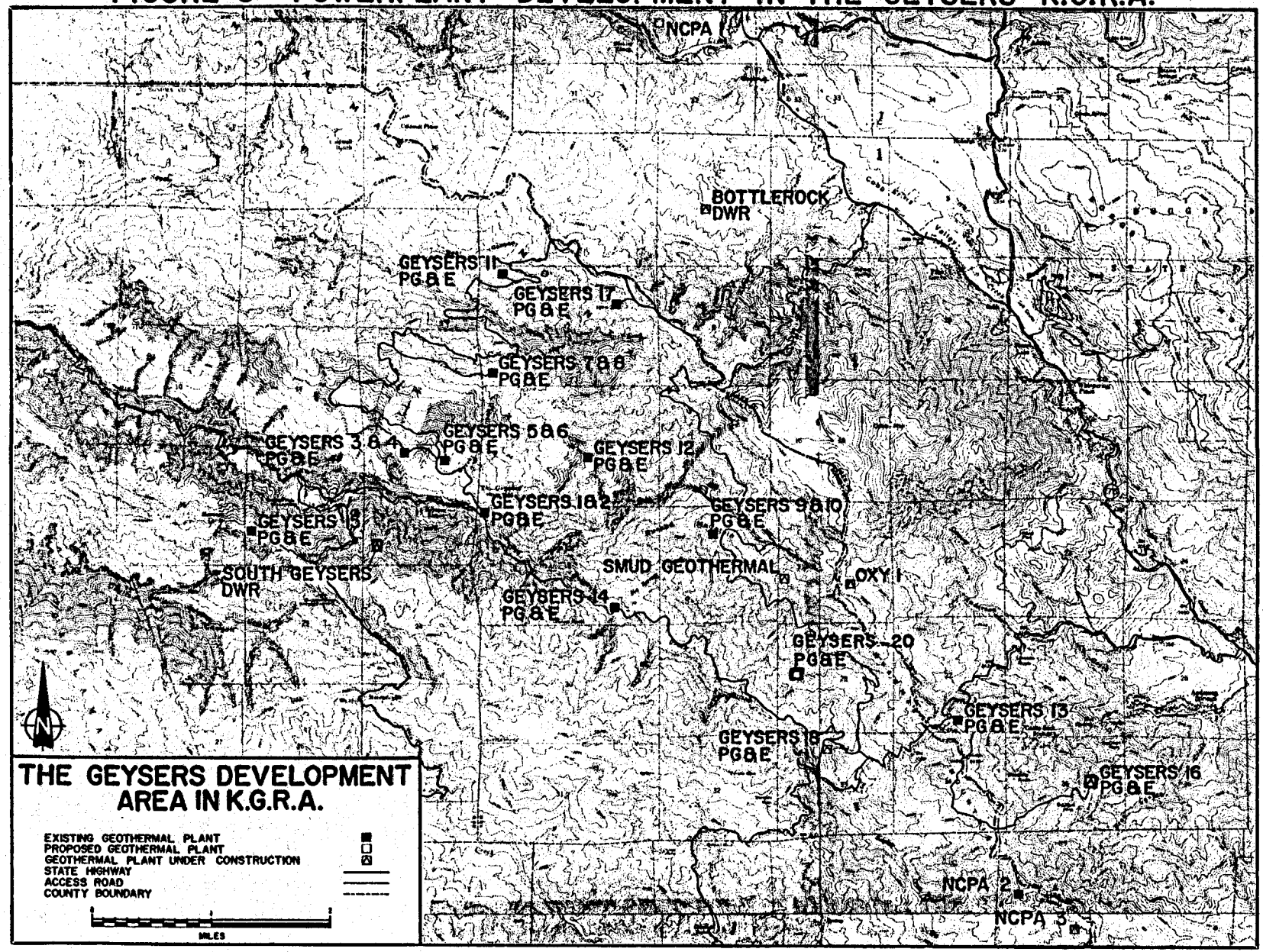


FIGURE 3: POWERPLANT DEVELOPMENT IN THE GEYSERS K.G.R.A.



Information the utilities submitted to the CEC 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 spreading 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 counties have experienced the majority of such socioeconomic changes. Napa and Mendocino counties have experienced fewer changes, since they are located somewhat farther from the dry steam resource area currently 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, the current availability of housing, and the current availability and capacity of public services 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 State 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 8 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, Jimtown, 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 Jimtown in the Alexander Valley. Additional access is possible via the Cloverdale-Geysers Road and the Pine Flat Road. A series of paved, privately maintained, controlled-access 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

City	1970 Population	1980 Population	Percent Change
Cloverdale	3,251	3,980	22.4
Cotati	1,368	3,446	144.5
Healdsburg	5,438	7,217	32.7
Petaluma	24,870	33,834	36.0
Rohnert Park	6,133	22,965	274.4
Santa Rosa	50,006	83,320	66.4
Sebastopol	3,993	5,595	40.1
Sonoma	4,259	6,054	42.1
County Total	204,885	299,681	46.3

Source: U.S. Census, 1982b.

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 29.3 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 22 percent between 1970 and 1980; the population of Healdsburg increased by a little over 32 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 8.2 percent during 1982, with seasonal fluctuations occurring between January and May. 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, 1982a).

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 was the major employer in the county until 1982. In 1981 over 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 on 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 were expected in 1980 to remain virtually unchanged during the 1981-82 outlook period (EDD, 1981f). By 1982 the number employed in the government sector represented only 19 percent (annual average) of the county's employed wage and salary workers and the services sector became the major employer (EDD, 1982a).

Services and trade industries comprises the 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 1983. In 1982 over 20 percent (annual average) of the county's employed wage and salary workers were employed in the services division of the county's industries. The services division is projected to be the fastest growing in the local economy during 1982-83 (EDD, 1982a).

By 1982 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, 1982a).

TABLE 2

CIVILIAN LABOR FORCE, EMPLOYMENT AND UNEMPLOYMENT

Sonoma County 1974 - 1982

Year	Labor Force[1] Annual Avg.	Employment[2] Annual Avg.	Unemployment[3] Annual Avg.	Unemployment Rate[4] High Month	Unemployment Rate[4] Low Month	Annual Avg. (Percent)
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
1981	135,800	125,800	10,000	Jan: 9.8	May: 6.6	7.4
1982	141,100	129,600	11,500	Jan: 9.8	May: 6.6	8.2

Source: EDD, 1981a; EDD, 1982a.

Note: Civilian labor force, employment, and unemployment are by place of residence.

1. Civilian labor force is the sum total of potential workers, employed, and unemployed.
2. Includes persons involved in labor management trade disputes.
3. Includes all persons without jobs and actively seeking work.
4. 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 EMPLOYMENT BY INDUSTRY
SANTA ROSA SMSA

Sonoma County 1979 - 1983

	Annual Averages				
		Actual			Projected
	1979	1980	1981	1982	1983
Total, all industries	93,800	97,100	97,100	102,000	106,700
Agricultural, forestry, & fisheries	4,700	4,600	3,200	4,300	4,600
Nonagricultural total	89,100	92,500	95,200	97,700	102,100
Mining	400	400	400	500	500
Construction	6,300	5,900	5,100	5,400	5,600
Manufacturing	14,300	14,900	15,300	15,900	17,400
Nondurable goods	4,700	4,700	5,200	5,300	5,800
Food & kindred products	2,900	3,100	3,500	3,600	3,900
Other nondurable goods	1,800	1,600	1,700	1,700	1,900
Durable goods	9,600	10,200	10,100	10,600	11,600
Lumber and wood products	2,200	2,000	1,500	1,800	1,900
Machinery and instruments	5,500	6,500	6,800	7,000	7,700
Other durable goods	1,900	1,700	1,800	1,800	2,000
Transportation & public utilities	4,200	4,500	4,800	5,100	5,400
Wholesale trade	3,400	3,500	3,700	3,800	3,900
Retail trade	18,000	19,100	19,800	20,200	21,400
General merchandise stores	2,100	2,300	2,600	2,500	2,600
Food stores	2,600	2,900	3,100	3,400	3,600
Eating and drinking places	5,600	5,900	6,000	6,500	6,900
Other retail trade	7,700	8,000	8,100	7,800	8,300
Finance, insurance, and real estate	5,500	5,700	6,000	6,100	6,400
Services	17,400	18,300	19,900	21,000	22,000
Hotels	1,100	1,200	1,100	1,300	1,400
Personal	1,100	1,100	1,200	1,300	1,300
Business	1,600	2,000	2,300	2,800	3,200
Auto & miscellaneous repair	1,200	1,100	1,100	1,100	1,100
Recreation & motion pictures	800	800	800	900	900
Health care	5,600	5,700	6,100	6,400	6,700
Legal	400	400	400	600	600
Social services	3,300	3,700	3,900	4,100	4,000
Other services	2,300	2,300	2,500	2,600	2,800
Government[1]	19,600	20,200	20,400	19,700	19,500

Source: EDD, 1981f; EDD, 1982a.

Note: 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.

1. Includes all civilian government employees regardless of activity in which engaged.

Despite continued mechanization and gradual conversion of farmland into residential, commercial, and industrial uses, the agriculture sector 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 occurred during the 1981-82 period, and Sonoma County's agriculture sector showed slight overall payroll increases. In 1983, however, farm employment is again expected to decline (EDD, 1982a).

The manufacturing division of Sonoma County's major industries is the fourth largest employer of the county's work force. In 1982 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 modest 2.5 percent increase in jobs between 1981 and 1982. Strong gains in the manufacture of electrical and electronic instruments and components helped to lessen the impact (EDD, 1982a). Based upon the current growth in the electronics industry, the Hewlett-Packard Company is planning expansion of a new facility in Santa Rosa and phased development of a new facility in Rohnert Park. These facilities may eventually employ as many as 17,000 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, 500 people in the county were employed in the mining division of local industries in 1982. This number has remained relatively constant since 1975. Jobs in this industrial category did show a slight increase between 1981 and 1982, 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 1982a).

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 DOF, 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:

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

- 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).

- 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 3 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

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

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 Sonoma County Office of Education. Water services are sup-plied 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 wastewater disposal. Emergency medical services available near the Geysers include three hospitals in the City of Santa Rosa and one hospital in Healdsburg. Law enforcement services are provided through the Sonoma County Sheriff's Department or through individual city policy 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 Unified, Geyserville Unified, Alexander Valley Union, Healdsburg Union, West Side Union, Rincon Valley Union, Windsor Union, 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 1981-82 school year, the districts nearest the KGRA which showed declining enrollment included Alexander Valley Union (K-6), Healdsburg Union (7-12), and Windsor Union (K-6). The most significant decline in enrollment occurred between the 1979-80 and 1980-81 school years, when the kindergarten through 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 1979-80 and 1980-81 school years (Eagan, June 1981).

According to data from the Sonoma County Office of Education, the 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 West Side Union and Piner-Olivet Union school districts had 1981-82 enrollments at or near capacity. In the 1981-82 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 which county school district representatives presented to the CEC 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-classroom limits. Whereas a district may have served a greater number of students in the same facilities in the past, it 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.

- 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).

- The City of Santa Rosa--As a customer of the Sonoma County Water Agency, Santa Rosa provides water to 35,000 customers. System storage capacity initially consisted of approximately 12 million gallons, with an additional 4 million gallon reservoir which was completed by the end of 1982. This increased reservoir capacity is projected to provide adequate water supplies until the year 2000 (Romano, June 1981). In 1981 the district's customers used approximately 12 million gallons per day. The utility has 6 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 compensate the city for future, developer-initiated city growth (Romano, June 1981).

- 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 from 30 percent during winter months to 70 percent during 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 (1981 cost: $5,000 to $10,000), additional holding capacity (1981 cost: $20,000), and a pipe distribution system (1981 cost: $50,000). This would bring the total cost of doubling current capacity to approximately $80,000 (Bosworth, June 1981).

- 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

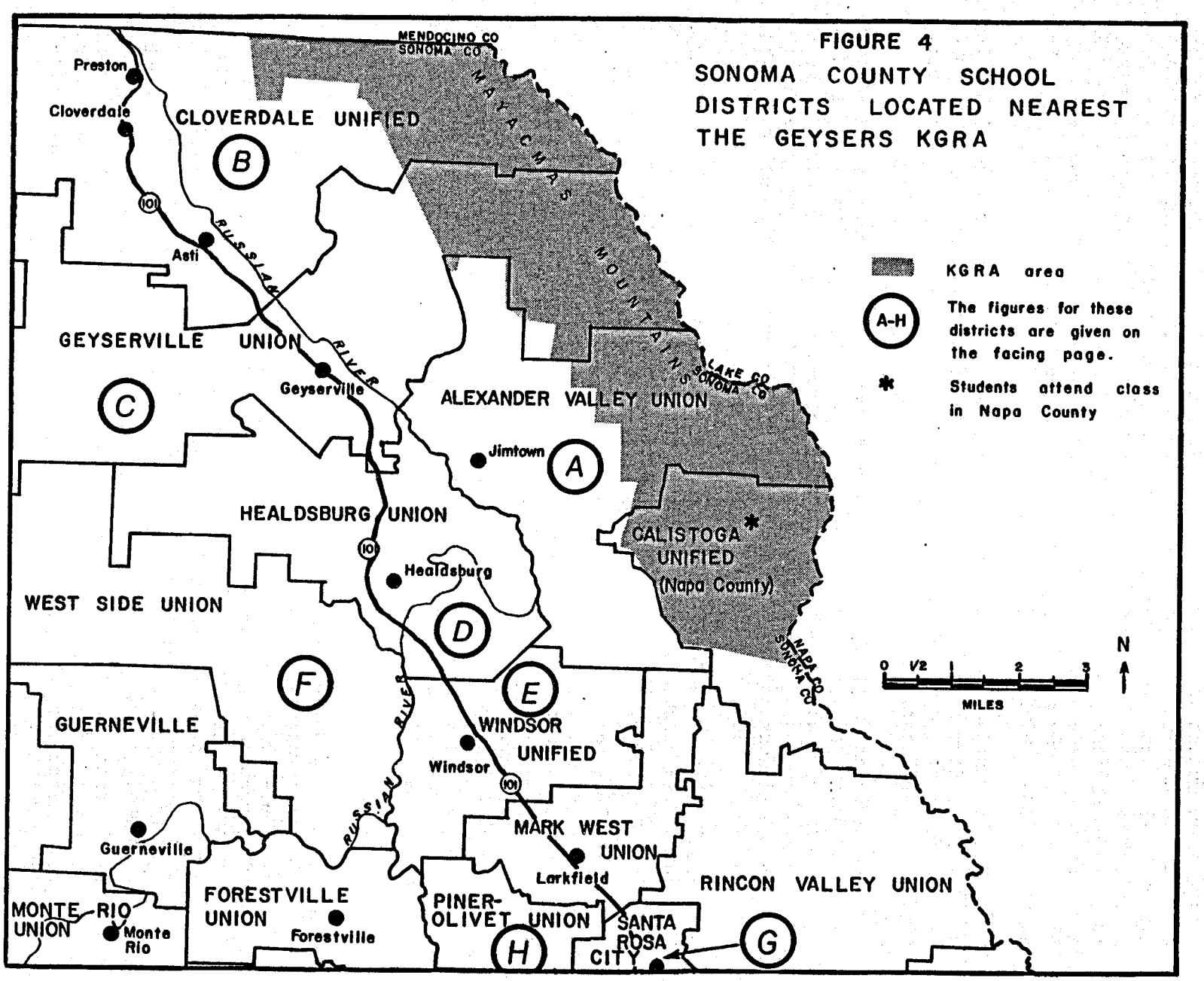


FIGURE 4
SONOMA COUNTY SCHOOL DISTRICTS LOCATED NEAREST THE GEYSERS KGRA
MENDOCINO CO
SONOMA CO
MAYACMAS MOUNTAINS
LAKE CO
SONOMA CO
NAPA CO
SONOMA CO
Preston
Cloverdale
CLOVERDALE UNIFIED
B
101
Asti
RUSSIAN RIVER
GEYSERVILLE UNION
C
Geyserville
ALEXANDER VALLEY UNION
Jimtown
A
HEALDSBURG UNION
Healdsburg
CALISTOGA UNIFIED (Napa County)
*
WEST SIDE UNION
D
F
E
GUERNEVILLE
WINDSOR UNIFIED
Windsor
RUSSIAN RIVER
MARK WEST UNION
Larkfield
Guerneville
MONTE RIO UNION
Monte Rio
FORESTVILLE UNION
Forestville
PINER-OLIVET UNION
H
SANTA ROSA CITY
G
RINCON VALLEY UNION
KGRA area
A-H
The figures for these districts are given on the facing page.
* Students attend class in Napa County
0 1/2 1 2 3
MILES
N

TABLE 4

ESTIMATED ENROLLMENT CAPACITY

SONOMA COUNTY SCHOOL DISTRICTS LOCATED NEAREST THE GEYSER KGRA

	Alexander Valley Union	Cloverdale Unified	Geyserville Unified	Healdsburg Union		Windsor Union		West Side Union	Santa Rosa City Unified		Piner-Olivet Union
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]	1,260[2]	325[3]	1,200[4]	1,800[4]	800[5]	(1,025)[1]	85[6]	3,900[7]	10,200[7]	600[8]
Total 80-81	91	1,137	298	860	1,450	740		93	3,267	8,431	591
81-82	89	1,175	300	911	1,405	696		99	3,535	9,076	620
Estimated Remaining Capacity	+159	+123	+27	+340	+350	+60	(+285)*	-8	+633	+1,769	+9
	+161	+ 85	+25	+289	+395	+105		-14	+365	+1,124	-20

Sources: Sonoma County Office of Education, 1981a, 1983a.

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

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

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 current city population data related to the growth of geothermal development (Pusich, June 1981).

In 1981 the city council was 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 $3,320 per unit for one unit per acre, $2,840 per unit for four units per acre , and $2,600 per unit for eight units per acre. Oversizing costs, including mains and distribution systems, based upon number of units per acre would be $400 per lot for one unit per acre, $500 for four units per acre, and $1,000 for eight units per acre (Pusich, June 1981).

- 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).

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

- 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 reached its capacity in 1981 due to local industrial discharge of between 220,000 and 330,000 gallons per day. The city is making plans for expansion of wastewater 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's cost of additional

service based upon actual use. In 1981 the cost of additional services necessary to double present system capacity was estimated at about $1 million (Wood, June 1981).

- Geyserville Sanitation District--Until Geyserville completed its own wastewater 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 to 55,000 gallons per day (Salisbury, May 1981).

  The current system reserve capacity of approximately 15 percent was expected to meet wastewater system needs of the Geyserville locality until 1990. However, district representatives expect that completion of construction of Warm Springs Dam would 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 early in the 1980s, and additional facilities may be required prior to 1990 (Salisbury, May 1981).

- The City of Cloverdale--Cloverdale has a community wastewater 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. In 1981 the cost of additional services necessary to double present capacity was estimated at approximately $1.2 million (Cann, June and September 1981; January 1982).

Emergency Services--Emergency medical services in Sonoma County are provided either by private or county hospitals, which generally are located in the larger urban areas. Available private ambulance services may also be supplemented by paramedic crews dispatched by local fire departments. During the annual fire season (usually May through October) the local medical emergency services may also be supplemented in the more remote areas of the county by helicopter units dispatched by the California Department of Forestry (CDF). The CDF helicopters may be dispatched either from the Boggs Mountain station in Lake County or the Willits station in Mendocino County.

- City of Santa Rosa--There are three hospitals located in the City--Santa Rosa Community, Santa Rosa Memorial, and Santa Rosa General--providing a combined total of 410 beds. All three hospitals have intensive care units, and Santa Rosa Memorial Hospital can accommodate neurological patients. Patients requiring specialized treatment for burns would be transferred to San Francisco, San Jose, or Chico.

- City of Healdsburg--Located nearer to the KGRA, the Healdsburg General Hospital has 49 beds and facilities to provide intensive care services.

- County Sheriff's Office--Sonoma County 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).

- Union Geothermal/Pacific Gas and Electric Geysers Facility--Union Geothermal Company and PGandE have jointly maintained emergency medical services in the Geysers. Their emergency facility is located near the PGandE Administrative Center near Units 3 and 4, and a trained paramedic staff is on duty around the clock. Union Geothermal and PGandE have contracted with Brown's Ambulance Service of Santa Rosa for an ambulance/van which provides emergency services within and from the Geysers. Currently these facilities are available only to employees of Union Geothermal and PGandE.

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

- Law Enforcement--Sonoma County maintains the Sonoma 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 provides services to unincorporated communities, such as Geyserville, located near the geothermal development area (Hess, June 1981).

  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 in 1981 was approximately $30,000. The cost of the equipment for the new deputy was approximately $15,000. The Sheriff's Department does not feel the need to increase the current force due to geothermal development (Hess, June 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 7 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 and $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 the KGRA plan to increase their force due to geothermal development (Cloverdale: Beebe, May 1981; Healdsburg: Paul, May 1981; and Santa Rosa: Walker, May 1981).

- 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, and the communities of 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 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 CDF 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.

Fire suppression, rescue, and emergency medical aid services in the Geysers area are provided by the CDF. Although the CDF has primary responsibility for the area, the City of Cloverdale shares responsibility for structural fires in the Sonoma County portion of the Geysers (Ramage, September 1981). The growth of geothermal development in the Geysers has increased the need for emergency medical services and fire protection facilities in the Geysers itself. The presence of approximately 2,000 workers each day, the occurrence of development activities and industrial facilities in a wildland, the transport of chemicals and other potentially hazardous materials, and the increase of traffic on the narrow and winding Geysers roads have all contributed to the pressing need for such facilities within the Geysers (Bach, January 1983).

In the fall of 1982 Sonoma County contracted with Hughes, Heiss, and Associates to conduct a fire protection study of the county. The study will cover four essential subject areas: fire suppression, fire prevention, communications (dispatching), and emergency medical problems. In early November 1982 representatives of several federal, state, and local agencies and the geothermal industry initiated discussions on developing a fire and emergency protection system for the Geysers area. Members of the newly formed Geysers Committee for Emergency Services met with Hughes, Heiss, and Associates to ensure that the study would provide the committee with information on the equipment, facilities, and personnel needed to provide fire and emergency services throughout the Geysers (Crossfield, 1982a&b). The consultant's study is expected to be completed in mid-1983 and will provide recommendations for fire protection for the county and for the Geysers area (Bach, January 1983).

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 geothermal resource moved eastward, the county experienced an increase in geothermal-related industrial development. With continued successful development of the resource, the geothermal industry and related services are expected to become significant components 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 Clearlake Highlands and Clearlake Park. A number of unincorporated communities lie along the shoreline of Clearlake. Among these are Lucerne and Nice on the northeastern side and Glenhaven and Clearlake 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 located nearest the Geysers geothermal development area. Many of these small 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 Table 5 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. Final U.S. 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

Year	Population	Percent Increase	Average Annual Increase
1950	11,481[1]	--	--
1960	13,786[1]	20.1	2.0
1970	19,548[1]	42.9	4.3
1976	26,500[2]	34.5	6.9
1978	30,000[2]	13.2	6.6
1980	36,366[1]	21.2	10.6

1. U.S. Census, 1982b.

2. CEC, 1980b.

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 generates 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 into the Geysers development area, 30 minutes from Middletown, 45 minutes from Clear Lake, 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). Data from the 1980 U.S. Census show that the percentage of county population aged 65 or older has decreased to 21.9, and the median age has decreased to 43.3, but Lake County still has the highest median age in the state (U.S. Census, 1982a).

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 population 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. Subsequent student surveys in 1981 and 1982 showed that the number of "geothermal students" was still nearly one-third of the total students in this district.

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 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 rate and seasonal pattern of unemployment among workers involved in geothermal development, since many of the workers do not, generally, tend to apply for unemployment benefits. Occasionally, workers operating the drilling rigs have filed claims for unemployment compensation between drilling assignments (Wall, June 1981). Workers involved in the various aspects of power plant site preparation and facility construction may also be employed in nongeothermal developments 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 was the major employer in the county up through 1981, when it was exceeded by employment in the services sector. 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, 1982b). In addition to direct employment in government, governmental transfer payments, especially Social

TABLE 6

CIVILIAN LABOR FORCE, EMPLOYMENT, AND UNEMPLOYMENT

Lake County 1974 - 1982

Year	Labor Force[1] Annual Avg.	Employment[2] Annual Avg.	Unemployment[3] Annual Avg.	Unemployment Rate[4] (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%
1981	13,775	12,325	1,450	Jan: 14.8%	Aug: 6.5%	10.6%
1982[5]	14,575	12,550	2,000	Feb-April: 16.3%	Aug: 9.6%	13.8%

Source: EDD, 1981c, and 1982b.

Note: Civilian labor force, employment and unemployment are by place of residence.

1. Civilian labor force is the sum total of potential workers, employed and unemployed.
2. Includes persons involved in labor management trade disputes.
3. Includes all persons without jobs and actively seeking work.
4. 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.
5. Figures for 1982 are preliminary estimates based on data available for January through November 1982.

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 percentage of disabled persons increased from 7.5 percent in December 1970 to 23.8 percent in December 1979. The percentage 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 - 1983

	Annual Averages			
	Actual		Projected	
	1980	1981	1982	1983
Wage and salary workers[1]	7,400	7,500	7,875	8,150
Agriculture, agric. serv., forestry and fisheries	750	775	775	900
Nonagricultural industries	6,650	6,725	7,100	7,250
Construction and mining	550	550	575	475
Manufacturing	300	300	325	300
Transportation and public utilities	375	375	400	425
Wholesale trade	250	250	275	250
Retail trade	1,575	1,625	1,750	1,725
Finance, insurance, & real estate	400	400	425	425
Services	1,550	1,575	1,700	1,850
Government	1,675	1,650	1,650	1,800

Source: EDD, 1982b; Carreon, 1983.

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

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

Two additional major components of the economic base include the service sector and trade associated with recreational use and tourism in the county. In 1982 over 22 percent (annual average) of the county's employed wage and salary workers were employed in the retail trade division and 21.5 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, 1982b).

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 total taxable transactions for the years 1965 through 1982 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 - 1982

Year	Gross Value of Agricultural Production[1]	Value of Total Taxable Transactions	Ratio
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
1980	36,889,000	147,492,000	.25
1981	37,157,000	162,489,000	.23
1982	37,402,000	174,402,000	.21

Source: Sedway/Cooke, 1981b; Borton, May 1983; West, May 1983.

1. Agricultural commodities are not subject to sales tax. 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, January 1983). 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

Type of Housing Unit	1970[1]	1980	Percent Increase
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.

1. 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 2 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 (DOF, 1981a&b). 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 U.S. 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. However, this total includes 3,165 units which are held for seasonal or occasional use. Subtracting the second homes from all other types of vacant units produces a vacancy rate of 10.9 percent, of which 5.7 percent were available for rent or sale (U.S. Census, 1982b).

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 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 Lake County Office of Education. Water supply is provided by numerous private companies and individuals, by the City of Lakeport, and by several county water agencies. Four sanitation districts in the county provide wastewater treatment and disposal services in the more densely populated areas. Residents of the more rural areas rely on individual septic systems for wastewater disposal. Emergency medical services are available at either of the two hospitals in the county. The Lake 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.

In recent years all of the districts in the county have received increasing numbers of new students, especially in the lower grades, kindergarten through 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 had applied for financial assistance through the Leroy F. Greene Act to initiate building programs (Sedway/Cooke, 1980a). However, in October 1981 these funds were frozen by state Executive Order and remained frozen through the end of fiscal year 1981-82. In July 1982 the state Legislature disbursed $114 million for school projects which had completed review and processing at the state Allocation Board. A portion of these funds were received by Lake County districts. In late 1982 the Legislature passed AB 28X (Robinson) which

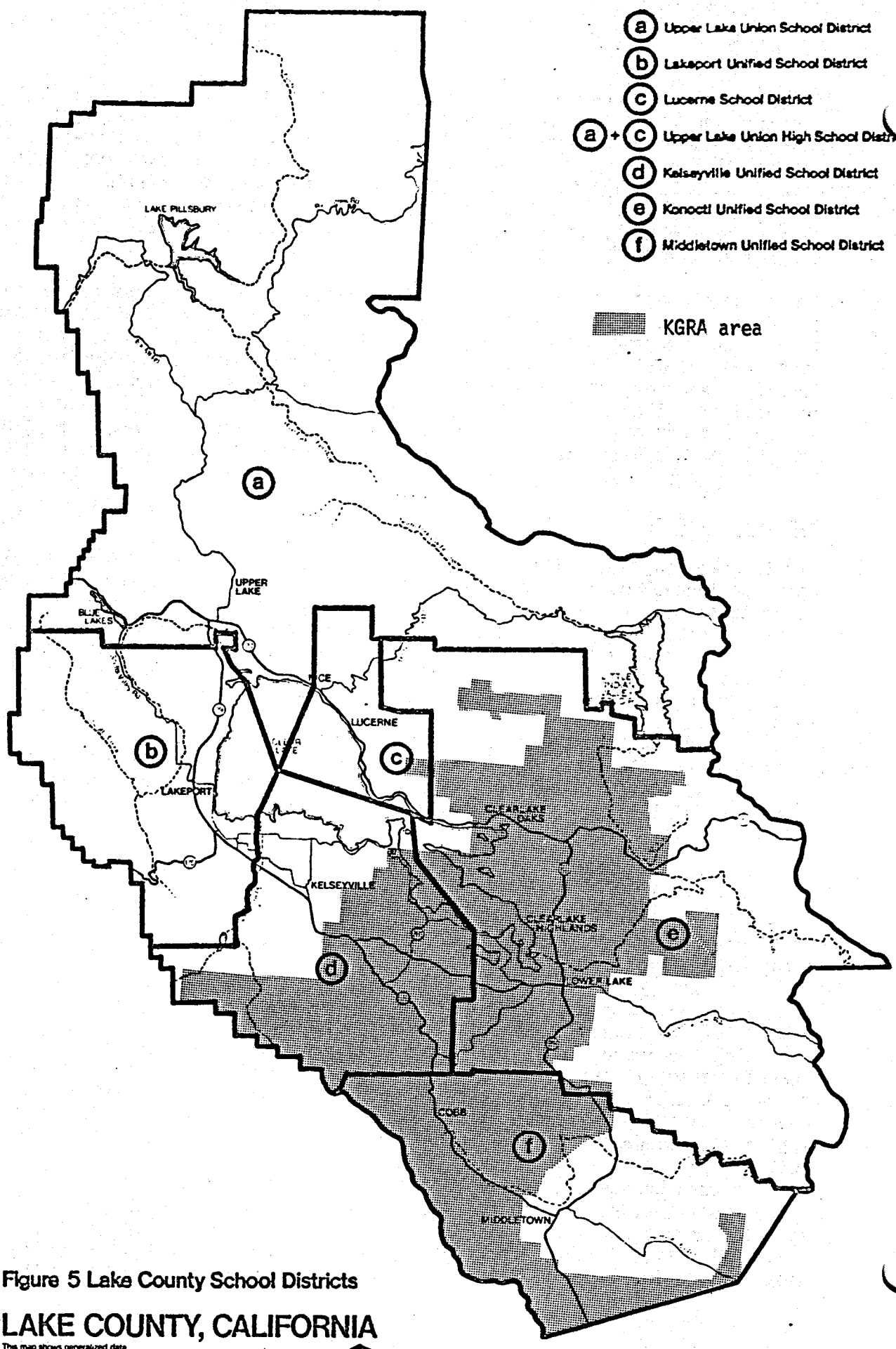


Figure 5 Lake County School Districts

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

required all unspent or uncommitted funds to be returned to the state immediately. Those funds which had already been spent or committed were to be repaid with state school bond money, as soon as bonds were sold (Smoot, March 1983).

In the November 1982 election the voters authorized the state to issue up to $500 million in bonds to fund school construction, but no mechanism was provided for determining project priority for disbursement of the bond funds. In April 1983 the state sold $200 million worth of bonds, of which $25 million were school bonds. The funds received from school bond sales will be applied to the repayment of school project funds required by AB 28X. Another $100 million in school bond funds will be needed to complete the AB 28X repayment before bond money can be disbursed for new eligible projects. Additional state bonds are expected to be offered for sale throughout the remainder of the calendar year, but the success of such sales will depend upon market conditions (Smoot, April 1983). Therefore, it may be some time before state funding is available for the capital costs of providing additional classroom space for Lake County schools experiencing enrollment in excess of capacity.

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). In December 1981 the district conducted another survey. This survey indicated that the overall percentage of students with parents employed in the geothermal industry dropped slightly, to 27 percent of total enrollment, but the percentage of new students (especially in grades K through 6) resulting from geothermal development remained about 30 percent. The survey conducted in November 1982 for the 1982-83 school year indicated a total of 180 geothermal students in the Middletown District, which equalled about 26 percent of total enrollment (Merrill, 1983).

In December 1981 a similar parents' employment survey was conducted for the other six school districts in the county for the 1981-82 school year. Results of this countywide survey became available in May 1982 and were included in the testimony of Dr. William Cornelison in regulatory proceedings before the CEC on the NCPA 3 project. The survey data showed that the Middletown Unified School District continues to have the largest percentage of students whose parents are employed in geothermal industry and services. The Kelseyville Unified School District had 10.7 percent "geothermal students", and the Upper Lake Union Elementary School District had 12.9 percent "geothermal students." Konocti Unified and the County Office of Education both had over 7 percent "geothermal students." The total number of geothermal students throughout the county school districts in the fall of 1981 was 552 (Cornelison, 1982).

The annual student survey conducted in November 1982 again showed that the Middletown district had the largest percentage of "geothermal students." Both the Kelseyville district and the Lucerne Elementary School District had over 11 percent geothermal students, and the Konocti and Upper Lake Elementary districts had over 9 percent geothermal students. The total number of geothermal students throughout the county school districts in the fall of 1982 was 711

(Merrill, 1983a). Refer to Appendix F and Tables F-1 and F-2 for more detailed information on the 1981 and 1982 student surveys of Lake County school districts.

Of the seven districts in the county, the Kelseyville, Konocti, and 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.

- 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).

- 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 F. Greene School Lease-Purchase Act to develop additional classroom space for all schools except the East Lake Elementary School (Sedway/Cooke, 1980a). Prior to the freeze on funding, the district received some Leroy Greene Act funds for construction of additional classrooms at the high school and for construction of a continuation school. 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 paid for the first year's lease for four relocatable classroom units. In October 1982 the Board of Supervisors allocated an additional $8,250 for a portion of the leasing costs. (Refer to Chapter V for additional discussion of AB 1905 funds.)

- 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), introduced by Assemblyman Doug Bosco and Senator Barry Keene in February 1981 and authorizing the release of state-owned lands from the forest, became effective in February 1982. Funding for acquisition of the land in the state forest was provided by Leroy Greene Act funds, and acquisition was completed by February 1983. Construction of the new Cobb Elementary

TABLE 10

CHANGES IN SCHOOL ENROLLMENT* IN LAKE COUNTY, 1970-1982
For Middletown Unified, Konocti Unified and Kelseyville Unified Districts

	70**	71	72	73	74	75	76	77	78	79	80	81	82	Capacity
MIDDLETOWN UNIFIED														
K-8	224	230	251	225	245	302	319	308	331	345	408	442	505	210
% Change	-6.6	2.7	9.1	-10.4	8.9	23.3	5.6	-3.4	7.5	4.2	18.3	8.3	14.2	
9-12	110	123	114	111	123	121	135	149	151	165	161	175	192	332
% Change	-8.3	11.8	-7.3	-1.6	11.6	-1.6	11.6	10.4	1.3	9.3	-2.4	2.4	9.7	
Total Enrollment	334	353	365	336	368	423	454	457	482	510	569	617	697	542
KONOCTI UNIFIED														
K-8	863	847	864	896	946	1,044	1,066	1,179	1,272	1,343	1,449	1,536	1,717	1,460
% Change	11.7	-1.9	2.0	3.7	5.6	10.4	2.1	10.6	7.9	5.6	7.9	6.4	11.7	
9-12	353	361	376	401	434	506	549	587	620	707	687	649	661	898
% Change	8.9	2.3	4.2	6.6	8.2	16.6	8.5	6.7	5.8	14.0	-2.8	-6.9	1.8	
Total Enrollment	1,216	1,208	1,240	1,297	1,380	1,550	1,615	1,765	1,892	2,050	2,136	2,185	2,378	2,358
KELSEYVILLE UNIFIED														
K-8	454	479	521	513	515	556	538	575	619	674	721	803	882	732
% Change	9.4	5.5	8.8	-1.5	0.4	7.9	-3.2	6.9	7.7	8.9	6.9	11.3	11.2	
9-12	241	258	240	223	256	242	256	300	294	327	362	361	362	600
% Change	9.5	7.1	-6.9	-7.1	14.8	-5.5	5.8	17.2	-2.0	11.2	10.7	-0.2	0.2	
Total Enrollment	695	735	761	736	771	798	794	875	913	1,001	1,083	1,164	1,244	1,332
LAKE COUNTY														
Total Enrollment	4,242	4,368	4,375	4,292	4,544	4,856	4,895	5,275	5,524	5,842	6,118	6,248	6,707	6,491
% Change	6.2	2.9	0.2	-1.9	5.9	6.9	0.8	7.7	4.7	5.7	4.7	2.1	7.5	

Source: Lake County Office of Education, January 1983.
* Active enrollment at start of school year; includes continuation school and special education.
** Percent change based on enrollment records for 1969.

School would also require funding from the Leroy Greene Act, but these funds are no longer available. Although the voters authorized the state in November 1982 to issue bonds to fund necessary school construction projects, it appears unlikely that funds from bond sales will become available in the near future and probably not until the state's fiscal situation has stabilized.

In April 1981 the Lake County Board of Supervisors approved disbursement of $30,000 from the county's AB 1905 account for the first year's lease of four relocatable classroom units. At the time of this 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). In October 1982 the Board of Supervisors allocated an additional $14,000 of its AB 1905 funds to cover a portion of the lease costs and again indicated that the district should not expect any future allocations.

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 manages Clear Lake as a storage reservoir for 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 C in Appendix C 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 Lake 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 C 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 was 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 might be adversely affected by geothermal development. In April 1981 the 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 made 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.

The Anderson Springs Community Services District (ASCSD) has developed a plan to revise and reconstruct the water collection and distribution systems. The total project involves several phases and a variety of funding sources. Phase 1 of the collection system will involve development of a new diversion point located upstream from Socrates Mine Road and installation of a 150,000 gallon storage tank and delivery piping to the community. During the CEC's regulatory review of the Occidental Geothermal Oxy No. 1 power plant project, Occidental agreed to provide funding toward the new collection system and in December 1981 placed $100,000 in a trust fund for these facilities. In 1982 the ASCSD also received a total of $150,000 from the CEC in AB 1905 grants and an additional $20,000 from Lake County's AB 1905 funds. Construction on Phase 1 of the new diversion, tank, and distribution system should begin in June 1983 and be completed by October 1983.

Phase 2 of the distribution system will cost approximately $350,000 and will entail "boxing in" the springs at the headwaters of Gunning Creek, installing underground piping from the springs to the new storage tank, and installation of flow monitoring devices. In early December 1982 Aminoil provided $100,000

toward Phase 2 and also indicated a commitment for additional funding or work-in-kind. Further funding for Phase 2 activities is intended to be provided through county use permit fees for geothermal leaseholds.

The final phase of the project involves the complete reconstruction of the existing water distribution system within the community. In December 1982 the district was awarded $550,000 in grant funds available under the Safe Drinking Water Act for the final phase of the project.

Wastewater Facilities--Wastewater 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, wastewater services are provided by the Clearlake Oaks County Water District, the City of Lakeport, and the Lake County Sanitation District through the Southeast Regional Wastewater System, the Southwest Regional Wastewater System, and the Northwest Regional Wastewater System (Sedway/Cooke, 1980a).

In the more sparsely populated areas of the county, wastewater is 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).

- Southeast Regional Wastewater 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 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 million gallons per day of effluent (Sedway/Cooke, 1980a; Brown, April 1983).

  The system is currently operating at about 60 percent of capacity. Average summer flows are 1.0 million gallons per day, and average winter flows are 1.2 million gallons per day. 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; Brown, April 1983).

  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 high priority with the federal government, and these funds were released in early 1983 (Brown, April 1983).

- Northwest Regional Wastewater System--This system serves the area north of Parkway Road near Lakeport and the communities of Nice, Kono Tayee, and Upper Lake. Upper Lake decided not to use the regional system, but Kono Tayee was connected to the regional system in August 1982. 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; Brown, April 1983).

  The Northwest system is comprised of a treatment plant which has a capacity of 2.75 million gallons per day and a storage reservoir and sprinkler irrigation system covering 540 acres for disposal of effluent. The system is currently operating at 60 percent of capacity. Average dry weather flows are 1.65 million gallons per day, and average wet weather flows are 2.5 million gallons per day. The winter flows include runoff from seasonal rainfall and may occasionally exceed the capacity of the storage reservoir (Brown, April 1983).

- Southwest Regional Wastewater System--This system serves the Kelseyville area and was comprised of a treatment plant, stabilization ponds, and a series of flood irrigation ditches used for disposal of effluent. In 1982, the district completed construction of another stabilization pond, a chlorine contact structure, and a pipeline to carry treated effluent to a new disposal area. Treatment plant capacity is 0.284 million gallons per day, and the plant is operating at about 60 percent of capacity. Average dry weather flows are 0.18 million gallons per day, and average wet weather flows are 0.234 million gallons per day. There currently are no plans for further service expansion (Sedway/Cooke, 1980a; Brown, April 1983).

- Clear Lake Oaks Water County District--This system provides water and sewer services to about 1,300 residents in the Clear Lake Oaks area about 6 or 7 miles northwest of the City of Clearlake. The system is comprised of a treatment plant and evaporation and percolation ponds for disposal of treated effluent. The system has a capacity of 500,000 gallons per day (Davidson, April 1983), with average dry weather flows of 380,000 gallons per day (Bean, May 1983). During wet weather the district's collection system is subject to significant infiltration and inflow.

  The district experienced severe problems during the winder of 1982-83, when the waters in Clear Lake exceeded flood stage and inundated district facilities to the extent that the district was unable to provide services for several weeks. On April 22, 1983, the Central Valley Regional Water Quality Control Board issued a cease and desist order to the district, limited new connections to 24 per year, and required the district to initiate an engineering study to identify the source of the problems and alternative solutions. The regional board required that the district completely resolve the problems by December 1986. In addition, the Lake County Board of Supervisors has initiated contact with the U.S. Army Corps of Engineers to assist in resolving flood problems in Clear Lake by increasing the capacity of the outflow channel (Brown, April 1983; Davidson, April 1983; Bean, May 1983).

- 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 Wastewater System to treat 400,000 gallons of wastewater per day. This amount will increase to 500,000 gallons per day by 1984 (Sedway/Cooke, 1980a).

  The city's wastewater 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 with average dry weather flows of 500,000 gallons per day and average wet weather flows of 569,000 gallons per day (Sedway/Cooke, 1980a).

  The treatment plant was designed to handle expected flows through the year 1986, at which time 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).

Emergency Services--Emergency medical services in Lake County are provided by either private or county hospitals, which are located in the larger, more urbanized areas. Available private ambulance services may also be supplemented by paramedic teams dispatched by local fire departments. During the annual fire season (usually May through October) the local medical emergency services may also be supplemented in the more remote areas of the county by helicopter units dispatched by the CDF. The CDF helicopters may be dispatched from either the Boggs Mountain station in Lake County or the Willits station in Mendocino County.

- City of Lakeport--The Lakeside Community Hospital in Lakeport provides general and emergency health care services. There are 33 beds in the hospital for general care and an additional 4 beds for intensive care.

- City of Clearlake--The Redbud Community Hospital provides general and emergency health care services. Located in the Highlands area of the city, Redbud has 27 beds for general care, and there currently are no intensive care facilities.

Neither hospital is equipped to provide specialized care for neurological patients or burn victims. Neurological patients are transferred to Santa Rosa or San Francisco. Patients requiring specialized treatment for burns would be taken to San Francisco General Hospital or to burn treatment facilities in San Jose or Chico.

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 CDF and the U.S. Forest Service for fire suppression and rescue services. The Lake County Sheriff's Department provides law enforcement services.

- Law Enforcement--Law enforcement services in unincorporated portions of the county are provided by the Lake County 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 administrative 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 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	3,952
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 Lake 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 a new deputy was to be assigned to the Middletown/Cobb area (Cox, August 1981). In 1982 the Board of Supervisors authorized expenditure of another $93,173 from the county's AB 1905 funds for additional deputies and equipment for the Middletown area (Cox, January 1983).

  The Lake 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 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 to 19-year-old youths who are participating in an Explorers-Cadets program (Sedway/Cooke, 1980a).

- 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 Lake 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 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, U.S. Highway 101 in the interior and State Highway 1 along the coast, traverse the county from north to south. 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 66,738 in 1980 (U.S. Census, 1982b). 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

City	1970 Population	1980 Population	Percent Change
Fort Bragg	4,455	5,019	+12.6
Point Arena	424	425	+ 0.2
Ukiah	10,095	12,035	+19.2
Willits	3,091	4,008	+29.6
County Total	51,101	66,738	+30.6

Source: U.S. Census, 1982b.

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; in 1980 the distribution was 31.6 percent urban and 68.4 percent rural (U.S. Census, 1982a). Ukiah is the county's largest city and is located nearest the Geysers KGRA. It is situated in the U.S. Highway 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. Several unincorporated areas in the county are located within 60 miles of the Geysers development area. These include the communities of Yorkville (population: 202), Booneville (976), Redwood Valley (2,762), Calpella (841), Talmage (1,045), and Hopland (796).

The county anticipates continued population growth because of the attractiveness of the rural nature of the county, increased retail and commercial development in the Ukiah area, reduction in commute time to Santa Rosa due to improvements on Highway 101, and the comparatively lower land and housing costs in contrast to Sonoma or the Bay Area counties (Mendocino Chamber of Commerce, 1979). According to 1980 statewide projections, Mendocino County was 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 side of the southern portion of the Geysers steam field 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 traveling time is about 1 hour and 40 minutes. The northwestern portion of the Geysers steam field is accessible only by Pine Mountain Road, which intersects with the Geysers-Cloverdale Road and passes through Sonoma County.

Economic Base and Employment

The economy of Mendocino County is based primarily on 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 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.

Total employment in Mendocino County decreased slightly in 1982 and is projected to increase only slightly in 1983. This is primarily due to the depressed lumber industry and the lack of any new major industrial development within the county (EDD, 1982c). As shown in Table 12, unemployment had decreased to 12.5 percent during 1979. By the last quarter of 1981, however, it had risen to 17.8 percent, which was nearly double the state average at that time. 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 between 1979 and 1980. Services, finance, insurance, real estate, and government posted employment gains but at a slower rate of growth than in previous years. The outlook for 1981 and 1982 was for slow growth, followed by continued improvement in 1983, with employment reaching 23,300 as the economy recovers (EDD, 1982d).

TABLE 12

CIVILIAN LABOR FORCE, EMPLOYMENT, AND UNEMPLOYMENT

Mendocino 1974 - 1980

Year	Labor Force[1] Annual Avg.	Employment[2] Annual Avg.	Unemployment[3] Annual Avg.	Unemployment Rate[4] (Percent) High Month	Low Month	Annual Avg.
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
1981	31,050	27,375	3,675	Dec: 17.8	Aug: 7.8	10.6
1982	30,900	26,925	3,975	Dec: 17.8	Aug: 7.8	11.9

Source: EDD, 1982c.

Note: Civilian labor force, employment and unemployment are by place of residence.

1. Civilian labor force is the sum total of potential workers, employed and unemployed.
2. Includes persons involved in labor management trade disputes.
3. Includes all persons without jobs and actively seeking work.
4. 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 shown in Table 13, the manufacturing division maintained its position as the largest wage and salary employer in Mendocino County in 1982, employing over 21 percent of the workers. Despite receding payrolls in lumber and wood products, this sector employed nearly 60 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 lumber industry payrolls below their 1978 and 1979 levels. As interest rates began to fall in late 1982 and the demand for construction increased, the industry showed a slight recovery (EDD, 1982c).

Mendocino County's manufacturing activities became more diversified during the 1970s. By 1982, 40 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 EDD's 1982-83 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, 1982d).

The second largest wage and salary employer in the county is government. In 1982 over 18 percent (annual average) of the county's workers were employed by some division of federal, state, or local government. This category showed nearly a 10 percent decline in workers from 1979 figures due to declining government expenditures. Federal employment registered unusually high figures during the summer and fall of 1980 due to temporary hiring for the 1980 Census. Following this brief rise in 1980, the total number employed in the public sector declined in 1981 and 1982 and is projected to hold at 1982 levels in 1983. The amount of money available from the state to aid local government is expected to be minimal in 1983, with a potential for reductions in local government personnel. At the same time, inflation-fighting and cost-reducing policies planned by the Reagan 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, 1982c).

Mendocino County's third largest industry, retail trade, employed 4,475 people in 1982, an increase of 100 jobs above the 1981 level. Nineteen percent of the total wage and salary employment for the county is in this industry division. This normally fast-growing industry sector slowed in 1980, with increases restricted primarily to eating and drinking establishments and food stores (EDD, 1982c).

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 added 250 new jobs (EDD, 1982c).

Agriculture, Mendocino's fifth largest industry, which employed 1,425 people in 1980, climbed to 1,600 in 1982, as pear, apple, and grape acreage continued a slow, steady growth. Commercial fishing employment makes up less than 8 percent of the employment in this group, and since most local fishers are

TABLE 13

WAGE AND SALARY EMPLOYMENT BY INDUSTRY

Mendocino County 1980 - 1982

	Annual Averages			
	Actual		Projected	
	1980	1981	1982	1983
Wage and salary workers[1]	23,025	22,925	22,925	23,275
Agriculture, agri. services, forestry, and fisheries	1,425	1,475	1,600	1,600
Nonagricultural industries	21,600	21,800	21,325	21,675
Construction and mining	725	725	625	650
Manufacturing	5,050	5,025	4,925	5,000
Lumber & wood products	3,225	3,225	2,925	2,975
other manufacturing	1,825	1,800	2,000	2,025
Transportation and public utilities	1,075	1,100	1,050	1,100
Wholesale trade	625	650	625	650
Retail trade	4,325	4,375	4,475	4,525
Finance, insurance, and real estate	800	825	825	850
Services	4,300	4,425	4,550	4,650
Government	4,700	4,675	4,250	4,250

Source: EDD, 1982c.

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

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

self-employed, changes in the length of the season or in the volume of the catch should not significantly affect the number on commercial fishing payrolls (EDD, 1982c).

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. The vacancy rate for rental units at the time of the 1980 Census was 6.1 percent (U.S. Census, 1982a). 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 (U.S. Census, 1982a&b). According to a 1977 survey of housing conducted 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 1981 (Payne, May 1981) and somewhat more than 1 percent in October 1981 (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).

Early in the 1980s, five or six motels were 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 multiple 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 Mendocino 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 areas rely on septic systems for wastewater disposal. Emergency medical services are available near the Geysers at one of the two hospitals in the City of Ukiah. Law enforcement services are provided through the Mendocino 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 CDF. 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. The total countywide 1981 enrollment in Mendocino elementary and secondary schools reached approximately 15,000 students. Total enrollment increased by 4 percent between 1972 - 1976 and by 10 percent between 1976 and 1981 (Delsol, June 1981).

School districts located nearest the KGRA include Ukiah Unified, 5,600 students; Potter Valley Community Unified, 500; Anderson Valley Unified, 450; and Willits Unified, 1,800. Even though 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 and 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 and 3.0 million gallons. The city, although it has adequate water supplies, believes there is a need to expand the existing storage capacity to meet future population growth needs (Goforth, June 1981).

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

The City of Ukiah has a wastewater treatment capacity of 2.5 million gallons per day, and present use during the dry season is 1.8 million gallons per day. 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 wastewater facilities at a cost of approximately $6 million (Noyd, July 1981).

Emergency Services--Emergency medical services in Mendocino County are provided either by private hospitals or by county hospitals, which are located in the urbanized areas. Available private ambulance services may also be supplemented by paramedic teams dispatched by local fire departments. During the annual fire season (usually May through October) the local medical emergency services may also be supplemented in the more remote areas of the county by helicopter units dispatched by the CDF. The CDF helicopters may be dispatched either from the Boggs Mountain station in Lake County or the Willits station in Mendocino County.

In Mendocino County the hospitals located nearest the Geysers steam field are in the City of Ukiah. There are two hospitals in the City--Ukiah General Hospital and Ukiah Adventist Hospital--which have a total of 87 beds available. Both hospitals have intensive care units but are not equipped to provide specialized care for neurological patients or burn victims. Neurological patients generally would be transferred to Santa Rosa or San Francisco, and burn patients would be taken to San Francisco, San Jose, or Chico.

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

- Law Enforcement--Mendocino County maintains its own sheriff's department, and incorporated cities have additional police protection. The closest Mendocino County 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 and is not planning to expand present services (Pascoe, June 1981).

  Within the City of Ukiah, the Ukiah 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. In 1981, the cost of expanding existing police services was approximately $45,000, which included both salary and benefits for one additional police officer (Williams, June 1981).

- Fire Suppression Services--Within Mendocino County there are 12 fire districts, 10 fire departments, and 1 seasonal CDF facility (State Fire Marshall's Office, 1983). The majority of the fire districts have volunteer fire staff, although several of the districts may also have paid fire chiefs and assistants. The largest fire service force available near the Geysers development area is attached to the Ukiah Fire Protection District and the City of Ukiah Fire Department. The Ukiah Fire Department serves about 4 square miles within the incorporated limits of the City of Ukiah and the Ukiah Fire Protection District serves about 40 square miles of uncorporated land outside the city limits. The Ukiah Fire Department and Fire Protection District share a paid staff of 19 plus a volunteer staff of 30, and the City Fire Department provides fire protection services to the unincorporated areas within the fire district under a contract between the district and the department. There also is a small volunteer fire district in the unincorporated community of Hopland, near the Geysers Development area (Hassler, May 1983).

  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 U.S. 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 CDF has assumed responsiblity 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 DOF 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, 1982a). 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 over 58 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 by 14,776. 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

City	1970 Population	1980 Population	Percent Change[1]
Calistoga	1,882	3,879	+ 106.1
Napa	36,103	50,879	+ 40.9
St. Helena	3,173	4,898	+ 54.3
Yountville	2,332	2,893	+ 24.0
County Total	79,140	99,199	+ 25.3

Source: U.S. Census, 1982b.

1. 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 conserved 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 economy of Napa County is based primarily on agriculture, government, services, tourism, and manufacturing. The mainstays of the local economy are the wine industry and tourism. Government comprises the second largest employment sector in Napa County's economy. Services has become the largest industry division in the county and employs over one-quarter of the non-agricultural workers. Retail trade is the third largest employer in the county, and manufacturing is the fourth largest (EDD, 1982d). Geothermal development represents an insignificant portion of Napa County's economy at this time (Nelson, June 1981).

Employment information for Napa County was incorporated in the data for the Vallejo-Fairfield-Napa SMSA (Standard Metropolitan Statistical Area) up through 1980. As indicated in Table 15, the average annual unemployment rate in the SMSA has ranged between 7.1 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 employment in the SMSA, 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 SMSA labor force for other reasons (EDD, 1981g).

In 1980 the employment data for Napa County were separated from the Vallejo-Fairfield-Napa SMSA. Table 16 presents employment/unemployment information and projections for the county for the years 1980 to 1983. As indicated in the table, the average annual unemployment rate in the county has ranged between 6.7 and 8.4 percent. These rates were consistently lower than the statewide average for these years.

TABLE 15

CIVILIAN LABOR FORCE, EMPLOYMENT AND UNEMPLOYMENT

Vallejo-Fairfield-Napa SMSA 1974 - 1980

Year	Labor Force[1] Annual Avg.	Employment[2] Annual Avg.	Unemployment[3] Annual Avg.	Unemployment Rate[4] (Percent) High Month	Low Month	Annual Avg.
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
1981	133,700	122,800	10,900	Dec: 10.2	June: 7.1	8.2
1982	138,800	125,200	13,600	Dec: 10.2	June: 7.1	9.8

Source: EDD, 1981b, 1982d; Joe Preston, EDD.

Note: Civilian labor force, employment and unemployment are by place of residence.

1. Civilian labor force is the sum total of potential workers, employed and unemployed.
2. Includes persons involved in labor management trade disputes.
3. Includes all persons without jobs and actively seeking work.
4. 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 16

CIVILIAN LABOR FORCE, EMPLOYMENT, AND UNEMPLOYMENT

Napa County 1980 - 1983

	Annual Averages			
	Actual		Projected	
	1980	1981	1982	1983
Civilian labor force[1]	37,800	39,200	40,500	42,000
Employment	35,400	36,400	37,100	38,800
Unemployment	2,500	2,800	3,400	3,200
Unemployment rate[2]	6.7%	7.0%	8.4%	7.6%

Source: EDD, 1982d.

Note: Labor force by place of residence. Employment includes persons involved in labor-management trade disputes.

1. Civilian labor force is employment plus unemployment.

2. Unemployment rate is unemployment as a percent of civilian labor force.

As indicated in Table 17, government is the second largest employer in Napa County. In 1981 over 23 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 budget cutbacks. 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 1982-83 period (EDD, 1982d).

The services division has become the largest major industry group in the county, employing nearly 25 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 1981. During the next 2 years, EDD expects the growth rate for service industries to slow from the 1980 pace, but they expected an additional 500 jobs in services by 1983 (EDD, 1982d). Retail trade is the third largest employer in Napa County, employing 17 percent (annual average) of the county's work force in 1981. During the 1982-83 forecast period, EDD expects an additional 400 jobs in retail trade as population growth, decreasing interest rates, and a pickup in tourism produce an increase in retail activity (EDD, 1982d).

TABLE 17

WAGE AND SALARY EMPLOYMENT BY INDUSTRY

Napa County 1979 - 1983

	Annual Averages				
	Actual			Projected	
	1979	1980	1981	1982	1983
Total Wage & Salary Workers[1]	33,400	34,100	34,700	34,800	36,000
Agricultural employment	2,700	2,800	2,800	2,800	2,900
Nonagricultural employment	30,700	31,200	31,900	32,000	33,100
Mining & construction	1,500	1,400	1,300	1,300	1,400
Manufacturing	4,600	4,400	4,900	4,900	5,000
Durable goods	2,100	1,800	2,000	2,100	2,100
Nondurable goods	2,500	2,800	2,600	2,900	2,900
Food & kindred products	1,500	1,500	1,600	1,800	1,900
Other nondurable goods	1,000	1,000	1,000	1,100	1,100
Transportation & public utilities	1,300	1,300	1,300	1,300	1,300
Wholesale trade	700	700	800	800	900
Retail trade	5,400	5,500	5,700	5,900	6,100
Food stores	1,000	1,100	1,200	1,300	1,400
Eating & drinking places	1,800	1,800	1,900	2,000	2,100
Other retail trade	2,600	2,600	2,600	2,600	2,700
Finance, insurance, & real estate	1,100	1,000	1,100	1,100	1,200
Services	7,400	8,000	8,600	8,600	9,100
Health	2,700	2,900	3,000	3,100	3,300
Other services	4,700	5,100	5,600	5,500	5,800
Government	8,700	8,900	8,200	8,200	8,100
Federal	200	300	200	200	200
State and local	8,500	8,600	8,000	8,000	7,900

Source: EED, 1982d.

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

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

Manufacturing is the fourth largest employer in Napa County, providing jobs for over 14 percent of the county's work force in 1981. The manufacturing 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 1981 modest gains were made in the number of manufacturing jobs (EDD, 1982d).

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. Only a small increase, however, is expected in the next two years in the number of agricultural jobs (EDD, 1982d).

The adverse conditions that plagued the home building climate in 1981 did not significantly improve in 1982. 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, both the economy and local building activity should gradually improve in 1983 (EDD, 1982d).

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 (U.S. Census, 1980). According to a 1975 DOF Census, the total housing vacancy rate for Napa County ranged between 3.6 percent in Napa and 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).

The vacancy rate for rental units at the time of the 1980 Census was 2.1 percent (U.S. Census, 1982a). 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 Census 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 some older motel units to housing units in recent years has provided some additional housing (Noble, 1982). However, city staff indicated that competition for housing in the city either for 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 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 multiple 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 Napa 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. Emergency medical services are available near the Geysers at hospitals in the City of Napa and in Angwin. Law enforcement service is provided through the Napa County Sheriff's Department or through local city police. 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--Napa County is served by 5 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 district, and the county is considering closure of other small, rural one-room schoolhouses. The Calistoga Joint Unified District 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.

- 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 and $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).

- 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. In 1981 Calistoga was rationing water due to its zero reserve capacity and the effects of several dry winters (Taratino, July 1981). While it is no longer rationing water, the city continues its conservation efforts to minimize consumption.

  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).

- 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 and 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).

Wastewater 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.

- The City of Napa--Napa provides wastewater services to approximately 23,500 customers. Current system capacity will accommodate approximately 15.5 million gallons of wastewater annually. Presently, 6.8 million gallons of wastewater are treated annually, so the City of Napa expects

to meet its projected growth needs without expansion until the year 2000. In 1981 the estimated cost of expanding existing capacity by 50 percent ranges between $15.5 and $23 million (Lynch, July 1981).

- The City of Calistoga--Calistoga completed its wastewater 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 wastewater system expansion due to the lack of available funding. Presently, Calistoga has a building moratorium, since the city is unable to meet additional wastewater system and water supply needs (Taratino, July 1981).

- The City of Yountville--Yountville has the wastewater system capacity to treat 2 million gallons of wastewater per day. Presently, the wastewater system is treating between 60,000 gallons and 2 million gallons of water per day, depending upon seasonal variations. Yountville completed modernizing its wastewater 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).

Emergency Services--Emergency services in Napa County are provided either by private or county hospitals, which are located in the urbanized areas. Available private ambulance services may also be supplemented by paramedic teams dispatched by local fire departments. During the annual fire season (usually May through October) the local medical emergency services may also be supplemented in the more remote areas of the county by helicopter units dispatched by the CDF. The CDF helicopters may be dispatched from either the Boggs Mountain station in Lake County or the Willits station in Mendocino County.

In Napa County there are two hospitals located near the Geysers steam field--the Saint Helena Hospital in Angwin and the Queen of the Valley Hospital in the City of Napa. These 2 hospitals have a combined total of 372 beds, and both hospitals have intensive care facilities. Queen of the Valley Hospital in Napa is equipped to provide specialized care for neurological patients, but patients requiring specialized treatment for burns would be taken to San Francisco, San Jose, or Chico.

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

- Law Enforcement Services--The Napa 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 office 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. In 1981 the annual cost of increasing the existing force was estimated at approximately $40,000 per deputy, including 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 believes 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 plan to expand current services (Berg, September 1981). In 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).

- 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 CDF in protecting wildlands in their service areas from fires (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 1982-83 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. In 1981 the fire department did not have funding problems, since the primary funding source is county/city revenue sharing, and the city voluntarily contributes its 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 through 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 CDF 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 III

DESCRIPTION OF THE GEOTHERMAL WORK FORCE

In identifying the work force associated with a particular industry, several major categories can be described, based upon the degree of involvement or association with that industry. In this study, three such major categories were identified for the geothermal industry: primary industry, industry-related, and industry-induced. The primary geothermal work force would be employed in jobs associated with the development and use of the geothermal resource. The geothermal-related work force would be employed by companies which provide materials or ancillary services to the primary industry. The geothermal-induced work force would be involved in businesses which provide materials and services generally to all businesses and people, including those involved in the primary industry. The individual subcategories within each major category are discussed in further detail below.

PRIMARY GEOTHERMAL WORK FORCE

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

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

Except for steam field development and steam field maintenance, the work force involved during each stage differs in the number of workers needed and the job skills required. There is no record of the actual total number of workers involved in the geothermal industry, and there has been no specific accounting of the actual number of workers employed in each aspect and each stage of geothermal development. For this study, the approximate number of workers involved in each aspect and each stage has been estimated from information provided by industry representatives. Based on these estimates there are currently between 1,500 and 2,000 workers involved in the geothermal industry in the Geysers KGRA.

Resource Development and Steam Field Maintenance

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--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 December 1982, there were nearly 20 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 about 225 full-time workers (Pardini, January 1983). Aminoil has been active in the Geysers since the mid-1960s and currently has a staff of about 70 (Marsh, January 1983). MCR Geothermal maintains a district office staff of six (Stoleson, January 1983). Thermogenics has been active in the Geysers since the early 1970s and in October 1982 merged with Geothermal Resources International (GRI) to become GRI Operator Corporation. The new company currently employes about 25 people (Evans, January 1983). Geothermal Kinetics Incorporated has maintained a local staff of three as they continue final drilling for the DWR South Geysers project (Bannister, January 1983). 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 which representatives of the various geothermal developers have provided, 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--Each geothermal power plant requires approximately 1,000,000 pounds per hour of steam to produce 55 MW of power. Depending upon the quality of the steam available within 1 mile of the proposed plant site, approximately 10 to 15 wells would initially be needed to provide steam for a 55 MW power plant. This total includes standby and reinjection wells. Over the lifetime of the power plant an additional 10 to 15 wells would have to be drilled to maintain the necessary supply of steam (Stelling, July 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.

Workers needed during the steam field development stage include drillers, derrickmen, roughnecks, roustabouts, floorhands, tool pushers, motormen, welders, foremen, and rig superintendents (Cornelison, 1980). While a small percentage of the steam drilling work force in the Geysers may choose to belong to a craft union, most are not members of a particular union local and are unlikely to register on a union's out-of-work list. Some of the steam drilling work force have filed unemployment claims in the Lake County office of the EDD 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 9 to 12 rigs active in the Geysers during the past 2 years (Stelling, January 1983). This number of drilling rigs would provide employment for 225 to 300 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 Environmental Impact Report (EIR) for Aminoil's East Ford Flat development and by the information contained in student surveys conducted by the Middletown Unified

School District in 1980, 1981, and 1982. Evaluation of the 1980 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--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 state Division of Oil and Gas (DOG) staff information, the estimated 9 to 12 rigs necessary to maintain steam flow for power plant generation would require a continuing work force of 225 to 300. As discussed earlier, the steam field 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.

The number of workers involved in the construction of the steam gathering system for each power plant varies with the design of the routing and interconnection plan for the pipelines. The work force may be as few as 4 or as many as 50 and the reconstruction period may be a few weeks or a few months (Lund, July 1982). The crews that construct the steam lines are different from those involved in drilling for the steam or in constructing roads, pads, and power plant facilities. The crew is generally comprised of 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

The average length of the construction stage for a 55 MW to 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, cooling towers and basins, and the switchyard and transmission system; and final site and facility finish work.

Workers 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).

Based on information which power plant developer-operators have provided, 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 (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 but has been as many as 55 on a single project (Clarey, October 1981). The number of pipefitters active during the peak period may range between 6 and 50 and has been as high as 110 (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, October, 1981; Springer, October, 1981).

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 18 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 region. When the construction contractors or subcontractors need workers with a specific skill,

TABLE 18

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

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

Source: Swinerton and Walberg, 1981

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 EDD offices 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).

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, representatives of each of the trade unions involved in power plant construction and Swinerton & Walberg Company, acting as Labor Relations Coordinater, entered into a labor agreement. This agreement, entitled "Project Labor Agreement for New Construction Work at The Geysers Power Plant," was initially signed in August 1976. The agreement was reopened and modified in March 1981, and its termination date was extended to the end of February 1984 (Phillips, September 1981 and July 1982).

As expressed in the agreement, its purpose is to:

- 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;
- Establish and maintain harmonious labor-management relations throughout the duration of the project;
- Avoid strikes, lockouts, or delays in the execution of the work;
- 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 four power plant owner-operators* whose power plants are being constructed under the terms of the Project Labor Agreement: Pacific Gas and Electric Company (PGandE), Northern California Power Agency (NCPA), Sacramento Municipal Utility District (SMUD), and Occidental Geothermal, Incorporated (Oxy). Each worker using the free bus service also receives a daily supplemental pay allowance. In 1982 this allowance was $15.50 per day worked and increases $1 each year throughout the term of the agreement.

*Current state law prohibits the state Department of Water Resources (DWR) from participating in such an 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 in 1981 the amount paid ranged from nothing up to $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 (Phillips, September 1981; Clarey, September 1981; Shaskan, September 1981; Springer, October 1981). 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 (Shaskan, September 1981).

The commuter bus service is operated by Patchett's Transportation Company in Santa Rosa. Bus schedules and passes are distributed by the Labor Relations Coordinator and the construction subcontractors. Each day a worker rides the commute bus he signs a roll sheet indicating the bus route, date, employer, and personal identification number. 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 maintain a minimum daily ridership, or that route can be cancelled (Watkins, September 1981).

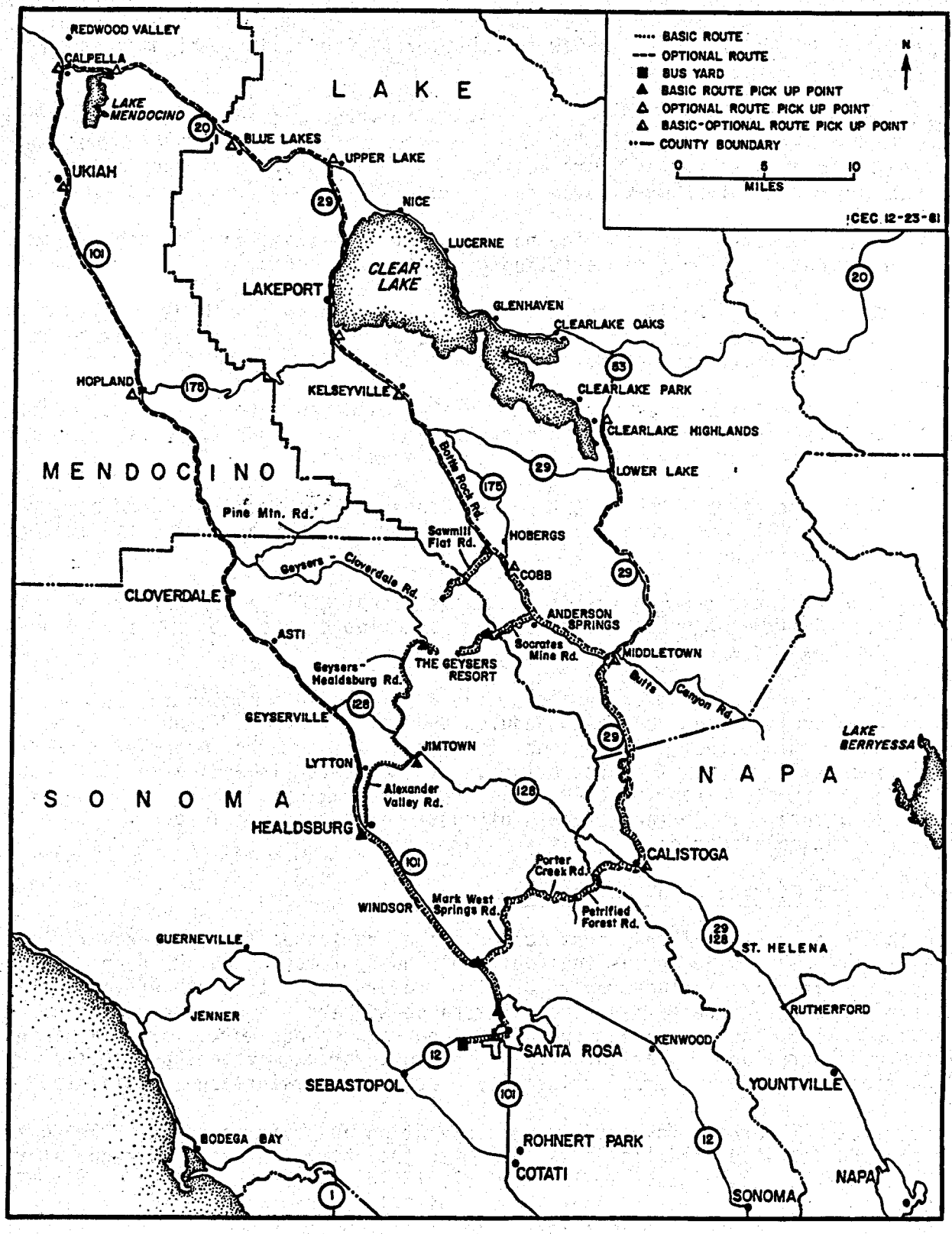
The bus service is primarily offered for an 8-, 9-, or 10-hour day shift and is generally provided only Monday through Friday. Occasionally, some buses are run six or seven days a week if the project construction schedule requires such service. The number of buses running each day has fluctuated between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

The buses originate in Santa Rosa and Lakeport, and the runs are made between specific pickup points and individual power plant construction sites. Routes which run from Santa Rosa (Sonoma County) and Lakeport (Lake County) are considered basic routes and are run daily. Additional routes are added to serve such areas as Ukiah (Mendocino County), St. Helena (Napa County), or Upper Lake or Clearlake Highlands (Lake County), as long as there are a minimum of eight riders. If ridership drops below eight passengers, the route is cancelled. Figure 6 indicates typical routes and pickup points for the commuter bus service. However, these routes are modified as circumstances dictate (Watkins, September 1981; Phillips, July 1982).

In June 1979 the Labor Relations Coordinator completed a survey of commuter bus usage between March 1977 and May 1979. This time period encompassed most of the 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 2-year period 1,025 bus passes were issued. In a tally of communities of residence named by bus riders, Santa Rosa had 188 workers; Napa, 45; Ukiah, 41; and Petaluma, 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 6 were picked up in the Middletown/Cobb area.

FIGURE 6: CONSTRUCTION WORKER COMMUTE BUS ROUTES



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 IV for additional discussion of construction worker residence choices.)

Based on analysis of the 1979 bus survey information and on conversations with the Labor Relations 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:

- Most workers involved in power plant construction in the Geysers apparently retain their existing permanent residence;
- Many workers commute to their job in the Geysers each day, either in individual vehicles, private carpools, or by individual vehicles to park and ride facilities or to contract bus service pickup points;
- 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;
- 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
- Some workers already residing in the local KGRA area have maintained relatively continuous employment on a series of projects in the Geysers development area.

The power plant developers-operators have submitted information to the CEC on estimated project construction schedules and estimated work force necessary to meet those schedules. Based upon this information, the number of workers involved in power plant construction in the Geysers is estimated to be 595 during the first quarter of 1983. (Refer to the raw data tables in Appendix D and to Chapter IV for additional discussion of the work force involved in power plant construction.)

Power Plant Operation and Maintenance

In the final months of the construction stage, personnel from the power plant developer-operator begin testing equipment and systems in the new power plant. These workers 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 17 geothermal units in operation. PGandE's current operation and maintenance work force for their Geysers power plant is about

130, with 4 to 6 more workers added 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).

In late 1982 and early 1983 several power plant developer-owners, in addition to PGandE, began 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 to 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 which geothermal power plant owner-operators provided to the CEC, 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.

GEOTHERMAL-RELATED WORK FORCE

As the geothermal industry in the Geysers steam field developed, it created a need for specialized materials and services. The work force involved in this aspect of the geothermal industry provides ancillary services and materials to the geothermal developers, the steam drillers, and the power plant construction, operation, and maintenance companies. This group of geothermal workers includes the following types of workers and geothermal-related services: 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 the geothermal-related work force. A 1980 student survey conducted by the Middletown Unified School District (see Appendix E and Table E-1) 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.

GEOTHERMAL-INDUCED WORK FORCE

The work force in this category is not directly involved in developing and using the geothermal resource or in providing geothermal-related services. 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. This group of workers would include employees of banks, grocery stores, restaurants, providers of household items, providers of automotive supplies and services, etc.

CUMULATIVE POWER PLANT WORK FORCE

In this study, the analysis of the socioeconomic effects associated with the geothermal industry focuses on the effects that the cumulative power plant work force would have on the four counties of the Geysers KGRA. The cumulative power plant work force, as defined in this study, includes those 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 CEC's regulatory review process and jurisdictional authority apply only to power plants and related facilities. The CEC has a responsibility to require mitigation of impacts attributable to those aspects of geothermal development within its jurisdiction. However, the development of the geothermal resource and the resultant growth of the geothermal industry have also contributed to the socioeconomic effects on the KGRA counties. It is hoped that those agencies with jurisdictional authority over these other aspects of the geothermal industry would also require mitigation of the socioeconomic effects associated with geothermal development.

Chapter IV

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 also 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 two resource development scenarios developed by the CEC staff.

Scenario 1: 2,487 MW

Development Scenario 1 includes all existing geothermal power plants in operation or under construction in the Geysers KGRA. It also includes the power plant projects with proven* steam resources which are undergoing regulatory review and those projects identified in current utility resource plans which do not yet have proven steam and/or which have not yet entered the regulatory process. Information on project location, size, ownership, and operating date is listed in Table 19 for all projects identified in Development Scenario 1.

*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 19

POWER PLANT DEVELOPMENT IN THE GEYSERS KGRA
1960-1991*

Project	CEC Certification	Estimated On Line Date	County of Location	Gross Capacity (MW)	Net Capacity (MW)**	Cumulative Net Output (MW)
PGandE 1	--	1960	Sonoma	12	11	11
PGandE 2	--	1963	Sonoma	14	13	24
PGandE 3	--	1967	Sonoma	28	27	51
PGandE 4	--	1968	Sonoma	28	27	78
PGandE 5	--	1971	Sonoma	55	53	131
PGandE 6	--	1971	Sonoma	55	53	184
PGandE 7	--	1972	Sonoma	55	53	237
PGandE 8	--	1972	Sonoma	55	53	290
PGandE 9	--	1973	Sonoma	55	53	343
PGandE 10	--	1973	Sonoma	55	53	396
PGandE 11	--	1975	Sonoma	110	106	502
PGandE 12	--	1979	Sonoma	110	106	608
PGandE 15	--	1979	Sonoma	62	59	667
PGandE 13	--	1980	Lake	138	133	802
PGandE 14	--	1980	Sonoma	114	109	911
NCPA 2	4/80	12/82	Sonoma	110	106	1,017
PGandE 17	9/79	12/82	Sonoma	120	110	1,127
PGandE 18	5/80	5/83	Sonoma	120	110	1,237
SMUDGEO #1	3/81	12/83	Sonoma	72	65	1,302
DWR Bottle Rock	11/80	6/84	Lake	55	52	1,354
Occidental #1	1/81	6/84	Lake	97	80	1,434
Magma Wild Well	--	1984	Sonoma	5	5	1,439
PGandE 16	9/81	6/85	Lake	120	113	1,552
NCPA 3	12/82	8/85	Sonoma	110	106	1,658
MSR #1	--	1985	Sonoma	5	5	1,663
DWR So. Geysers	11/81	2/86	Sonoma	55	52	1,715
PGandE 20	1/83	3/86	Sonoma	120	113	1,828
NCPA 1→Santa Clara***--Shelved indefinitely --			Lake	--	--	--
PGandE 19		6/88	Sonoma	55	53	1,881
PGandE 22		6/88	Sonoma	110	106	1,987
PGandE 21		12/88	Sonoma	110	106	2,093
PGandE 23		6/89	Sonoma	110	106	2,199
CCPA #1		1989	--	110	106	2,305
MID/Shell		1990	Sonoma	25	23	2,328
CCPA #2		1990	--	55	53	2,381
PGandE 24		6/91	Sonoma	110	106	2,487

* Data in table are current as of January 1, 1983. The power plant projects listed in this table include projects already in operation, under construction, in regulatory review, or identified in current utility resource plans.

** Due to in-plant service requirements, each power plant generates somewhat less electricity than its rated capacity. Where net capacity figures are not available, the net capacity was derived from other projects of similar gross capacity.

*** The Notice of Intention for the NCPA 1 project was approved by the CEC in March 1980. In February 1982, NCPA's interest in the project leasehold was transferred to the City of Santa Clara which is an NCPA member. In October 1982, the City relinquished its rights to the leasehold and they were subsequently acquired by MCR Geothermal.

The information shown in the table was provided to the CEC by the power plant developers-operators and was current through January 3, 1982. The list of projects includes two which are proposed by the Central California Power Agency (CCPA). The CCPA is comprised of the Sacramento Municipal Utility District (SMUD), the Modesto Irrigation District (MID), and the cities of Santa Clara and Redding.

Scenario 2: 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 513 MW are currently unplanned and unscheduled, staff must make a number of assumptions to complete the projection of power plant construction and operation work force and, consequently, the population changes associated with this level of resource development.

The first assumption is that approximately one-half of the power plants needed to produce the added 513 MW will be 110 MW facilities, and the other half will be 55 MW facilities. 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 520 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 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 1971-85 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 2:

TABLE 20

POWER PLANT DEVELOPMENT IN THE GEYSERS KGRA

Scenario 2: 3,000 MW

Project	On-Line Date	County of Origin	Capacity (MW)	Cumulative Capacity (MW)
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, and the 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 the 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 types of 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 which the state Division of Oil and Gas provided, the number of drilling rigs necessary to develop and maintain steam in the Geysers is 9 to 12 rigs, which would involve 225 to 300 workers (Stelling, January 1983). 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 III 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 various lengths of time. For those projects which the CEC has or is currently reviewing, the size and the scheduling sequence of the work force are based on information that utility applicants provided 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 not yet entered the CEC's regulatory review process or which have not yet been planned. For projected power plants of 110 MW (PGandE Units 21 - 24 and CCPA #1 projects), the number of workers and scheduling pattern were assumed to be the same as that used for PGandE's Unit 18. Data for the PGandE 19 (55 MW), CCPA #2 (55 MW), and the MID/Shell (25 MW) projects are based on those data provided for the SMUDGEO #1 project.

Power Plant Operation and Maintenance--Once a power plant is on line, only a relatively small work force is needed to operate and maintain the facilities. Prior to December 1982, PGandE was 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 estimated they need to add only four to six additional workers for each subsequent power plant unit in the Geysers (PGandE, 1979b).

Beginning in late 1982, new geothermal power plants operated by other utilities began to come on line. DWR estimated that they will need 23 workers to operate their Bottle Rock project (DWR, 1978). Later, when their South Geysers project comes on line in early 1986, they anticipate that they will need an additional nine workers to operate the new power plant (Hockenson, 1981). NCPA estimated they would need 8 to 10 workers to operate their first project--NCPA 2 (NCPA, 1979a). NCPA has one additional project in the Geysers, and this project is assumed to 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 projects in the Geysers (SMUD, 1980; Oxy, 1981). This figure was also applied to the work force projections for the planned Modesto Irrigation District (MID) and Central California Power Agency (CCPA) power plants, since they would become "first-time operators" in the Geysers KGRA in the late 1980s.

The unnamed, undefined geothermal projects which would be constructed under the Scenario 2 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 per plant 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 which utility applicants provided and extrapolation of available data, quarterly geothermal work force totals were projected for all stages of geothermal power plant construction and operation in the Geysers KGRA. The quarterly totals are based upon the project sequence provided in utility resource plans and were current as of January 3, 1983. The work force totals include the workers 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 - 9. (Refer to the tables in Appendix D for the raw data used to develop these graphs.)

Each graph in Figures 7 and 8 represents one of the development scenarios, and each curve in these 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 and 8, for the beginning of the third quarter of 1980, the estimated power plant construction work force total is 220; then the estimated total operation and maintenance work force of 122 is added to this for the second curve, making a cumulative total of 342. The third graph in Figure 9 compares the cumulative power plant work force for the two development scenarios presented individually in Figures 7 and 9.

The work force figures presented below include only estimates of workers primarily 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 geothermal-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 III for discussion on estimating the number of workers involved in such geothermal-related industries and services.)

Scenario 1

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 projects identified in the current utility resource plans. In addition, the 2,487 MW total for Scenario 1 includes 5 MW which will be produced by harnessing the Magma Wild Well and another 5 MW from Modesto Irrigation District's MSR project (with MID/Santa Clara/Redding as partners). The work force needed to construct power generation and transmission facilities for each of these 5 MW power plants 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.

SCENARIO I: 2487 MW

CUMULATIVE POWERPLANT WORKFORCE IN THE GEYSERS KGRA

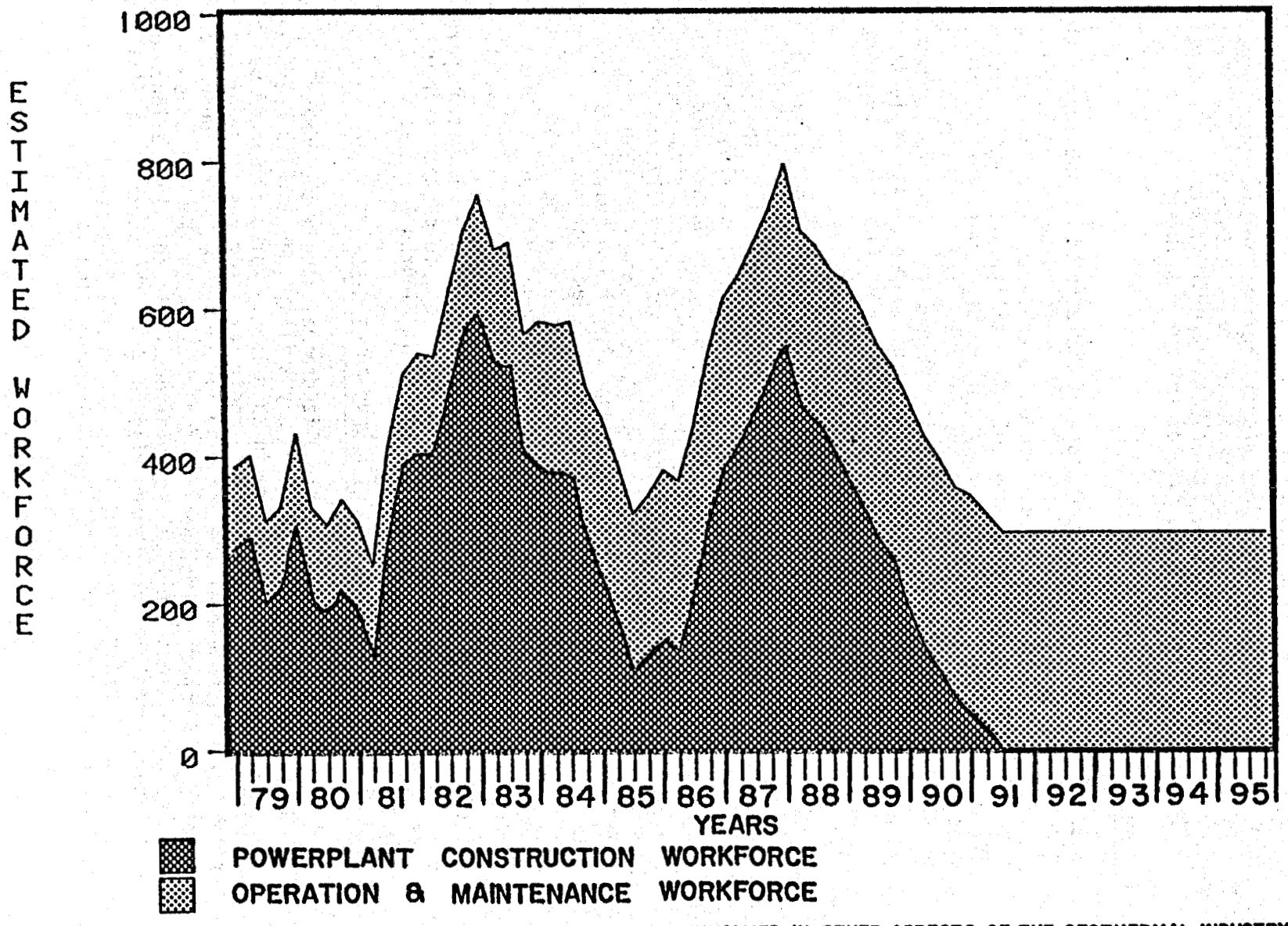


FIGURE 7

NOTE: TOTALS DO NOT INCLUDE THE ESTABLISHED WORKFORCE INVOLVED IN OTHER ASPECTS OF THE GEOTHERMAL INDUSTRY.

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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 775 workers in the first quarter of 1983. The cumulative work force total will rise again to a second, higher peak of 795 in the first quarter of 1988 although the size of the construction work force needed will be smaller than that needed in 1983. Toward the middle of 1991 the work force involved in new power plant construction will taper off to zero, and only the operation and maintenance work force of 295 will continue for the life of the power plants.

Scenario 2

Scenario 2 represents the extension of Scenario 1 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 the Geysers. Based upon extrapolations of existing work force, plant size, and construction schedule information, an estimated 7 additional power plants would be required to produce the 513 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.

The addition of the seven projects under Scenario 2 would extend development activity in the Geysers another five years beyond Scenario 1. Scenario 2 includes all of the projects identified in Scenario 1. The same set of work force data used to develop the graph in Figure 7 has also been incorporated into development of the graph for Figure 8. The Scenario 2 graph shows the same work force peaks as the Scenario 1 graph in the first quarters of 1983 and 1988. The Scenario 2 work force curve drops briefly and then rises again to a second series of peaks in the third quarter of 1990 (730), the third quarter of 1991 (750), and the second and third quarters of 1992 (735 and 725). Beginning in 1994 the work force needed for power plant construction would begin to taper off, and by 1995 there would be a steady 330 workers involved in operation and maintenance of the power plant and transmission facilities.

For comparison purposes an additional graph, Figure 9, was prepared. This graph represents the cumulative power plant work force totals from each of the development scenarios shown in the graphs in Figures 7 and 8.

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 to or relocate in that area. Workers who commute can either commute daily to the job site from their permanent residence or commute to a 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.

SCENARIO 2: 3000 MW

CUMULATIVE POWERPLANT WORKFORCE IN THE GEYSERS KGRA

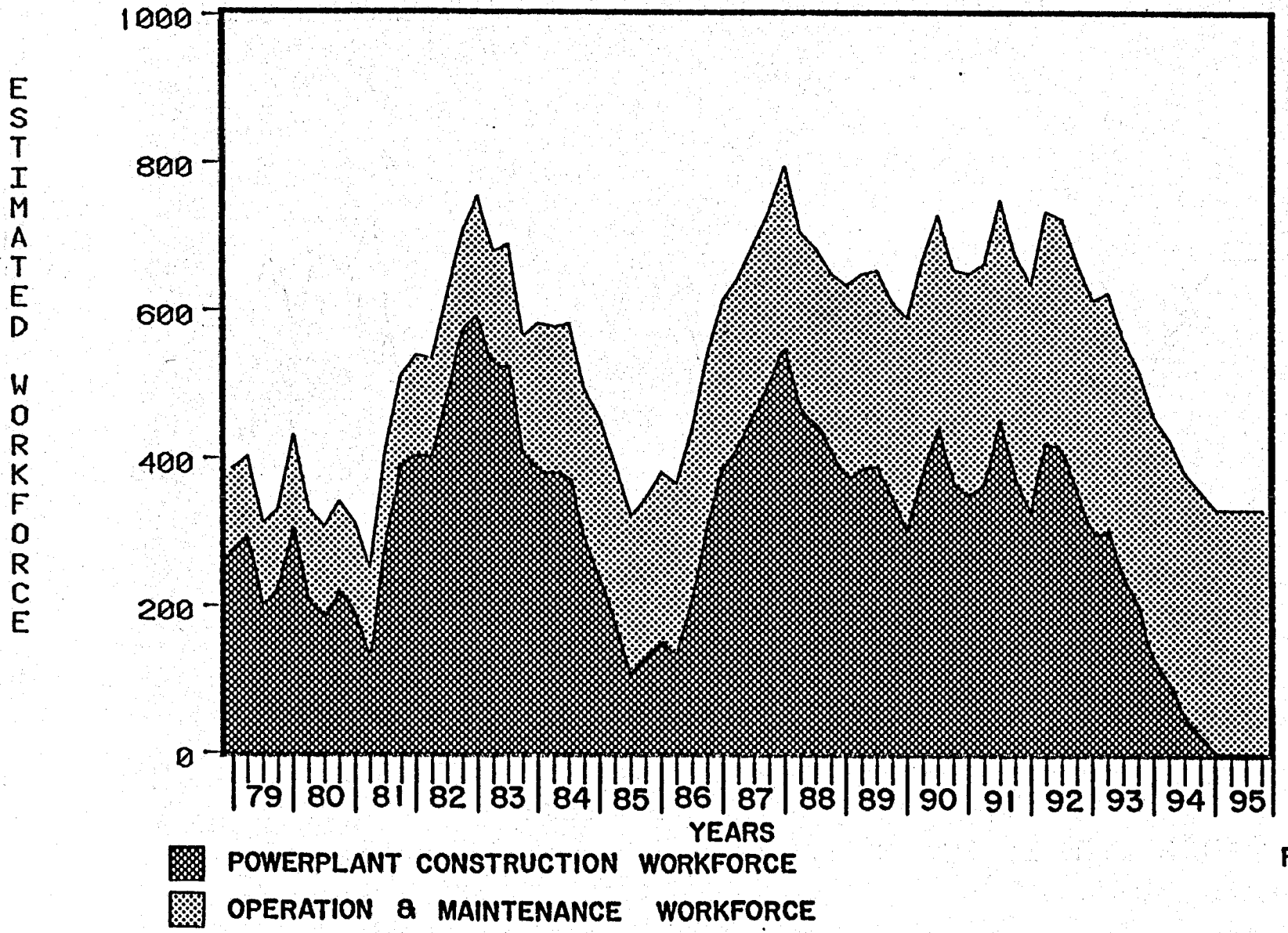

FIGURE 8

NOTE: TOTALS DO NOT INCLUDE THE ESTABLISHED WORKFORCE INVOLVED IN OTHER ASPECTS OF THE GEOTHERMAL INDUSTRY.

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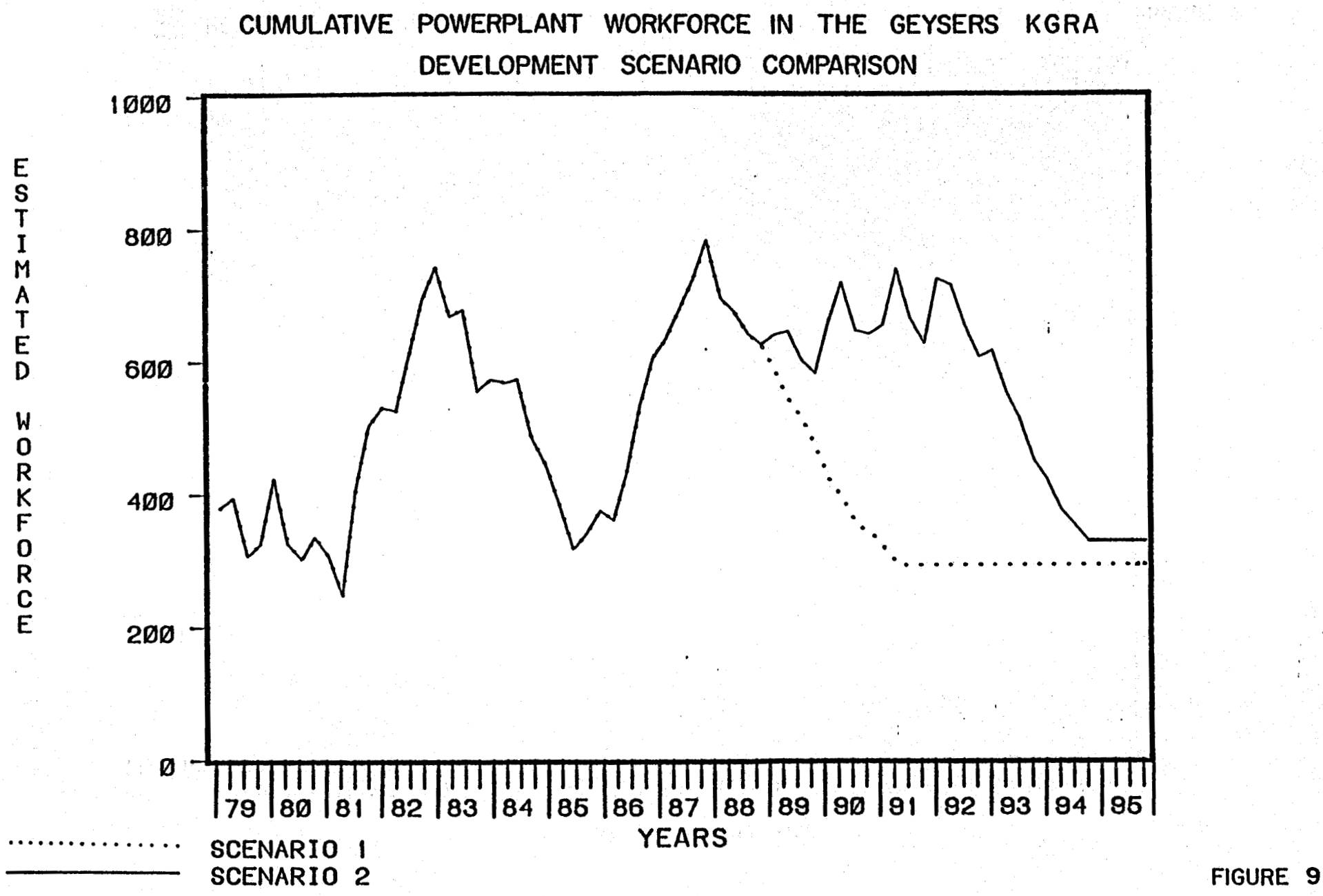


FIGURE 9

NOTE : [illegible]LS DO NOT INCLUDE THE ESTABLISHED WORKFORCE INVOLVED IN OTHER ASPECTS OF THE GEOTHERMAL INDUSTRY.

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 areas 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 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 more remote portions of the western United States: Construction Worker Profile (1975) by Mountain West Research and 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 analyzed the effects of large-scale development projects on the infrastructure of small rural communities. The study then presented 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, and while they could potentially experience similar types of impacts, the magnitude of the impact would not be as great as that described in the two studies discussed above.

Based on similarities between some of the communities described in these studies and portions of the Geysers development area, CEC staff used the assumptions and methodologies in the Construction Worker Profile in its early regulatory case analyses. These population change assumptions were used to provide a general estimate of the maximum number of workers who could be

*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.

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 its earlier evaluations for CEC regulatory cases included the following:

- 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.

- 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.

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

- A limited response survey of parents' occupations conducted by the Middletown Unified School District (Lake County) in the 1979-80 school year. Results of this survey indicated that in early 1980, about 33 percent of the students in the district had parents who were involved in geothermal development in the Geysers (Cornelison, 1980a).

- The parents' occupation and employer survey of all students in the Middletown Unified District conducted early in the 1980-81 school year. As determined by the school district, nearly 32 percent of the students had parents who were employed in geothermal development or in geothermal-related services and industry (Cornelison, 1980b). Further staff evaluation of the survey data on the employers of the "geothermal parents" indicated over 43 percent of the geothermal parents were involved in operation and maintenance of geothermal power plants. Nearly 31 percent of the geothermal parents were employed by steam drilling companies, almost 12 percent were employed by the geothermal development companies, and over 16 percent were employed in geothermal services. Only one or possibly two of the employers of geothermal parents in the 1980-81 survey were involved in construction of power plants in the Geysers (refer to Appendix E for survey results). Similar surveys were conducted for all districts in Lake County in the fall of 1981 and 1982 (refer to Appendix F for copies of survey results).

- As discussed in Chapter III, most of the power plant construction work force are members of a craft union which is a party to the Project Labor Agreement. Each of these unions has responsibility for workers in areas of vastly different size, ranging from a few counties to the entire State of California and portions of adjoining states. Generally, the hiring

hall located nearest a job site has responsibility for overseeing the matching of workers to jobs and, if necessary, drawing workers from neighboring hiring halls to meet project needs.

Several representatives of local craft unions indicated that their members who accepted jobs in the Geysers would either commute to the job site or to one of the local pickup points of the commuter bus service provided for construction workers in the Geysers. The union representatives also indicated that the major portion of their members who lived outside the four KGRA counties and worked in the Geysers would commute to a temporary residence in a community near the Geysers and remain there for the work week (Clarey, September 1981; Shaskan, September 1981; Springer, September 1981; Deorsey, October 1981).

- The dispatcher for the commuter bus service provided for Geysers power plant construction workers indicated that the buses often carried their lightest passenger loads on Fridays. Use on this day was light because 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.

- The Electrical Power Research Institute (EPRI) 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 knowledgeable 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 Population Changes in the Four Counties of the KGRA

As described in Chapter III, PGandE has identified a previous 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 workers active in the Geysers in the last quarter of 1978. Referring to the work force data shown in Figures 7 through 9, it is apparent that work has continued on several geothermal projects in the Geysers since the end of 1978. The data show the cumulative power plant work force totals briefly dropping down to 207 for the first quarter of 1981 but rising again to

705 in the fourth quarter of 1982. Therefore, it seems reasonable to assume that many 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.

Based on the data graphed in Figures 7 through 9, the 1978 cumulative work force peak of 402 would be exceeded by 300 and 395 in the peak periods of Scenarios 1 and 2, which occur in the first quarter of 1983 and again in the first quarter of 1988. During these projected peak periods the number of workers involved in power plant construction will exceed the 1978 peak of 300 by 295 and 255, respectively. However, the number of construction workers needed to meet the peak demand in 1983 will exceed the number estimated to have been working on projects in the Geysers in late 1982 by only 25. The number of construction workers needed for the 1988 peak construction period, based on current scheduling projections, does not exceed the late 1982 peak.

Residence Distribution of Work Force

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

- PGandE Geysers 18: 75 percent Sonoma County/25 percent Lake County (PGandE, 1979a),
- PGandE Geysers 16: 67 percent Sonoma County/33 percent Lake County (CEC/PUC, 1981a), and
- Occidental Geothermal No. 1: 50 percent Sonoma County/50 percent Lake County (Oxy, 1981a).

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:

- Less than 3 percent (23) of the workers surveyed showed out-of-state residence; of these 23 workers, 17 boarded the commute bus at Sonoma County pickup points, and 6 boarded the bus at Lake County points;
- Approximately 72 percent (640) of the workers surveyed named one of the four Geysers KGRA counties as their residence location;
- 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 8.4 percent in Napa County;
- Nearly 19 percent (164) of the surveyed workers named one of the seven counties surrounding the San Franciso Bay as their residence location;
- 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
- 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 and 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 his permanent residence, (2) the area in which the construction worker has a temporary residence (for the work week or by the month), or (3) the point to which the worker commutes each day from his/her permanent residence. Staff assumes that the greater the distance between the worker's listed residence and the pickup point, the

TABLE 21

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

March 1977 - May 1979

Number Surveyed = 888

Cities (County)	Number
Santa Rosa (Sonoma)	188
Napa (Napa)	45
Ukiah (Mendocino)	41
Petaluma (Sonoma)	32
Sebastopol (Sonoma)	29
Clearlake Highlands (Lake)	29
San Francisco (S.F.)	25
Healdsburg (Sonoma)	22
Lower Lake (Lake)	22
Windsor (Sonoma)	21
Cobb (Lake)	18
Rohnert Park (Sonoma)	18
Lakeport (Lake)	16
Kelseyville (Lake)	16
Cloverdale (Sonoma)	15
Oakland (Alameda)	13
Middletown (Lake)	11
Vallejo (Solano)	11
Concord (Contra Costa)	10

Counties	Number	Percent of Total
Geysers KGRA		
Sonoma	365	41.1
Lake	148	16.7
Mendocino	73	8.2
Napa	54	6.1
TOTAL	640	72.1
Bay Area		
Contra Costa	41	4.6
Alameda	39	4.4
San Francisco	25	2.8
Solano	20	2.3
San Mateo	21	2.4
Marin	12	1.4
Santa Clara	6	0.7
TOTAL	164	18.5
Central Valley		
Stanislaus	7	0.8
San Joaquin	6	0.7
Tehama	6	0.7
Sacramento	6	0.7
TOTAL	25	2.8
Other California	36	4.1
Out of State	23	2.6
TOTALS	888	100.1

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.

Conclusions

Except for the information on residence distribution which can be obtained from the four-year old construction worker bus pass survey, there is insufficient information on the residence choices of the existing geothermal work force. Based upon the current project scheduling information provided by the power plant developers and operators, the peak period for construction work force will have passed by the second quarter of 1983. While the cumulative power plant work force needs are projected to reach their highest peak in early 1988, the number of construction workers needed during this peak would not exceed those needed in late 1982 and early 1983.

As long as there is no change in project construction schedules, it is the power plant operation and maintenance work force which is likely to become new, long-term residents somewhere in the KGRA counties. The number of workers involved in operation and maintenance of the power plant and transmission facilities was estimated to be 112 in 1979 and is projected to be 295 by 1991 under Scenario 1 and 330 by 1994 under Scenario 2.

Based upon the bus survey information, discussions with craft union representatives, and discussion with local agency representatives, the following residence distribution for any additional in-migrating power plant work force is proposed:

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

It is important to note here that these percentages 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 residence distribution ratios suggested above and those presented in previous utility applications and CEC regulatory project documents points up the difficulty involved in predicting how people choose where they will live. The same factors which affect a newcomer to any area would also influence the commuting work force's choice of temporary residence or the long-term operation and maintenance personnel's choice of permanent residence. Such factors include:

- Commute Distance--This is usually measured in miles but also is influenced by commuting time and by the amount of difficulty (e.g., traffic, road conditions, weather conditions, route circuity) 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 persons 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.

- Cost of Housing--In February 1983 the median sale price of homes in California was $112,072. In the San Francisco Bay Area the median sale price was $123,719, and in the Northern Wine Country region, which includes Sonoma and Mendocino counties, the median sale price was just over $87,300 (CABR, 1983). The interest rate for prospective home buyers currently ranges between 12 and 14 percent. While there has been some reduction in the interest rate, the high cost of new housing and the 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.

- Available Housing--This factor includes kind of housing desired (e.g., single family, multi-family, mobile homes), whether the worker wants to rent or buy, and whether there is anything vacant in the area desired. As indicated in Chapter II, many locales in the four-county Geysers area are experiencing a significant shortage of available housing. This problem is due to a slowdown in new construction and the inflation of interest rates for construction or for purchase.

- 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 other three counties offer a range of residential alternatives, including farms, ranches, cabins, or homes in small towns, villages, or small, slow-paced cities.

- 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 to 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.

- Location of Worker's 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 V

EFFECTS OF GEOTHERMAL DEVELOPMENT ON LOCAL GOVERNMENTS

A number of governmental entities 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 governments, which often have similar and overlapping responsibilities. These various agencies and their jurisdictional responsibilities are briefly described in Appendix G.

The local governmental entities must deal with both the positive and the negative effects of geothermal development because of their close proximity to the geothermal development activity. 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, diversification of the economic base, and new employment opportunities. At the same time, geothermal development has also resulted in additional local expenditures for road construction and maintenance, school construction, water supply, and other public services.

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 fiscal year 1980-81, taxes account for for 25 percent of general county revenues; property taxes account for 21 percent of all taxes (see Figure 10). Statewide, approximately 60 percent of county revenues are obtained from federal and state governments. Charges for current services equal about 9 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 2 percent of the general county 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 42 percent and 24 percent, respectively, of all county expenditures in fiscal year 1980-81 (Figure 11). Health and sanitation expenditures represent 13 percent of county budgets, while the expenditures on public ways and facilities account for 5 percent of those budgets. The remaining 16 percent is spent on miscellaneous items.

Figure 10

GENERAL COUNTY REVENUE--EXCLUSIVE OF COUNTY-OWNED ENTERPRISES AND BOND FUNDS AS A PERCENT OF TOTAL REVENUES
Fiscal Year 1980-81

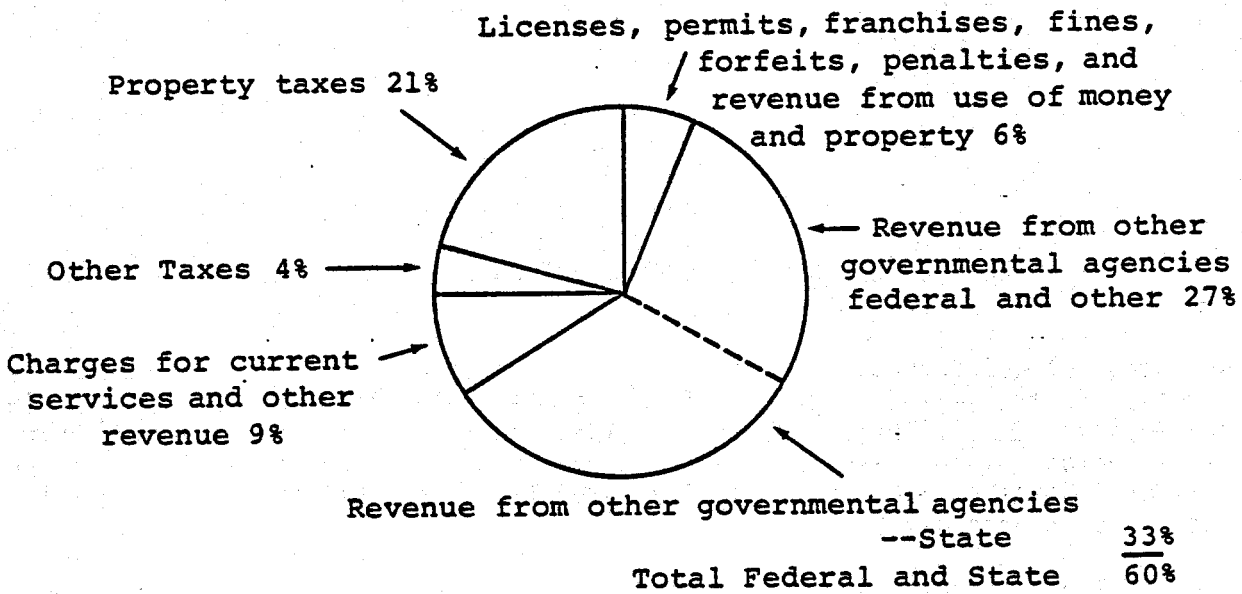
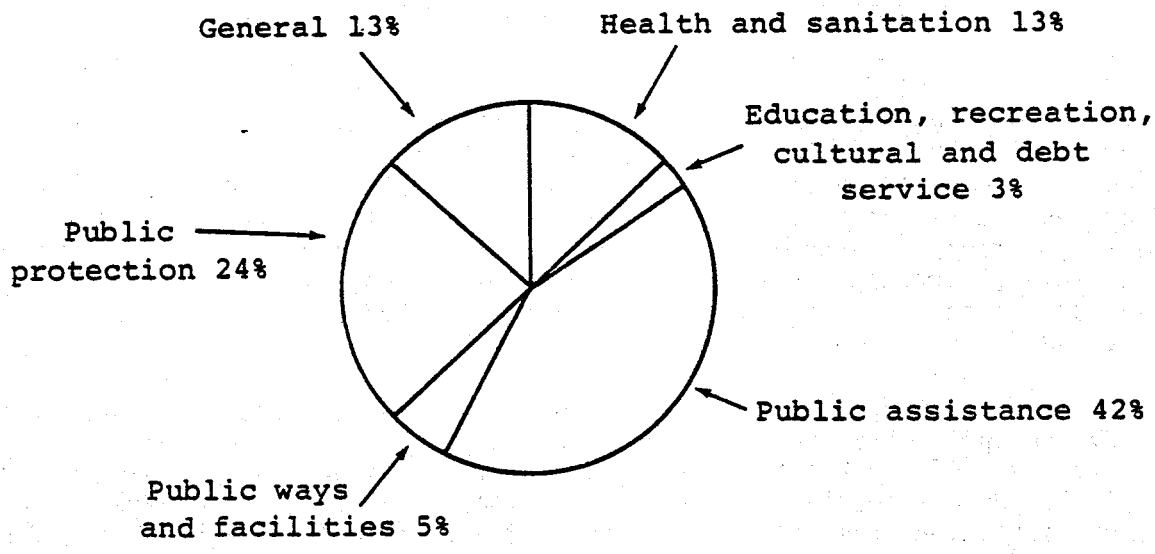


Figure 11

GENERAL COUNTY EXPENDITURES--EXCLUSIVE OF COUNTY-OWNED ENTERPRISES AND BOND FUNDS AS A PERCENT OF TOTAL EXPENDITURES
Fiscal Year 1980-81



SOURCE: State Controller's Office Annual Report 1980-81 Financial Transactions Concerning Counties of California.

The revenues received during the 1980-81 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 fiscal year 1980-81 general expenditures broken down by function and activity. Data for fiscal year 1981-82 became available in mid-March 1983 but were not incorporated in this study.

Rough estimates of the potential income that might be generated in Lake and Sonoma counties indicates that local revenues from taxes on the power plants and steam fields could be substantial. Staff calculations indicate that, with maximum development of the Geysers resource described under Scenario 2, Lake County could be retaining for local use approximately $2 million dollars in geothermal property tax revenues in 1985. This amount might increase to around $4.3 million by 1992. In Sonoma County property tax revenues retained solely for county government use from geothermal power plants and steam fields could total about $5.5 million tax dollars in 1985 and could increase to approximately $8 million by 1992 (Comalli, June 1981).

In addition to the revenues generated for the counties from property taxes on power plants and steam fields, there also is 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, and income taxes, 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 only temporarily reside in the four counties of the KGRA also contribute to the local economy during their residence.

Revenues from Taxation of Geothermal Development

Property Taxes--Geothermal development in the Geysers 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 determining property value will vary. State and federal lands, in addition to property owned by city and county governments and special districts, are exempt from taxation.

Following the passage of Proposition 13 in June 1978, all properties in the state are taxed at 1 percent of their market value. The property tax rate was fixed at a maximum of 1 percent and any additional special tax must be approved by a two-thirds majority of those voting (Lubbock, 1982a).

The market value of all private property in the state, except that owned by public utilities, is determined locally by the county tax assessors. For locally assessed properties, the market value of properties developed after Proposition 13 was passed is determined by:

- Comparison of sales values of similar properties,
- Comparison of the value of capitalized earnings from similar properties, or
- The estimated cost of replacing the property (Lubbock, 1982a).

TABLE 22

GENERAL REVENUES FOR THE KGRA COUNTIES

Amounts in Millions of Dollars — Fiscal Year 1980-81[1]

County	Property Taxes	Misc. Taxes	Licenses, Permits, etc.	Fines, Penalties, etc.	From Use of Money and Property	From Other Goverment Agencies	Charges for Current Services	OTHER REVENUES	TOTAL REVENUES
Lake	4.31	1.64	.57	.23	1.16	11.30	1.22	.47	20.89
Mendocino	6.99	3.12	.62	.30	1.40	18.79	1.33	.62	34.31
Napa	6.76	3.07	.61	.36	1.62	17.38	2.03	.44	32.55
Sonoma	23.74	6.83	2.07	1.20	5.82	60.00	7.76	1.04	108.40

Source: California Controller's Office, 1982a.

1. Figures for Fiscal Year 1981-82 became available in mid March 1983.

TABLE 23

EXPENDITURES BY THE KGRA COUNTIES
BY SELECTED CATEGORIES

Amounts in Millions of Dollars — Fiscal Year 1980-81[1]

County	Public Protection	Public Ways and Facilities	Health and Sanitation	Education and Related	Public Assistance	General[2]	MISC.	TOTAL EXPENDITURES
Lake	5.50	2.15	1.34	.24	6.49	3.95	.30	20.04
Mendocino	6.67	5.63	3.15	.51	13.07	8.26	.14	37.42
Napa	8.77	3.58	3.66	.93	9.06	6.49	.33	31.98
Sonoma	22.76	11.34	15.99	2.21	38.07	15.50	1.42	107.29

Source: California Controllers Office, 1982a.

1. Figures for Fiscal Year 1981-82 became available in mid-March 1983.
2. Includes financial, personnel, administrative, plant acquisition, and other costs.

For locally assessed properties which existed prior to Proposition 13 and which have not changed ownership since then, the market value is based on its 1975-76 assessed value, carried forward to the current day level at a compound rate which cannot exceed 2 percent per year. Should any locally assessed property change ownership, the market value is the sales price. If there is no sales price, then the assessor may use any of the methods described above to derive a market value (Lubbock, 1982a).

The state assesses the value of properties and facilities owned by public utilities. For state assessed properties the market value is determined by using the unit valuation method. As applied to a public utility, the unit value is based on an appraisal of the utility's properties and facilities as an integrated whole, without any reference to the value of the individual component parts. Once the market value of the unit as a whole has been determined by the state Board of Equalization, then the total market value is allocated back to each county in which the utility has properties, in direct proportion to the amount of the utility's property in that county (Lubbock, 1982a).

Once the market value for state assessed properties has been determined, the state assessment roll is transmitted back to each county where it is incorporated into the local roll. From the combined roll of locally assessed and state assessed properties, each of the various counties in the state then determines the local property tax rate, which may not exceed the 1 percent maximum, plus allowable debt, to finance its respective budget (Lubbock, 1982a).

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. The market value of any improvements located at a steam well on state assessed properties is included in the unit valuation of properties owned by that public utility. The market value of geothermal steam wells assessed by local tax assessors is based upon the present worth of the future benefits from that well (Lubbock, 1982a).

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, U.S. Bureau of Land Management, 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 Bosco-Keene Act of 1980)

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 was required to disburse 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.

Funds paid from the GRDA 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.

The former Geothermal Research, Information, and Planning Services Commission (GRIPS) estimated the amount of money Sonoma, Lake, and Mendocino counties would 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 CEC would be able to disburse in that same time period (Table 24).

Actual revenues to the Geysers KGRA counties have varied from the GRIPS estimates. In December 1980 the state made the first payment to the counties of origin in the Geysers 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. These counties received the following amounts for fiscal year 1981-82: Sonoma County, $589,675; Lake County, $414,798; and Mendocino County, $2,021. While Napa County is in the Geysers KGRA, it did not have any land on which bids were taken for geothermal development between January 1, 1976, and early 1981 and did not receive any county of origin funds. In 1982 the sales of additional geothermal leases provided Napa County with its first AB 1905

TABLE 24

ESTIMATE OF AB 1905 FUNDS
AVAILABLE Fiscal Year 1980 - 1986

Revenues to Counties of Origin

Fiscal Year	Sonoma County	Lake County	Mendocino County	Energy Commission
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.

revenues and increased the revenues to Mendocino County. In December 1982 the four Geysers counties received the following amounts toward their payments for fiscal year 1982-83: Sonoma County, $473,343; Lake County, $322,751; Mendocino County, $1,620; and Napa County, $794.

Agreements by Tax-Exempt Power Plant Operators

In California, publicly owned utilities and governmental entities are not required to pay local property taxes. This fact has created an issue of concern in the Geysers 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 or operating 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 recently formed Central California Power Agency (CCPA), is developing plans for one 35 MW and several 110 MW power plants in the Geysers, due to come on line between 1988 and 2000.

Outside of the CEC's regulatory proceedings, the counties have negotiated with three of these tax-exempt developer-operators to reach agreements for mitigation of some 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. In addition, NCPA participated in the reconstruction of the Socrates Mine Road in Lake County and signed an agreement with Sonoma County to pay for any damages its projects cause to the

Geysers-Healdsburg Road if NCPA uses that road. DWR agreed to rebuild sections of the roads in Sonoma and Lake counties which it uses to transport material to its power plant sites and also agreed to provide funding for Lake County to build a flashboard dam below the DWR facility on Kelsey Creek. Although many of these agreements have been negotiated outside of the CEC's regulatory proceedings, many of the terms of the agreements have been incorporated into the CEC's decisions on the projects involved.

County Yield Taxes on Geothermal Steam

In November of 1981 the voters of Sonoma County voted to approve and enact Measure A (Ordinance 2853-R). In June of 1982 the voters of Lake County overwhelmingly approved and enacted a similarly worded measure as Ordinance No. 1228. The purpose of these two measures is to create special yield taxes in Sonoma and Lake counties on the production of electrical energy from geothermal resources within the counties. These taxes are 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 and Lake counties. In March 1983 the Sonoma County Board of Supervisors adopted a 6 percent rate for their yield tax, and the county expects to make its first assessment of the tax later in 1983 (Kovacovich, April 1983).

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 and Lake counties. The Measure A ordinances also modified the expenditure limitations established in 1979 by the passage of Proposition 4 (see following discussion). The Measure A ordinances allow the counties to spend up to 50 percent of the revenues collected from the yield tax.

The rationale behind the Measure A ordinances enacted by the two counties 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 counties. As soon as Measure A was passed by the voters in Sonoma County, however, SMUD indicated an intention to file suit to block the enactment of the ordinance. However, no yield taxes have been assessed or collected and no lawsuits have been initiated. It is SMUD's contention, shared by DWR, that the purpose of measure is to act as a substitute for property taxes. Since the California Constitution exempts public agencies from property taxation, these two agencies believe that the Measure A ordinances are unconstitutional.

With the enactment of the Measure A ordinances in Sonoma and Lake counties, 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, became clouded. There appears to be no reason for a tax-exempt power plant operator to enter into a mitigation agreement with a county if the yield tax is to be imposed upon them. If the Measure A ordinances in the two KGRA counties are challenged in court and found to be constitutional, the extent to which county revenues would increase is unknown.

Effects of Expenditure Limitations (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 Consumer Price Index (CPI) and population], unless so voted on and approved by a two-thirds majority of the voters or in an emergency. Fiscal year 1978-79 was selected as the first base year.

With a rapid expansion of geothermal development generating significant new property tax revenues, a county potentially could exceed the spending limit imposed by Proposition 4. If the CPI and the county's population growth were minimal during a given year, the county would have to return excess revenues to the taxpayers within the following two fiscal years, either through revisions in the tax rates or through revisions in fee schedules. Thus, a county could potentially 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. To date, the rate of the CPI increases and the rate of the county's population growth have outpaced the Proposition 4 limitations in the Geysers counties (Comalli, December 1982; Strong, January 1983; Carpenter, January 1983). The Middletown Fire District in Lake County, however, has experienced significant revenue increases from geothermal development in the district and in 1982 reduced its tax rate to meet the Proposition 4 limitations (Carpenter, February 1983).

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 different amount of development that has occurred in each county and because of the different population and economic base present in each county. All four counties are examined separately because the amount of revenues and the type of impacts are unique to 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 fiscal year 1960-61, 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 fiscal year 1965-66 and 0.9 percent in fiscal year 1970-71. Geothermal properties accounted for 3 percent of all property tax revenues in Sonoma County in fiscal year 1975-76, which increased to 4.2 percent in 1977-78, 6.7 percent in 1979-80, 7.6 percent in 1980-81, 11 percent in 1981-82, and approximately 17 percent in 1982-83. 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 (Comalli, June 1981 and December 1982). However, unlike the other three counties in the KGRA, Sonoma County's tax base is sufficiently diversified so that property tax revenues from geothermal development are not expected to dominate its tax rolls.

While the property tax revenues from geothermal improvements initially provided a relatively insignificant portion of Sonoma County's total annual property tax income, the dollar amount of such geothermal tax revenues has become substantial. As shown in Table 25, the property taxes accruing from geothermal developments in the county have risen from $25,000 in fiscal year 1960-61 to over $6 million in fiscal year 1980-81 (WESTEC, 1983).

As a county of origin, Sonoma County had received a total of $1,593,284 in AB 1905 funds up through December 1982. In September 1981, the Sonoma County Board of Supervisors decided how to appropriate the funds for fiscal years 1980-81 and 81-82. In July 1982, the board made its appropriations for fiscal year 1982-83. This information is contained in Table 26. In general, the expenditures were in three areas:

- Annual maintenance and construction costs for the Geysers-Healdsburg Road,

TABLE 25

PROPERTY TAXES GENERATED FROM GEOTHERMAL IMPROVEMENTS IN SONOMA COUNTY

Fiscal Year	Full Cash Value	Assessed Value	Total Geothermal Tax Revenues	Annual Increase Percent
1960-61	$ 1,807,480	$ 450,370	$ 24,991	30.9
1961-62	3,216,360	804,090	80,409	321.8
1962-63	3,304,760	826,190	82,619	2.7
1963-64	5,026,760	1,256,690	126,669	52.1
1964-65	5,356,200	1,339,050	133,905	6.6
1965-66	6,262,360	1,565,590	156,559	16.9
1966-67	8,077,120	2,019,280	201,928	28.9
1967-68	11,175,280	2,793,820	279,382	38.3
1968-69	13,552,840	3,380,710	338,071	21.0
1969-70	15,726,940	3,931,735	393,173	16.3
1970-71	18,239,000	4,559,750	455,970	16.0
1971-72	32,000,000	8,000,000	760,000	273.7
1972-73	44,000,000	11,000,000	1,067,000	40.4
1973-74	56,000,000	14,000,000	1,295,000	21.4
1974-75	75,000,000	18,750,000	1,415,625	9.3
1975-76	144,144,500	36,000,000	2,718,000	92.1
1976-77	217,035,000	54,258,750	3,537,684	30.2
1977-78	275,625,884	68,906,471	4,623,624	30.7
1978-79	381,225,814	95,306,453	3,907,564	18.3
1979-80	454,420,052	113,605,113	4,657,809	19.2
1980-81	589,300,428	147,325,107	6,048,846	20.9

Source: WESTEC, 1983.

Note: Includes utility, secured and unsecured rolls, land, steam rights, and possessory interest.

TABLE 26

SONOMA COUNTY ALLOCATION OF AB 1905 FUNDS
1980-1983

Fiscal Year 1980-81

Appropriations	Amounts
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	42,267
TOTAL	$530,267

Fiscal Year 1981-82

Appropriations	Amounts
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 Healdsburg Dam	40,000
TOTAL	$530,000

Fiscal Year 1982-83

Appropriations	Amounts
Annual maintenance costs on Geysers-Healdsburg Road	$350,000
Construction on Geysers Road	100,000
Road repairs and maintenance, City of Healdsburg	75,000
Healdsburg Dam (raising and lowering)	5,000
TOTAL	$530,000

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

- o Improvements and development of county parks, and
- 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 fiscal year 1985-86 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 AB 1905 funds could be redistributed.

Similar to Lake County, Sonoma County has attempted to reach agreement with tax-exempt utility companies 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 the steam yield tax ordinance in 1981, it is difficult to predict what, if any, agreements will be reached in the future between the counties and the tax-exempt power plant operators.

Because of the continuing increase in the population of Sonoma County and the constant rise in the CPI, county expenditures as regulated by Proposition 4 have continued 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; Kovacovich, December 1982). This would occur if the appropriations the county gained from geothermal development rose at a faster rate than the appropriation rate allowed by increases in the county's population and the CPI. A Sonoma County representative indicated that the county would 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 (Comalli, June 1981).

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 fiscal year 1973-74 the assessed valuation of geothermal properties in the county was roughly $200,000, compared to the total assessed value of geothermal properties in 1982-83 of $4,685,000. In fiscal year 1978-79 geothermal property values represented less than 6 percent of the county's property tax base. This figure grew to 6.75 percent in 1979-80, to 12 percent in 1980-81, to 19.6 percent in 1981-82, and is expected to reach 28.3 percent in 1982-83. Longer-range projections which the Lake County Tax Assessor's Office prepared indicate that geothermal property tax revenues will continue to increase, and it is currently estimated that they will comprise as much as 40 percent of the county's gross property tax income in fiscal year 1985-86 or 1986-87 (Strong, June 1981 and January 1983; Carpenter, December 1982 and February 1983).

TABLE 27a

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
			TOTAL $345,916

Source: Record-Bee March 1981 - April 1982; Kelly Cox, Board of Supervisors Office.

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TABLE 27b
LAKE COUNTY ALLOCATION OF AB 1905 FUNDS, 1982

Date	Recipient	Use of Funds	Amount
6/10/82	County Department of Public Works, Roads	Repairs to local roads in the Cobb and Middletown areas.	$158,250
7/21/82	County Department of Public Works, Roads	Repairs and rebuilding of Butts Canyon Road.	$104,000
7/28/82	County Sheriff's Department	Extension of last year's funding for additional deputies and equipment in the Middletown area.	$ 89,690
8/3/82	County Department of Public Works, Engineering and Inspection	Purchase four-wheel drive vehicle for inspection, testing, and monitoring of geothermal development activities.	$ 10,800
8/3/82	County Department of Public Works, Engineering and Inspection	Soil compaction testing device.	$ 5,000
9/28/82	County	Contract with consultant to prepare a grant application for the CEC's AB 1905 funds.	$ 3,000
10/9/82	Anderson Springs Community Services District	Portion of cost of relocating water supply pipeline from Anderson Creek.	$ 70,000
10/19/82	Middletown Unified School District	Portion of one year's leases on portable classrooms.	$ 14,000
10/19/82	Konocti Unified School District	Portion of one year's leases on portable classrooms.	$ 8,250
12/21/82	County Sheriff's Department	Additional costs associated with purchase of new equipment.	$ 3,483
12/21/82	County Department of Public Works, Engineering and Inspection	Additional costs associated with purchase of four-wheel drive vehicle.	$ 753
		TOTAL	$467,226

Source: Kelly Cox, Lake County, Board of Supervisor's Office, December 1982 and January 1983.

The amount of money which Lake County received from AB 1905 through December 1982 totaled over $1,070,798. The $333,269 received from AB 1905 funds in 1980-81 represents a substantial amount when compared to the approximately $4.3 million in property taxes the county collected during fiscal year 1980-81. The revenues provided from the AB 1905 account have proved extremely important to the county in providing funds for mitigating the adverse impacts of geothermal development. Table 24 listed the amount of funds GRIPS expected Lake County to receive from AB 1905. The county believes these funds will become even more important as the extent and pace of geothermal development increases. In 1981 the Lake County Board of Supervisors allocated nearly $350,000 of its first-year AB 1905 funds to a variety of recipients (see Table 27a). In 1982 the board allocated another $467,226 of its second-year AB 1905 funds to a comparably varied set of recipients (see Table 27b).

There is no real concern at this time in Lake County that the expenditure limits of Proposition 4 will affect tax revenues from the increased geothermal development that is taking place in Lake County. Because of the large anticipated growth in geothermal property tax revenues in the mid-1980s, it appears that the county could eventually exceed the limitations on expenditures established in 1979 by Proposition 4 if taxable geothermal property values increase faster than the combined factors of county population growth and the CPI (Strong, January 1983).

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 negotiated 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 and operating their geothermal power generating facilities. Much will depend on whether the ordinance establishing a yield tax on geothermal steam produced in the county survives anticipated legal challenges.

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 and some exploratory drilling. Through December 1982 the total amount received by the county from the AB 1905 funds was $3,641. In 1981 the county planning department indicated it had expended more money in monitoring geothermal development than the county had received from AB 1905, and these funds had been deposited into the county's general fund. The amount of AB 1905 funds returned to the county are expected to rise dramatically toward the end of fiscal year 1982-83 due to sales of additional leases in 1981-82 and the anticipated release of additional lands for bid and lease. According to the county assessor's office, there had been no property tax generated through the development of, or exploration for, geothermal resources up through fiscal year 1981-82 (Clyburn, September 1981).

Napa County

In December 1982 Napa County received its first revenues from the AB 1905 funds produced by the sale of leases for development of geothermal resources within the county. As the exploration for geothermal resources expands to surrounding areas outside the current Geysers development area, there is a possibility that geothermal facilities could be constructed in the northern part of Napa County. If this does happen, the extent of the development and its location could have an impact upon the county. The types of impacts are not possible to predict at this time. However, since Napa County has a small population (around 100,000) and a small tax base (1980-81 total revenues of $32.5 million), even moderate geothermal development could potentially 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 become most evident. For local governments the potential costs of geothermal development 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 less tangible and less measurable. This study is directed at the more tangible, measurable kinds of costs described above.

General Administrative and Service Costs

General administrative costs and service costs are incurred by the county governments in the Geysers KGRA as a result of time spent reviewing and commenting on geothermal development proposals, reviewing and monitoring environmental mitigation measures on geothermal developments, and processing permits and proposals. The costs of the field work necessary for site inspection or monitoring are included in the administrative cost category, since they can be clearly associated with a local agency's permitting procedure. As many as six county permits and ten state permits may be required by a geothermal developer in order to drill a single new geothermal well in the Geysers area, either on privately owned or state-owned lands. A steam well drilled on federal lands would require a comparable number of permit authorizations prior to development (JPL, 1976).

While the general framework for local governmental operations is relatively similar throughout the state, there is considerable variation between individual local entities. Each entity establishes its own organizational structure, carries out its own local responsibilities, sets up its own policies and

programs, determines its own personnel needs, and budgets its own available fiscal resources. Due to such structural and fiscal differences it is most difficult to specifically identify the costs to each of the local governments of overseeing the development and use of the geothermal resources in the Geysers KGRA.

The approximate administrative costs to Lake County of processing a well permit in 1978 were discussed by Gennis and Associates in an EIR prepared for the county for the proposed development of the Aminoil leasehold in the East Ford Flat area. The discussion in the Gennis EIR identified each of the different county departments which had some responsibility for geothermal development, briefly described its involvement, and estimated its costs for geothermal processing. Since the administrative costs provided in this EIR are now five years out of date, current expenditure data were drawn from the Lake County annual report for 1981-82, which was filed with the State Controller's Office. The description of the county's organizational structure and the distribution of geothermal responsibilities presented in the EIR remain relatively unchanged. It is important to realize that the administrative structure, the distribution of geothermal responsibilities, cost of geothermal administration, and the fee and fiscal structure described are provided as an example of only one governmental entity in the Geysers KGRA and that this example represents only one of several alternative patterns.

Lake County Planning Department--The work the Planning Department performs is paid for by fees charged to the applicant. In some instances the department contracts 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 the Planning Department incurs due to geothermal development is not considered significant. In 1981 the county was charging geothermal developers $2,600 for each application, and the county averaged about 11 such applications per year. However, the department conducted a study to determine what expenses it actually incurred. When the study was completed and the new estimate determined, the fee rates were adjusted upward. The Planning Department expects that the work performed on geothermal-related items will continue to be funded by the applicant's fees and that the county will not incur any additional expenses (Borden, June 1981).

Lake County Building Inspector--Work performed by this department is largely paid for by the building inspection fees and plan-checking fees. The county representative anticipates that private companies will perform future inspection work on most geothermal facilities under contract to the county, and power plant developers will pay for the work. Thus, it does not appear as if the county will incur any additional expenses in this area. It can be expected that any work the Building Department performs on geothermal facilities will probably be paid for by the fees they charge (Borden, June 1981).

Lake County Counsel's Office--In fiscal year 1979-80 the budget for the County Counsel's office in Lake County was $188,000; in fiscal year 1980-81 the budget was $228,527. The County Counsel's Office estimated that in 1981 staff was spending roughly 10 percent of its 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 both development scenarios. Ten percent of the office's budget in 1980-81 was $22,850. This would be a liberal estimate of the cost of geothermal development to the County Counsel's Office, since much of the budget represents fixed overhead costs which would still exist irrespective of geothermal-related work.

Lake 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 cover the costs of its work. In 1981 the County Assessor estimated that in the Assessor's Office the amount of staff time spent working on items directly connected with geothermal issues was equal to about 1 technical person from a staff of 23 per year, plus accompanying clerical support (Strong, October 1981). The budget for this office during fiscal year 1979-80 was $327,000. For fiscal year 1979-80, the 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 totaled $23,750 for the 1979-80 year. In fiscal year 1980-81 the total budget for the Assessor's Office was over $432,400. The proportion of that total expended on administrative costs associated with geothermal is assumed to be comparable to that estimated for fiscal year 1979-80. As with the County Counsel's Office, these estimates would represent the probable upper limit of expenses directly related to geothermal development, since 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 its to staff 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 increase at as rapid a pace, especially when considering the advantages of an economy of scale or, in this case, a larger, more efficient operation.

Lake County Clerk's and Auditor-Controller's Offices--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 also expend staff time on geothermal-related activities because this office issues warrants to county contractors performing work on geothermal facilities. In 1981 the office estimated that it incurred a cost of approximately $5 to $10 for every warrant it issued to geothermal contractors. In 1981 the Auditor-Controller's Office averaged about 80 warrants per year, which amounted to administrative costs of about $400 to $800 per year.

Lake County Board of Supervisors--The Board of Supervisors is directly involved in many geothermal-related issues. The board determines how to distribute AB 1905 funds. It reviews geothermal applications when there is an appeal of a decision made by the Planning Commission regarding the issuance of a use permit. Some members of the board may also sit on the Air Pollution Control District's Hearing Board, which meets to decide on disagreements between applicants and the Air Pollution Control District over decisions regulating project-related geothermal emissions.

It is difficult to estimate how much time the board devotes 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. Assuming that 10 percent of all board costs result because of work on geothermal-related items, then based upon the fiscal year 1980-81 budget of $336,200, the cost generated by geothermal development would be $33,600.

Lake County Air Pollution Control District--The annual budget for the Lake County Air Pollution Control District during fiscal year 1980-81 was $156,673. Of this amount, $51,907 was paid from the state subvention funds received from the state Air Resources Board, another $78,414 was paid for by the permit fees charged by the district to various applicants, and $10,756 was received from other district sources. When the state subvention funds, the permit fees, and other district revenues are combined, they total $141,077. This leaves $15,596 of the 1980-81 annual budget that the county was directly responsible for providing. Of the $78,414 in permit fees received, approximately $1,800 is from nongeothermal sources, and $76,614 is from geothermal sources (Reynolds, 1983).

The district estimates that it is currently spending between 80 and 90 percent of its time on geothermal-related air quality issues. The district estimates that the fees charged for work performed on geothermal steam transmission lines and steam field wells are not adequate to offset the cost of the work they perform. Additionally, the district believes that the air pollution control work performed because of the CEC's power plant certification process is even less self-supporting. Based upon the district's estimate that geothermal represents 80 to 90 percent of its workload, a rough estimate of the cost of district time spent on geothermal-related matters is between $125,338 and $141,006. This results in costs of between $48,724 and $64,392 which the District would incur in excess of the $76,614 in permit fees from geothermal sources (Reynolds, 1983).

Summary of Administrative Costs

Based on the preceding discussion, a number of Lake County offices and departments incur general administrative costs for geothermal-related permit processing, monitoring, accounting, and review responsibilities. The Lake County departments which are incurring geothermal costs include the County Planning Department, the County Building Department, the Tax Assessor's Office, the Auditor-Controller's Office, the County Counsel's Office, the County Clerk's Office, the County Board of Supervisors, and the Lake County Air Pollution Control District. While other county offices such as the Sheriff's Department and various fire districts may also have geothermal-related responsibilities, these costs are related to the provision of services and are discussed in the following section on public service costs.

The discussion of administrative costs for each of the Lake County offices and departments included an estimation of maximum annual costs related to its geothermal responsibilities. Where no information was available on the amount of time spent by a particular office or department on its geothermal workload, it was assumed to be 10 percent of its annual budget. The 10 percent amount was assumed to be a reasonable maximum, based on discussions with representatives of those county offices. Using either the hypothetical 10 percent figure or actual figures the departments provided, the estimated total annual

cost of administering geothermal responsibilities in fiscal year 1980-81 for Lake County ranged between $129,325 and $145,400. The gross assessed valuation of the geothermal power plant and steam field properties in Lake County totaled $135,300,000 in fiscal year 1980-81. At the 1 percent taxation rate, the county collected $1.35 million in property tax revenues from these geothermal developments. 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 is not available for the other counties in the Geysers KGRA. Although each of these counties would have organizational and fiscal structures different from Lake County's, such a cost/revenue comparison for the other counties is expected to produce similar results. The tax revenues from geothermal properties in those counties are expected to exceed the administrative and general service costs of geothermal development which the counties incur.

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, a local government may not provide all such services 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 II 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, medical facilities, 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 accommodate demands associated with growth in its service area. For a water supplier this may mean it 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 the geothermal industry undoubtably contributed to increases in the local population. There are no data, however, on the exact amount, rate, and distribution of local population increases attributable to geothermal development. Likewise, there are no hard data on the portion of increase attributable to any single aspect of geothermal development.

Research for this study indicates that the geothermal power plant construction workers and their families currently are not likely to change their permanent residence to take a short-term job in the Geysers development area. It does appear however, that the number of workers involved in power plant construction, combined with overlapping construction schedules, has the potential to produce short-term fluctuations in the local population.

As the pace of geothermal development increased between 1960 and the present, local governments began to experience noticeable geothermal-related impacts on public services. Based upon information gathered in the preparation of this study, it appears that the local public services most demonstrably affected to date by geothermal development are education and road maintenance. The effects on these services are a result of all aspects of geothermal development: steam resource exploration, development, and maintenance; power plant construction, operation, and maintenance; and provision of geothermal-related services and supplies.

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, school districts in California currently have serious financing constraints and often are not able to immediately respond to a rapid or large increase in student population. The October 1981 action of the state executive office which froze appropriation of Leroy Greene Act funds and the subsequent conditional release and recall of a limited amount of school assistance funds have further reduced the local school districts' ability to respond to increased needs for educational facilities and services. Although the voters authorized the sale of bonds for school construction in November 1982, it is unlikely that the local districts will receive state funding for additional classroom space until the funds recalled by AB 28X have been repaid and the state's fiscal status has stabilized.

Historically, the primary source of school district operational revenues was 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.

Following the Serrano-Priest court decision in the early 1970s, school districts were required to take steps to help resolve some of the disparity between educational services available to students in districts with high assessed valuation and those with low valuation. To comply with the court decision, each district 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 a school district's capital outlay costs. Capital costs include such things as land for a school district's new school sites, 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 Act. 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 building sites 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 established a priority rating system to assist it in allocating the funds available each year. The state also 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 relocatable 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 the allocation of over $200 million in Greene Act funds which the Legislature had previously allocated, although not appropriated. School districts which had project proposals pending before the state Allocation Board did not receive Leroy Greene Act funding for any phase of their project through the end of fiscal year 1981-82 (Eckhardt, 1981). In July 1982 the state Legislature disbursed $114 million for school projects which had completed review by the State Allocation Board. However, late in 1982 the state Legislature passed AB 28X, which called for the return of all unspent or uncommitted funds for capital costs and the repayment of the spent and committed funds through the sale of the state school bonds approved by voters in November 1982. Approximately $25 million in school bonds were sold in April 1983, and another $100 million sold in May 1983. These $125 million in bonds had to be sold before the state could release additional funds for capital expenditure projects for eligible school districts. While additional bond sales are expected to occur later in the year, the success of such sales and corresponding availability of funding to local districts is dependent upon market conditions (Smoot, March, April, and June 1983).

The October 1981 freeze placed on the Greene Act funds had a particularly severe effect on several Lake County school districts which had applications being reviewed by the State Allocation 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 District also had applied for funding for a new high school.

Other Lake County districts which were affected by the freeze on the Leroy Greene Act funds include the Konocti Unified District (funding for a new elementary school); Lakeport Unified District (funding for expansion at an existing elementary and an existing high school, including new classroom space and additional land); and Upper Lake High School District (funding for a replacement gymnasium and a continuation school). The Konocti District was able to get the Phase 3 funding for its new continuation school just before the funds were frozen in 1981 and has completed construction of this facility. The district has let contracts for furnishing the facility and expects the final finish work to be completed in early 1983 (Merrill, February 1983).

In an effort to determine the extent of the impact that the growth of the geothermal industry is having on the local schools, some of the districts have begun to conduct student surveys. The Middletown Unified School District in Lake County 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 the 1979-80 school year indicated the parents of nearly 34 percent of the students were employed in geothermal development (Cornelison, 1980a). In the 1980-81 school year the percentage was about 33 (Cornelison, 1980b). 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 some districts in Sonoma County will be conducting annual surveys to determine the percentage of their students whose parents are involved in geothermal development or geothermal-related industries. The results of the surveys conducted by the Middletown District during the 1979 through 1981 student registrations have indicated that geothermal development has had a significant impact on the Middletown District's facilities and ability to provide educational service. (Merrill, February 1983). Results of the 1982 Lake County surveys became available in April 1983 (refer to Appendices E and F for survey results).

Sonoma County evaluated its first student surveys in early 1982. The districts surveyed included: Alexander Valley, Cloverdale, Geyserville, Healdsburg, West Side, Windsor, Cinnebar, Forestville, Liberty, Piner-Olivet, Roseland, and Rincon Valley. Of the survey forms returned in these districts, the Cloverdale, Healdsburg, Roseland, Rincon Valley, Piner-Olivet, and Forestville districts indicated they had 10 or more students whose parents were involved in some aspect of geothermal development. (Refer to Appendix F for a summary of the survey results.)

Since not all of the survey forms were returned for tabulation in any of the districts surveyed in 1981, the survey results only provide a generalized indication of where geothermal families are residing in Sonoma County. Future surveys of these districts may be informal consultation with district superintendents, since the mitigation agreements are limited to providing funding for new students enrolled in districts with capacity enrollments (Chouteau, December 1982).

Road Maintenance Costs--The impact upon the roads in the KGRA caused by geothermal development has been significant. The county roads providing access to the KGRA were intended for light vehicular traffic and were not designed to handle geothermal/industrial traffic. 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 had a deleterious effect upon the roads as development increased.

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.

- 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 (Jimtown) 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 west 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 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 (CEC, 1982m).

  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 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 although it is presently being used by truck traffic. The travelway and shoulders in some sections are eroded away, leaving the effective width of the road at eight feet, which is barely enough room for a single lane of traffic (CEC, 1982m). The road is county owned and maintained up to the vicinity of the Union Geothermal Company's gate at the former Geysers Resort.

  The Pine Mountain Road provides access to the northwestern portion of the KGRA which lies in Mendocino County. Pine Mountain Road is a 12 mile long narrow mountain road which is unpaved, steep, and winding. The road originates in Sonoma County about 1 mile east of State Highway 101 and extends a little more than 6 miles from the Geysers-Cloverdale Road to the Mendocino County line. From the Sonoma/Mendocino County line, the Pine Mountain Road extends nearly 6 miles to the Lake County line (CEC, 1982m).

  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 Socrates Mine Road is a 5 mile long, steep, and winding mountain road which recently underwent reconstruction. The reconstruction work included improving the road alignment, constructing an adequate base and surface and constructing new bridge structures over Anderson and Gunning creeks. As a result of the reconstruction, the road is now capable of carrying

the heavy truck traffic associated with geothermal development. 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 county will be responsible for ordinary maintenance required on the road. The county will be reimbursed for the costs for any extraordinary maintenance required, per the provisions of an agreement between the county and a group of geothermal road users (CEC, 1982m).

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.

The Bottle Rock Road in Lake County runs between State Highway 175 at Cobb and State Highway 129 near Kelseyville. Bottle Rock Road provides access to the DWR "Bottle Rock" project site and to the site originally proposed for the NCPA 1 project. This road also intersects with the Sawmill Flat Road, which provides direct access into the northeastern portion of the Geysers steam field. However, the Sawmill Flat Road is privately owned, and vehicles must have permit authorization to pass through the Union Geothermal Company gate on the road. Bottle Rock Road is a paved, relatively narrow, two-lane road with some steep grades. The road is county owned and maintained and is currently undergoing partial reconstruction funded by DWR, in conjunction with the Bottle Rock project (CEC, 1982m).

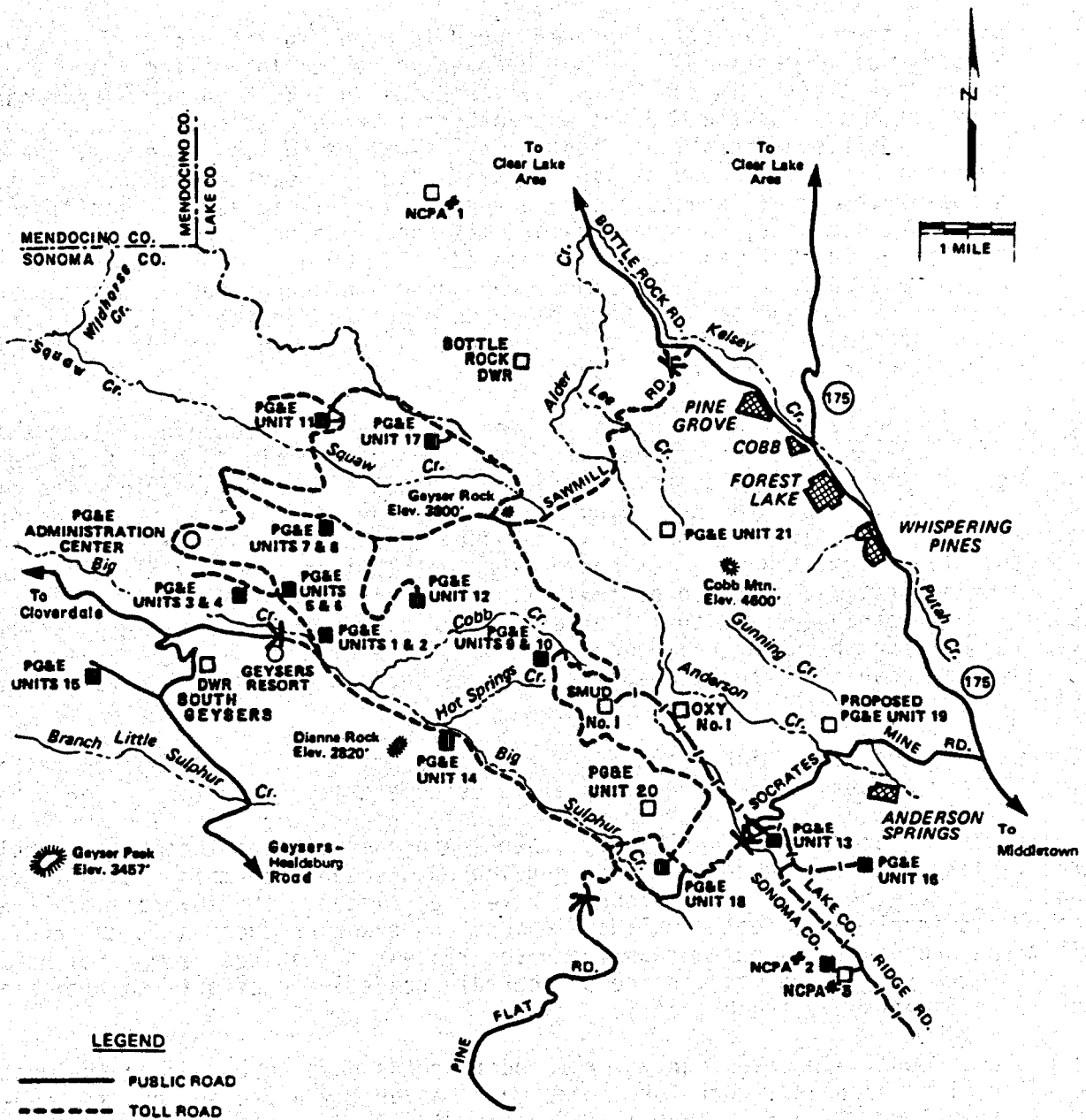
- Access Within the Geysers--Within the Geysers development area, several of the geothermal developers have developed and maintain most of the roads providing access to the various geothermal leaseholds, steam wells, and power plant sites. As the developer which has been active in the Geysers for the longest period, Union Geothermal Company owns the majority of these roads. (Refer to Figure 12 for a map of the roads within the Geysers development area.)

  The increasing development of the geothermal resource has produced an increase both in 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 12). 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 five 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 traffic flow into and within the Geysers. Several of the power plant

Figure 12

ROAD SYSTEM WITHIN THE GEYSERS DEVELOPMENT AREA



LEGEND

- PUBLIC ROAD
- TOLL ROAD
- PRIVATE ROAD
- EXISTING POWER PLANTS
- PROPOSED POWER PLANTS
- LOCKED GATE and GUARDHOUSE

DATE: 4/1/81 DRAWN BY: J.Hockett REVISED: 2/83 CEC

SOURCE: SWINERTON and WALBERG, 1981

developer-owners who 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.

- 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 county owned and maintained. 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 were not adequate for heavy traffic. In 1981 Lake County allocated $186,000 of its AB 1905 funds to begin repairs to the road by improving the drainage and raising the road base. By the end of 1982 work had been completed on the fill, base, and chip sealing. The road still requires a new paving cap to complete upgrading of the road (CEC, 1982m).

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 increase 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 have been 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.

- 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 and 6 for location).

  An agreement has been reached between Lake County and the DWR whereby DWR will repair specified portions of the Bottle Rock Road and, in addition, will pay the county a sum necessary to repair a section of Sulphur Creek Road. In 1982 the estimated total cost was $3,600,000 (DWR, 1982a).

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. 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. 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 per mile (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 believes it is necessary to repave the total length (approximately 3.2 miles), from State Highway 29 to the geothermal waste facility site. The county has paved one-half of the distance using county funds. In early 1983 the county received a grant of $119,000 from the CEC's AB 1905 funds to pave the remaining 1.67 miles with asphaltic concrete. The work on this section should be completed by the summer of 1983.

In fiscal year 1980-81 the county expended $2.13 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 industry is taking steps to mitigate some of the adverse road impacts attributable to geothermal development.

- Sonoma County--In Sonoma County the road most heavily used by geothermal developers is the Geysers-Healdsburg Road. The Geysers-Cloverdale 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 Geysers-Healdsburg Road and $10 million for Geysers-Cloverdale Road (Morelli, June, 1981). Considering that in fiscal year 1979-80 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. An agreement was reached between the Department of Water Resources and the county, whereby DWR paid the county $900,000 in December 1981 for the rebuilding and repair of portions of the Geysers-Healdsburg road. Sonoma County also has negotiated agreements with other developers to mitigate adverse project effects on those roads impacted by geothermal development. These agreements are usually contingency agreements with the exact dollar amount dependent upon the degree of usage of specified county roads. These agreements usually also contain contingency provisions for either increased payments or refunds, depending on whether the project-related use is greater than or less than that projected. The county's agreement with the Sacramento Municipal Utility District for the SMUDGEO #1 project took the form of posting a bond for payment of $75,889 if SMUD used the county roads during the project (SMUD, 1981). The Northern California Power Agency, in conjunction with its NCPA 3 project, agreed to pay the county $11,903 for anticipated project-related usage of county roads (Sonoma County, 1982c). In April 1983 the Pacific Gas and Electric Company and the county completed negotiations on an agreement for mitigation of road impacts associated with the PGandE Geysers Unit 20 project.

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 Sonoma County Ordinance No. 2853-R and Lake County Ordinance No. 1228, related to assessing a yield tax on geothermal steam used by nontaxpaying power plant operators, 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 VI

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, steam field exploration and development, steam drilling, and power plant construction and operation.

The California Energy Commission has the jurisdictional authority to require mitigation of adverse 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 other aspects of geothermal development indirectly related to construction and operation of the power plant and related facilities. In the interest of equity, amelioration of impacts clearly attributable to these other aspects of geothermal development should also 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:

- Exactions imposed on the project developer for identifiable costs of specific geothermal development projects;
- Mitigation agreements among geothermal developers and operators or between developers, operators, and local governments;

- o 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;

- o Formation of a community facilities district which would include the lands leased for geothermal development within the district boundaries and which could provide funding for community facilities such as school sites and structures; parks; libraries; fire, police, and ambulance services; and any other governmental facilities authorized by law; and

- o 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 V, each of the four counties in the Geysers KGRA receives some amount of revenue from geothermal development within their jurisdictional limits. The majority of such geothermal revenues has 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 exactions imposed on geothermal developers for mitigation of impacts directly attributable to their project or through multi-party agreements among several developers for mitigation of impacts 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 currently 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 county's governing boards of supervisors, and the school districts have no authority over them. As shown in Table 28, the 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 attributable to their projects. The Leroy Greene Act funds were frozen by state Executive Order in 1981 and were 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 Greene Act are being approved and completed; the districts in Lake County, in particular, have no excess facilities available; the developer's fees authorized under SB 201 apply only

TABLE 28

FINANCING MECHANISMS AVAILABLE TO CALIFORNIA SCHOOL DISTRICTS

Income Sources		Allowable Expenditures
State School Fund (includes federal program funds)	Revenue Limit*	Operation and maintenance cost: existing facilities & equipment, existing staff, new staff
County property taxes, apportioned per AB 8 (Calif. Rev. & Tax Code, Sections 95-100)		
State: Leroy Greene School Building Lease-Purchase Act		Capital improvement costs: new sites, remodelling of existing facilities, new classrooms, new facilities
State: Emergency Classroom Act		Lease/purchase of temporary classrooms
State: CEC Power Plant Certification, mitigation requirements		Agreed upon by developer and impacted school districts; specified in AFC proceedings and decision
State: State School Bond Issue, passed in November 1982.		Capital costs of new facilities; up to $150 million of the $500 million approved may be used for reconstruction or remodeling of existing facilities
Local: Sales and rentals of excess properties		Operation and maintenance costs and/or capital improvement costs
Local: Developer's fees, per SB 201, for new residential subdivisions, (generally only available if local government adopts ordinance specifying standardized charges)		Capital costs of new facilities (recent court interpretation apparently limits expenditure to interim temporary sites and classrooms)
Local: Supplemental funding at discretion of local governmental jurisdictions		Specified by governmental entity providing supplemental funds

*Revenue Limit = 1972-3 expenditure per student, times allowable percent annual increase set by state Legislature, times last year's Average Daily Attendance (ADA). The combined income from state school funds plus local property taxes cannot exceed the allowable revenue limit for each district.

to proposed developments of new residential subdivisions; while a portion of the school bonds approved by the voters in November 1982 have been sold, the initial bond revenues must be applied toward repayment of earlier state funding before being disbursed to new eligible projects; and the Lake County Board of Supervisors has not committed itself to continue distribution of their discretionary funds for direct-related impacts of geothermal development.

EXACTIONS IMPOSED ON THE DEVELOPER FOR MITIGATION OF IMPACTS ATTRIBUTABLE TO A SPECIFIC PROJECT

Exactions imposed on the developer for costs attributable to project development have 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 involved in a particular geothermal project.

Assessment of public service costs attributable to a project has been recommended in recent geothermal power plant projects undergoing CEC regulatory review: the DWR South Geysers project, the Occidental Geothermal No. 1 project, the PGandE Geysers Unit 20 project, and the NCPA 3 project. The basic components of the school mitigation agreements on these projects are shown in Table 29. (Refer to Appendix A for the staff's policy regarding mitigation of school enrollment impacts.)

DWR South Geysers Project Mitigation Agreements

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 related to 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 who is primarily employed (i.e., more than 50 percent of the time) on the DWR South Geysers project. Each such student is considered to be a student unit (or "unit of impact," as proposed in this study), 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 primarily involved in 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 parent(s) is primarily involved in providing services to the South Geysers project, multiplied times 0.05.

TABLE 29

COMPARISON OF SCHOOL IMPACT MITIGATION AGREEMENTS

	DWR South Geysers		Occidental Geothermal	PG&E Unit 20	NCPA Unit #3
	Sonoma Co.	Lake Co.			
Length of contract	10 years	10 years	8 years	8 years	8 years
Amount of $	No advance; estimated $675 per project-related student. No payment for nonproject-related students.	$50,000 advance; $4,250 per project-related student; fraction of this for geothermal-related students (see below).	No advance; $5,400 per project-related students; fraction of this for geothermal-related students (see below).	No advance; $5,400 per project-related students; fraction of this for geothermal-related students (see below).	No advance; $5,400 per project-related students; fraction of this for geothermal-related students (see below).
Basis for calculation	Average annual local revenue portion of the schools (k-12) budget x no. of students. No allowance for buses.	No. of students x 50 ft^2/student x construction cost/ft^2 of classroom space + $1,000 per student for buses.	No. of students x 55 ft^2/student x construction cost ft^2 of class-space + $1,000 per student for buses.	No. of students x 55 ft^2/student x construction cost/ft^2 of classroom space + $1,000 per student for buses.	No. of students x 55 ft^2/student x construction cost/ft^2 of classroom space + $1,000 per student for buses.
Factor for geothermal-related students	No mitigation for non-DWR project-related students.	.05 of a project-related student.	.04 of a project-related student.	.04 of a project-related student.	.04 of a project-related student.
Notes	Local revenue is that raised by local property taxes and excludes state & federal contributions. Payment is made each year regardless of the number of students in previous year.	Construction cost for ft^2 of classroom space used was $65. Payment per student is one time only and is deducted from the advance. Any unallocated portion of the advance will be returned to DWR.	Construction cost for ft^2 of classroom space used was $80. Contract is with both Lake and Sonoma counties' school districts. Payment is only made for no. of students greater than previous year.	Construction cost for ft^2 of classroom space used was $80. Contract is with both Lake and Sonoma counties' school districts. Payment is only made for no. of students greater than previous year.	Construction cost for ft^2 of classroom space used was $80. Contract is with both Lake and Sonoma counties' school districts. Payment is only made for no. of students greater than previous year.

Per the agreement with the Lake County Office of Education, 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 primarily employed in construction of this 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 and residence 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:

- $900,000 for repairs and improvements to certain portions of the Geysers-Healdsburg Road.

- Reimbursement to the county for unrecoverable costs of emergency situations related to the project.

- 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. It should be noted that the agreement specifically excludes costs paid by sales taxes from the amount which DWR will pay (DWR, 1982a).

- 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 multiplied by an average cost of education paid by local revenues for students in the county schools. These mitigation payments can only be used for capital outlay expenses of impacted school districts and/or lease/purchase expenses (DWR, 1982a).

- Also written into this agreement was a provision related to the special tax measure passed by Sonoma County voters in the November 1981 election. If County Ordinance 2853-R survives court challenge and remains law in the county, then the county will reimburse DWR for all past payments for road repairs (DWR, 1982e). If any portion of the monies collected from DWR under Ordinance 2853-R were applied to mitigation of school impacts, then DWR would be reimbursed for payments in the year in which the tax is paid (DWR, 1982a).

Occidental Geothermal's Oxy No. 1 Project Mitigation Agreements

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 No. 1 project. 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.

In addition to the agreement related to mitigation of project impacts on schools, 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. (The terms of the agreement are discussed in further detail in Chapter II, under Lake County public services.) This agreement to mitigate project-related impacts on the local water supply was negotiated outside the CEC's regulatory process and required the transformation of the 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.

PGandE Geysers Unit 20 Project Mitigation Agreements

In September 1982 PGandE completed negotiations on school impact mitigation agreements with representatives of the Sonoma County and the Lake County offices of education. These agreements commit PGandE to providing mitigation fees to school districts experiencing enrollment increases attributable to construction and operation of the Geysers Unit 20 project. Similar to the DWR and Occidental agreements, PGandE has agreed to make mitigation payments to those districts which are at or over enrollment capacity and which can show they have new students whose parents are employed in the construction or operation of the Geysers Unit 20 power plant.

PGandE has also agreed to pay the fractional amount of 0.04 for students in qualifying districts whose parents are involved in providing services to geothermal power plants in the Geysers but who are not associated with a specific

project. As with the Occidental agreement, the payment from NCPA would be based upon the number of new "Geysers Unit 20 students" multiplied by the cost of school construction per square foot multiplied by an average of 55 square feet required per student. Based upon this formula, PGandE has agreed to pay $5,400 per student. This amount is larger than that required under the Occidental and DWR agreements and reflects current school construction costs. The number of "Geysers Unit 20 students," as in the Occidental agreement, will be determined by an annual school district survey, and no payments will be made until the survey indicates the presence of project-related students in an impacted district.

PGandE also has negotiated a separate agreement with Sonoma County for mitigation of project-related impacts on county roads, particularly the Geysers-Healdsburg Road. While the negotiations on the mitigation agreements on school and road impacts have taken place outside the CEC's regulatory procedings, the terms of the agreements have been incorporated into the CEC's decision on the Geysers Unit 20 project.

Northern California Power Agency, NCPA 3 Project Mitigation Agreements

In December 1982 NCPA completed negotiations on school impact mitigation agreements with representatives of the Sonoma County and Lake County offices of education. The language and terms of these agreements are quite similar to those in the PGandE agreement on the Geysers Unit 20 project. Mitigation payments would be made only to those districts which are at or over capacity at the time the NCPA 3 project begins. Under the terms of the agreements, NCPA agrees to provide a $5,400 mitigation fee to impacted school districts for each new student whose parent(s) are involved primarily in the construction or operation of the NCPA 3 project. NCPA also agreed to provide the fractional amount of 0.04 of the mitigation fee for each new student whose parent(s) are involved in providing geothermal-related services in the Geysers KGRA. The number of NCPA 3 project students will be determined by an annual school district survey, and no payments will be made until the survey indicates the presence of project-related students in an impacted district.

NCPA has also negotiated a separate agreement with Sonoma County for payment of mitigation fees for NCPA 3 project-related use of county roads, particularly the Geysers-Healdsburg Road. The agreement is a contingency agreement, with the exact amount of the fee to be determined by projected usage of the county roads. The agreement contains provisions for either increased payment if the use of the road(s) is greater than projected or refunds if the usage is less than projected. As with the PGandE Geysers Unit 20 agreements, the negotiations took place outside of the CEC's regulatory proceedings, but the terms of the agreements have been incorporated into the conditions of the CEC's decision on the NCPA 3 project.

Sacramento Municipal Utility District, SMUDGEO #1 Project Mitigation Agreements

SMUD negotiated a contingency agreement with Sonoma County relative to potential impacts on county roads from the SMUDGEO #1 project. As with the NCPA agreement, the exact amount of mitigation fees will depend upon usage of the county roads. If the use is greater than projected, the fees will increase, and if the use is less than projected, some amount of the fees would be

refunded. As with the Geysers Unit 20 and NCPA 3 agreements, the negotiations took place outside of the CEC's regulatory proceedings, but the terms of the agreement were incorporated into the conditions of the CEC's decision on the SMUDGEO #1 project.

MITIGATION AGREEMENTS AMONG DEVELOPERS, OPERATORS, AND/OR THE COUNTIES FOR IMPACTS NOT ASSOCIATED WITH A SPECIFIC PROJECT

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 has redesigned, realigned, and reconstructed the Socrates Mine Road to meet the design standards set by Lake County. 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 primary access road into the Geysers which is not subject to user permit fee requirements.

The Bottle Rock Road, which provides access to the northern portion of the Geysers development area in Lake County, is being rebuilt and repaired in certain sections by DWR. This repair project is part of a negotiated agreement between DWR and Lake County for DWR's Bottle Rock project, but the terms of the agreement are not included in the CEC's decision on this project. Subsequent geothermal developer-operators also using the road are also expected to be required by the county 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 pursuant to the Municipal Improvement Act of 1913, Division 12 of the Streets and Highways Code (commencing with Section 10000). The district can be set up to provide a funding mechanism for the construction of local public improvements specifically benefiting the lands within the boundaries of the proposed district. Proceedings to establish an assessment district can be initiated either by the county board of supervisors or by a petition signed by the owners of 60 percent (in area) of the lands subject to assessment. After an assessment district has been proposed it is subject to a protest hearing before the county board of supervisors. The hearing is held to specifically describe the public improvements, to specifically estimate project costs, and to specifically estimate the amount of assessment for each parcel of land which would be included in the proposed district (Jensen, 1982).

If the proceedings to establish the district have been initiated by the board of supervisors and if the district formation is protested by the owners of more than one-half of the area subject to assessment, then the proceedings must be abandoned. If the proceedings have been initiated by petition and are subsequently protested during the hearings before the board, the board of

supervisors may, nevertheless, establish the district if the protests are overruled by the affirmative vote of four-fifths of the members of the board. The types of local public improvements which may be financed by special assessments are generally described in the 1913 Municipal Improvement Act directly, or by reference. Such improvements, however, do not include schools or educational facilities or other types of public improvements usually held to be general in nature and not specially benefiting a particular local area (Jensen, 1982).

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 improvements provided by the district.

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

FORMATION OF A COMMUNITY FACILITIES DISTRICT

A community facilities district can be established pursuant to the Mello-Ross Community Facilities Act of 1982, Division 2, Part 1 of Title 5 of the Government Code (commencing with Section 53311). The district can be set up to provide an alternative method of financing public capital facilities, especially in developing areas and areas undergoing rehabilitation. A community facilities district may be established to provide the following types of additional facilities and services:

- Police protection, including criminal justice facilities (limited to jails, detention facilities, and juvenile halls), and
- Fire protection ad suppression, and provision of ambulance and paramedic facilities and services.

These facilities and services may only be provided by the district to the extent that they are in addition to those provided in the district prior to its creation and may not supplant facilities and levels of service which existed prior to formation of the district (Government Code, Section 53313).

A community facilities district may also be formed to provide for the purchase, construction, expansion, or rehabilitation of any real or other tangible property which is necessary to meet increased demands placed upon local agencies as a result of development or rehabilitation occurring in the district. The district may provide facilities such as:

- Local park, recreation, or parkway facilities;
- Elementary and secondary school sites and structures;

- o Libraries; and
- o Any other governmental facilities which the legislative body creating the community district is authorized by law to construct, own, and operate (Government Code, Section 53313.5).

Proceedings to establish a community facilities district can be initiated either by the legislative body having jurisdiction over the territory within the proposed district or by a petition signed by not less than 10 percent of the registered voters residing within the territory proposed to be included in the district. In either case, the boundaries of the proposed district and the types of facilities and services to be provided must be described (Government Code, Sections 53318-19).

After a community facilities district is proposed there is a public hearing before the legislative body. If 50 percent or more of the registered voters residing within the area proposed for the district or if the owners of one-half or more of the land area proposed for inclusion in the district file written protests, the legislative body shall abandon the proposed establishment of the district (Government Code, Section 53324). Following completion of the hearings, the legislative body may abandon efforts to establish the district or may, after passing on all protests, determine to proceed with establishing the district (Government Code, Section 53325). If they decide to proceed with the proposed district, the levy of any special taxes must be approved by two-thirds of the votes cast (Government Code, Section 53328). If more than 12 registered voters reside within the area proposed for the district, each voter shall have 1 vote. If less than 12 registered voters reside within the boundaries of the proposed district, each landowner has 1 vote for each acre, or portion thereof, of the land owned within the proposed district (Government Code, Section 53325.3). Once established, the legislative body can increase or decrease the services and facilities provided by the district and can incur bonded indebtedness if approved by two-thirds vote (Government Code, Sections 5330-53358).

As with the assessment districts, formation of community facilities districts in the Geysers could be advantageous for mitigation of public service impacts related to geothermal development. Perhaps the greatest hurdle to be overcome in forming a community facilities district is the requirement that there be a two-thirds majority vote in favor of district formation and district financial matters. As with the assessment districts, formation of a community facilities district falls within the jurisdiction and authority of local governmental entities. The CEC cannot require the formation of such districts as a mitigation measure for geothermal projects in the Geysers, but it could recommend that project applicants and local governments consider this mitigation option wherever appropriate.

APPLICATION TO THE CEC FOR ALLOCATION OF AB 1905 FUNDS

As discussed in Chapter V, 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 annually disbursed back to the counties of origin.

The amount disbursed to the counties in the Geysers KGRA in 1982 ranged from the $2,500 which Mendocino County received to the $589,700 Sonoma County received. Following the sale of leases on federal lands in Napa County for geothermal development in 1981 and 1982, Napa County received its first AB 1905 funds in 1982.

Both Sonoma and Lake counties have allocated their local shares of the AB 1905 funds to a variety of projects (refer to Tables 26, 27a, and 27b). 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 relocatable classroom units, and partial funding for a controlled burn program to enhance wildlife habitat in the Geysers. In Sonoma County, a portion of its AB 1905 funds were allocated for improvements at park and recreation facilities throughout the County.

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 CEC. These funds are disbursed to local jurisdictions 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:

- Administrative costs incurred by the local jurisdiction that are attributable to the development or production of geothermal resources;
- Monitoring and inspecting geothermal facilities and related activities to assure compliance with applicable laws, regulations, and ordinances;
- Identifying, researching, and implementing feasible measures that will mitigate the adverse impacts of such development or production;
- Planning, constructing, providing, operating, and maintaining those public services and facilities that are necessitated by and result from such (geothermal) development or production;
- Undertaking projects demonstrating the technical and economic feasibility of geothermal direct heat and electrical generation applications; and
- 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 CEC 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.

CONCLUSIONS

A number of alternatives exist for the mitigation of the effects of geothermal development on local public services. Each of these mitigation alternatives has been considered or applied to one or more of the geothermal development projects in the Geysers. The most direct mitigation option is for the local governmental entities to allocate a portion of the revenues from geothermal development to those public services which are experiencing identifiable geothermal impacts. However, local governments' revenues from geothermal development currently do not cover the cost of providing additional educational facilities and increased road reconstruction and maintenance costs.

Of the mitigation alternatives discussed in this chapter, the two most frequently used have been (1) exactions imposed on project developers for mitigation of impacts attributable to a specific project and (2) mitigation agreements among geothermal developers, operators, and local governments for impacts not associated with a specific project. The first alternative is the only funding mechanism currently available to local school districts which will provide mitigation for geothermal-related enrollment increases in districts already experiencing capacity problems. The second alternative has provided a mechanism for funding reconstruction and repair of local roads subjected to geothermal-related traffic.

The CEC staff encourages the use of these two alternatives in the mitigation of the effects of geothermal development on local public services. Staff has incorporated these alternatives into the policy recommendations presented in the Executive Summary of this study and in the algorithm for mitigation of impacts on school districts experiencing project-related enrollment increases (Appendix A) and the algorithm for mitigation of geothermal development impacts on local roads (Appendix B). The policy recommendations and concepts for calculating mitigation fees presented in this study could be adapted as necessary for mitigation of other types of public service impacts.

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APPENDIX A

STAFF POLICY REGARDING THE MITIGATION OF SCHOOL ENROLLMENT IMPACTS

STAFF POLICY REGARDING MITIGATION OF SCHOOL ENROLLMENT IMPACTS

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January 1983

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ABSTRACT

Testimony in recent geothermal power plant siting cases in the Geysers-Calistoga KGRA has established that nine local school districts have reached or exceeded the design capacities of their facilities. Consequently, any geothermal development which induces immigration into these impacted districts will aggravate the situation.

Several power plant applicants have agreed to provide annual mitigation payments to local school districts which can document adverse student enrollment impacts. The Lake County agreements with Occidental Geothermal, Inc. and the California Department of Water Resources require mitigation fees for students having at least one parent who either works directly with the power plant or works indirectly with the geothermal-service industry. An adjustment is made each year so that the applicant only pays a one-time fee for each student. An annual student survey is used to help identify students qualifying for mitigation payments.

This paper presents an algorithm which CEC staff will propose to be used in the event that a power plant applicant and an impacted school district are unable to negotiate a mitigation agreement. The algorithm provides a basis for calculating an annual mitigation payment which would be used to help construct new permanent facilities and to purchase additional school buses.

STAFF POLICY REGARDING MITIGATION OF SCHOOL ENROLLMENT IMPACTS

INTRODUCTION

The California Energy Commission (CEC) has the responsibility of ensuring that the state has a reliable, efficient, and environmentally sound energy system. As a part of fulfilling this responsibility, the CEC is charged with the review and approval of new thermal power plants.

In reviewing new power plant applications, the CEC considers the design, construction, and operation of the proposed plant. Engineering, physical, environmental, economic, and socioeconomic factors are analyzed. Potential impacts and mitigation measures to eliminate or reduce impacts to an acceptable level are identified. In issuing a certificate for the plant, the CEC attaches conditions specifying measures to mitigate any adverse impacts.

Geothermal power is one of the preferred power-generating technologies identified by the CEC. The Geysers-Calistoga KGRA constitutes one of the major areas with geothermal resources. Increased development activity in the Geysers KGRA, including new power plants, has resulted in increased socioeconomic impacts. One of the most significant adverse impacts has involved the Lake County and Sonoma County school districts.

Testimony in recent geothermal power plant siting cases has established that nine local school districts have reached or exceeded the design capacities of their facilities. Consequently, any geothermal development which induces immigration into these impacted districts will aggravate the situation. As part of the Geysers Cumulative Impacts proceeding, the CEC staff was requested to develop a general formula, or evidentiary test, which could provide the basis for mitigating significant adverse enrollment impacts attributable to a power plant project.

ANALYSIS

Existing Mitigation Algorithms

Three school impacts mitigation agreements were negotiated between power plant applicants and school districts for the Oxy No. 1 and the DWR South Geysers

siting proceedings. One agreement involved Oxy and Lake county schools; a second agreement, DWR and Lake county schools; and the third agreement, DWR and Sonoma County schools. Significant differences exist between the agreements with Lake County and the agreement with Sonoma County.

Lake County. The Lake County agreements attempt to mitigate adverse enrollment impacts by payment of an annual mitigation fee. The basis for the Lake County fee is the cost of new-school construction per square foot per student (plus an additional cost per student for bus transportation). The mitigation fee directly relates to the cost of providing additional permanent facilities.

The Lake County agreements require an identification of all students having at least one parent directly or indirectly employed by the geothermal industry. The procedure used to identify these students involves comparison of employee lists submitted by power plant operators and annual student surveys conducted by the school districts.

Based on these documents and other school enrollment records, the school districts derive student "units," which are a total of all project-specific students and a specified percentage of geothermal-related students. The number used to calculate the actual mitigation payment is the increase, if any, between the current year and the highest number previously surveyed. For example, if the current survey identified 16 student "units" and if the highest previous survey identified 12 student "units," then the number to be used in calculating the current mitigation payment would be "4." If the current survey had identified a number less than the number in the highest previous survey, then no mitigation payment would be required for the current year. This provision is intended to ensure that the mitigation payment is only collected once for each student attributable to a specific project.

To determine the actual mitigation payment using the Lake County agreement, the derived student "units" number is multiplied by the estimated cost-per-square-foot-per-student of classroom space and by the allocated amount of classroom space per student. The mitigation payment also includes an additional fee for school bus transportation. This additional fee is calculated by multiplying the derived student "units" number by the pro rata cost of a new school bus.

The Lake County agreements specify expiration dates for the agreements and include provisions for review of the mitigation formula.

Sonoma County. The Sonoma County agreement requires DWR to pay an annual mitigation fee for all students having at least one parent who is "a DWR employee or an employee of a prime construction contractor or subcontractor..." These students are identified through comparison of an employee list submitted by DWR and an annual student survey conducted by local school districts.

The basis for the mitigation fee is the school districts' total local income divided by the average daily enrollment. Since local revenues are not used to build new facilities, the mitigation fee has no relationship to the actual

cost of providing new permanent facilities. The agreement, however, does specify that the annual mitigation payment must be used for capital construction and facility leasing.

The Sonoma County agreement differs with the Lake County agreements in four fundamental respects. First, the mitigation fee has no relationship to actual construction costs. Second, the fee is paid every year for all students directly related to the DWR power plant. No adjustment is made for previous payments. Third, the DWR/Sonoma County agreement provides for mitigation payments for the life of the project. No provision is included to cease payments when school districts no longer have enrollment impacts. Fourth, the agreement does not include payment for students whose parents, while not employed by DWR, are employed in the geothermal-service industry. Consequently, the agreement fails to mitigate enrollment impacts indirectly attributable to the project.

Alternative Mitigation Measures

There are alternative measures other than new school construction, which in some cases could temporarily mitigate the adverse impacts of excess student enrollment. These alternatives include bussing, double-sessions, year-round sessions, and the conversion of administrative offices and student activity areas to classrooms. These measures, although expedient, are believed by educators to have an adverse effect on educational programs. Furthermore, these temporary measures fail to mitigate the long-term enrollment impacts attributable to geothermal development.

STAFF'S ALGORITHM

Concept

Staff adopted the principal concepts of the Lake County agreements as the basis for a general algorithm which could be used to calculate mitigation payments. Staff included several additional concepts to ensure that an applicant pays only the cost of mitigating adverse enrollment impacts directly and indirectly attributable to the proposed project. Excess payment is an unfair burden which ultimately is transferred to the ratepayer. Similarly, an insufficient payment transfers the costs of mitigation measures to the school district and ultimately to the general taxpayers throughout the state.

The staff's algorithm reflects the following concepts:

1. A power plant developer shall be required to mitigate school enrollment impacts directly and indirectly attributable to the proposed project.

2. The mitigation fee is based on each district's current costs of constructing new permanent facilities.

3. The mitigation fee shall include provision, if necessary, for school buses.

4. The mitigation fee shall be a one-time fee for students whose families have relocated to the district since the certification of the project by the CEC.

5. An annual survey shall be used to identify students eligible for a mitigation fee. The survey shall be structured so as to identify both project-specific students and students having parents employed by firms primarily providing ancillary services to the geothermal industry. The survey shall also establish the date of residency in the school district for each student.

6. In order to be eligible for mitigation payments, a school district shall annually certify that it is at, or in excess of, design enrollment capacity and that all reasonable and feasible mitigation measures have been implemented.

Definitions

Project-Specific Students. Project-specific students are those students having at least one parent employed either by a power plant developer/operator or by a firm primarily providing its goods or services to a specific project.

Geothermal-Related Students. Geothermal-related students are those students having at least one parent employed by a firm providing ancillary services to the geothermal industry located in the Geysers KGRA. This category specifically includes firms primarily engaged in exploratory well development, steam field development, waste disposal, water supply, trucking and other transportation, heavy equipment operation, and equipment maintenance and repair, provided that these services are provided to the geothermal industry in general and not exclusively to a specific project.

Assumptions

The CEC staff's algorithm incorporates an assumption used in the Lake County mitigation agreements. The assumption is that the ancillary service firms, considered as a group, provide proportionate support to all the power plants being constructed or operated in the Geysers KGRA. On the basis of 20 geothermal power plant units, each individual unit is responsible for mitigating 5 percent of the enrollment impacts attributable to geothermal-related students. As the number of power plant units increases in coming years, this pro rata share would gradually decrease.

The Algorithm

Staff prefers that an applicant and potentially impacted school districts reach a negotiated agreement without involvement of the CEC. If agreement has not been reached 20 days prior to the start of the evidentiary hearings, CEC staff will request that the issue be adjudicated. Staff will submit testimony proposing that the following general algorithm be used as the basis for calculating mitigation payments for impacted school districts:

> Mitigation Payment = (number of square feet of classroom space allocated per student) x (average construction cost per square foot of classroom space per student) x (number of students qualifying for mitigation).

The "Leroy F. Greene State School Building Lease-Purchase Law of 1976" specifies the maximum amount of square feet to be allocated for children at

various grade levels. The law designates the State Allocation Board as having "...full charge of the acquisition, construction, completion, and control of all [school construction] projects..." funded by the State of California (Education Code Section 17712). The State Allocation Board has adopted an extensive set of administrative regulations implementing the provisions of the Leroy Greene State School Building Lease-Purchase Law of 1976. The Board, in reviewing school district applications, annually determines appropriate construction costs for each school district in the state. The third element of the algorithm--number of students qualifying for mitigation--would be determined using the annual student survey conducted by impacted school districts, as well as such other information as may be readily available.

A separate algorithm is used to calculate an additional mitigation payment for school districts which use school buses to transport students. This algorithm is:

> Bus Mitigation Payment = (pro rata cost per student of a bus) x (number of students qualifying for mitigation).

A hypothetical example using both the general algorithm and the bus mitigation algorithm is attached.

CONCLUSIONS

Several conclusions can be reached regarding school enrollment impacts associated with geothermal development in the Geysers-Calistoga KGRA.

1. At least nine school districts in Lake County and Sonoma County have reached or exceeded the design capacities of their facilities. This situation has arisen, in part, due to immigration of workers employed by the geothermal industry.

2. Feasible administrative remedies have been implemented by the impacted school districts. These measures include double sessions and the conversion of administrative offices and student activity areas to classrooms. These expedient measures, however, do not provide a long term solution to the problem.

3. The state's program to provide permanent facilities has not been responsive to the needs of Lake County and Sonoma County school districts.

4. A power plant siting applicant has a responsibility to mitigate school enrollment impacts directly and indirectly attributable to the proposed project.

5. The staff's algorithm provides an equitable basis for calculating the mitigation payment needed to construct new permanent facilities and to purchase new school buses.

Based on the foregoing, staff has adopted the following policy:

1. A formal agreement, negotiated between the power plant applicant and the local school districts, is the preferable method of mitigating the

adverse effects of geothermal development on school enrollments. This agreement should be reached prior to the submission of an application for certification of a power plant.

2. School districts shall be responsible for conducting an annual survey identifying students eligible for a mitigation fee. The survey shall be structured to identify both project-specific students and students having parents employed by firms primarily engaged in providing ancillary services to the geothermal industry. The survey shall also establish the date of residency in the school district for each student.

3. The mitigation fee shall be used to help construct new permanent facilities. In order to be eligible for mitigation payments, a school district shall annually certify that it is at, or in excess of, design enrollment capacity and that all reasonable and feasible mitigation measures have been implemented.

4. The use of staff's algorithm will be proposed by staff as a condition of certification in CEC power plant siting proceedings if agreement cannot otherwise be reached between the applicant and impacted school districts. If a school enrollment impacts mitigation agreement has not been negotiated 20 days prior to the start of the evidentiary hearings, staff will request that the matter be adjudicated as an issue during the evidentiary hearings. Evidence would be submitted to the Commission committee by CEC staff, the applicant, and affected school districts regarding the need for mitigation payments, the current cost of constructing new permanent facilities, and the cost of purchasing new school buses.

5. When use of the school enrollment impacts algorithm is required as a condition of certification, staff will propose an appropriate compliance requirement. This compliance requirement will require that the school enrollment impacts algorithm be used to calculate the mitigation payment, and, following billing by the impacted school districts, that the applicant verify to the CEC that payment has been made.

6. Staff recommends that the counties consider use of the school enrollment impacts algorithm as one possible approach to be used when approving use permits for steam field development.

EXAMPLE

GIVEN: a) $65 is the construction cost per square foot per student.

b) 55 square feet is the classroom space allocated per student.

c) $1,000 is the pro rata cost per student for a school bus.

d) An individual power plant unit is responsible for a 5 percent share of all geothermal-related students.

ANNUAL SURVEY RESULTS

	Project-specific students enrolled since approval of project			Geothermal-related students		
	1979	1980	1981	1979	1980	1981
Project	10	8	14	29	33	43

The project-specific student number for 1981 would be "4." This is the positive difference between the highest previous survey (in 1979) and the current survey. (In 1980, Project A would not have had to pay for any project-specific students.)

The geothermal-related raw student number for 1981 is "10." This is the positive difference between the highest previous survey (in 1980) and the current survey. This raw number is then multiplied by 5 percent to determine Project A's share of the mitigation payment for geothermal-related students. Project A's share is "0.5" geothermal-related students.

The project-specific number and the geothermal-related derived number are then added together to be used in the algorithm.

Using the Algorithm

Classroom Mitigation Payment = (number of square feet of classroom space allocated per student) x (average construction cost per square foot of classroom space per student) x (number of students qualifying for mitigation).

Classroom Mitigation Payment = (55) x ($65) x (4.5) = $16,087.50.

Bus Mitigation Payment = (pro rata cost per student of a bus) x (number of students qualifying for mitigation).

Bus Mitigation Payment = ($1,000) x (4.5) = $4,500.

Total Mitigation Payment by Project A in 1981 = $20,587.50.

APPENDIX B

STAFF POLICY REGARDING THE MITIGATION OF GEYSERS ROADS IMPACTS

STAFF POLICY REGARDING MITIGATION OF GEYSERS ROADS IMPACTS

by

Brian Bell, Steve Williams, and Norman Wilson

January 1983

Environmental Office
Siting and Environmental Division
California Energy Commission

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ABSTRACT

Increased geothermal development activity in the Geysers-Calistoga KGRA has resulted in significant adverse impacts to local public roads. Traditional funding mechanisms are inadequate to mitigate these impacts.

This paper examines three alternative mechanisms--formal agreements, county use permits, and performance bonds--and presents a staff algorithm which will be proposed for use in CEC power plant siting proceedings in the event that a power plant applicant and an impacted county are unable to negotiate a formal mitigation agreement. The algorithm provides a basis for annual mitigation payments which equitably allocate extraordinary maintenance costs among users of public roads in the Geysers KGRA.

STAFF POLICY REGARDING MITIGATION OF GEYSERS ROADS IMPACTS

INTRODUCTION

The California Energy Commission (CEC) has the responsibility of ensuring that the state has a reliable, efficient, and environmentally sound energy system. As a part of fulfilling this responsibility, the CEC is charged with the review and approval of new thermal power plants.

In reviewing new power plant applications, the CEC considers the design, construction, and operation of the proposed plant. Engineering, physical, environmental, economic, and socioeconomic factors are analyzed. Potential impacts and mitigation measures to eliminate or reduce impacts to an acceptable level are identified. In issuing a certificate for the plant, the CEC attaches conditions specifying measures to mitigate any adverse impacts.

Geothermal power is one of the preferred power generating technologies identified by the CEC. The Geysers-Calistoga KGRA constitutes one of the major areas with geothermal resources. Increased development activity in the Geysers KGRA, including new power plants, has resulted in increased socioeconomic impacts. One of the most significant adverse impacts has involved the roads leading into and serving the Geysers area. The cumulative impact of the heavy construction traffic associated with geothermal development has resulted in significant degradation of roads and increased maintenance.

County road construction, maintenance, and repair is one of the primary functions of county government. In Fiscal Year 1979 - 1980, Lake, Mendocino, Sonoma, and Napa counties spent $18.7 million dollars on "public ways and facilities." This amount was approximately 11 percent of the counties' total expenditures for the fiscal year.

Geothermal development in the Geysers-Calistoga KGRA has resulted in increased local traffic. The volume of traffic has increased in a direct relationship with major geothermal development activity. A major part of this traffic consists of heavy truck traffic, which has imposed severe stresses on the local road network (see map). Much of this network consists of county roads intended for light duty traffic and not designed for heavy truck traffic. Consequently, these county roads have experienced extraordinary maintenance and repair costs in excess of planned costs for these types of roads.

Extraordinary maintenance for both Lake and Sonoma counties, the counties currently experiencing increased road maintenance costs as a result of heavy geothermal traffic, is defined as any maintenance required over and above the county-wide average cost for maintaining paved roads. Typically, where maintenance agreements have been reached, provision has been made to index maintenance costs to a mutually acceptable standard, such as the San Francisco-Oakland area Consumer Price Index or Engineering News Record Marketing Trends Construction Cost Index. County procedures do not normally include a specific accounting for every road. When Extraordinary Maintenance Agreements are used in Lake County special accounting is required for each road involved.

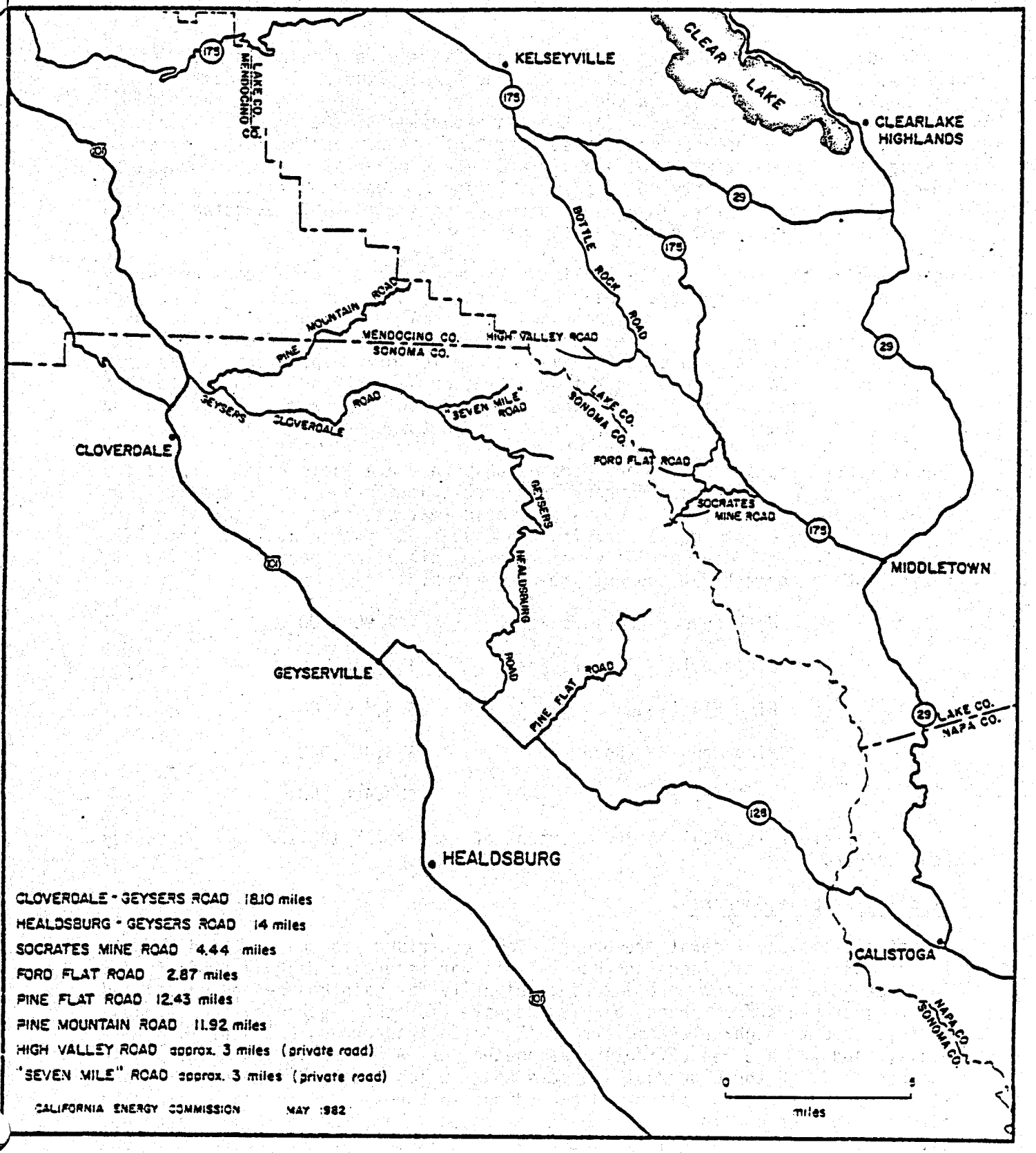
The extraordinary road maintenance and repair costs associated with geothermal development in the Geysers-Calistoga KGRA cannot be satisfied using traditional county funding mechanisms. Road funds cannot be shifted from existing projects without significantly disrupting needed construction and repairs in other parts of the county. Similarly, any major shift of funds to the road budget from other county programs would adversely impact those other programs.

This paper examines several methods which could be used to mitigate the adverse impacts on roads attributable to geothermal development in the Geysers-Calistoga KGRA. Mitigation measures will be necessary until such time as those state and local agencies having jurisdiction can allocate sufficient funds to reconstruct the roads to the standard needed for geothermal industrial traffic.

Road Conditions

Healdsburg-Geysers, Cloverdale-Geysers, and Socrates Mine roads are the most severely affected because of the pattern of geothermal development. As exploration expands into other sections of the KGRA, additional roads are expected to experience the same type of impacts. County roads would include Pine Mountain, Pine Flat, Bottle Rock, Highland Springs, Dry Creek, and Western Mine roads. Private roads would include High Valley and "Seven Mile" roads. Portions of Bottle Rock and High Valley roads are being reconstructed by the Department of Water Resources. This reconstruction should mitigate the effects of geothermal development.

GEYSERS - CALISTOGA K. G. R. A.



CLOVERDALE - GEYSERS ROAD 18.10 miles
HEALDSBURG - GEYSERS ROAD 14 miles
SOCRATES MINE ROAD 4.44 miles
FORD FLAT ROAD 2.87 miles
PINE FLAT ROAD 12.43 miles
PINE MOUNTAIN ROAD 11.92 miles
HIGH VALLEY ROAD approx. 3 miles (private road)
"SEVEN MILE" ROAD approx. 3 miles (private road)

CALIFORNIA ENERGY COMMISSION MAY 1982

EE-73 GEYR

Sonoma County and Lake County roads are the most severely degraded. In Sonoma County, in spite of increased maintenance expenditures in recent years, degradation on some roads has progressed to the point where major reconstruction and repairs are necessary for the safe passage of the traffic. In Lake County, Socrates Mine Road, the worst situation, is currently being corrected through an agreement with the county and the geothermal users. Impacts to roads in Mendocino County are just beginning to occur due to exploration activities, and similar impacts and road degradation are expected as the result of increased geothermal development.

According to the Sonoma County Public Works Department, those roads presently needing reconstruction are the Healdsburg-Geysers and Cloverdale-Geysers roads. In addition, Pine Mountain Road in Sonoma and Medocino counties will need reconstruction if current exploration activity justifies geothermal resource development. In Lake County, the Public Works Department states that those roads which will need work if exploration should result in development include Dry Creek, Western Mine, and Highland Springs roads. There are no roads in Napa County needing reconstruction due to geothermal traffic.

The costs of reconstruction are considerable and available county funds are inadequate to pay for these extraordinary construction and repair costs. For example, Sonoma County Public Works estimated that the costs of reconstructing the four Sonoma County roads serving the Geysers-Calistoga KGRA to a traffic wear index which would minimize maintenance given the heavy truck traffic typical of geothermal development are as follows.

Healdsburg - Geysers Road	$ 7,900,000
Cloverdale - Geysers Road	$12,600,000
Pine Flat Road	$ 5,500,000
Pine Mountain Road	$ 3,400,000
Total	$29,400,000

This cost alone is equal to 300 percent of the total 1981-82 Sonoma County road budget.

Existing Revenue Sources

Existing state and federal revenues which contribute to county road budgets include state gas tax funds and Federal Aid for Secondary Highway (FAS) funds. The state gas tax funds are intended primarily for maintenance purposes, and in recent years have been barely adequate for this purpose. FAS funds, administered through Caltrans, are available to those roads which (1) are eligible, and (2) are specifically designated as FAS roads. The Healdsburg-Geysers Road and the Cloverdale-Geysers Road, which are most in need of reconstruction, are not so designated according to Sonoma County and may not be eligible for designation. It should be noted that, according to Caltrans, extension of the FAS program is uncertain at this time. The program may continue at present levels, be reduced, or be eliminated entirely.

Lake, Mendocino, and Napa counties currently fund capital road construction costs solely on the basis of revenues received from the state and federal governments. Sonoma County is able to supply some county funds for capital road improvements as a result of state "bailout" funds. Essentially, the road budgets for all four counties are for maintenance of existing roads.

Sonoma and Mendocino counties recently began to utilize the use permit process to require developers, whose projects will substantially affect existing county maintained roads, to pay for major improvements which will bring those roads up to a standard that will enable the road to withstand the changed traffic conditions. Lake and Napa counties, at present, do not generally include such conditions in their use permit process.

An obvious source of new funds would appear to be the property taxes attributable to geothermal development. For several reasons, these revenues cannot fund the extraordinary road construction and repair costs.

First, road reconstruction should occur prior to the start of geothermal development construction. Otherwise, nondesign traffic loads will exacerbate existing conditions. Yet, at the time of need for reconstruction funds, a yet-to-be-built geothermal facility is not paying any significant property tax. Some facilities, in fact, will never pay property taxes since the facilities are owned and operated by tax-exempt government agencies.

Second, property taxes account for less than 25 percent of the total general revenues for the four KGRA counties. In the two counties whose roads have been most extensively affected by geothermal development, property taxes account for a very small portion of the road budgets. In Sonoma County the 1980-81 road budget was $9.4 million, which included $3.5 million derived from property taxes. For 1981-82 the Sonoma County road budget was $10 million, with $5.4 million derived from property taxes. In Lake County the 1979-80 road budget was $2.68 million, with $410,000 derived from property taxes. In 1980-81 the Lake County road budget was $3.97 million, with $220,000 derived from property taxes. For both counties the figures include both construction and maintenance costs, and geothermal related roads are included with all other county roads. In the current economic recession, any increase in property taxes tends to be off-set by corresponding decreases in other revenue categories. Particularly critical have been the reductions in state and federal funding for county programs.

Third, property taxes cannot provide a significant new source of funds because of the limitations contained in Proposition 4. Adopted in 1979 by voters of the state, Proposition 4 was designed to limit spending by the state and local governments. Each year the total annual appropriations of a local government cannot exceed the appropriations of the prior year (as adjusted for changes in the cost of living and population), unless approved by the voters or except in an emergency. The practical effect of Proposition 4 is that property tax rates countywide will be lowered as major geothermal facilities come on line. Consequently, the net effect is no change in total property tax revenues. Even though a greater proportion of property taxes may come from geothermal facilities, the amount of funds available in the county budget for road construction and repairs will remain unchanged. Thus, road repair projects must compete with other county programs for funding priority. Any increase in the roads budget must be matched by a corresponding decrease in some other budget.

Inasmuch as many county programs are mandated by federal or state law, county supervisors have limited discretion in shifting funds to road projects. A recent newspaper article estimated that only 15 percent of a county budget could be considered to be discretionary.

Alternative Funding Mechanisms

Mechanisms which are used in other areas to solve similar situations include: (1) formalized agreements, (2) county use permits, and (3) performance bonds.

Formalized agreements. The United States Forest Service (USFS), in its administration of the National Forests, experiences situations where heavy truck traffic associated with commercial users must utilize a variety of roads. Construction of USFS roads is handled through normal government budget procedures. Road maintenance involves a formal Cooperative Agreement system. The agreement apportions the maintenance of the subject roads on a proportionate basis between the USFS and the Cooperators. As part of the agreement, an Annual Maintenance Plan is developed which identifies the roads covered, the expected traffic, the expected maintenance (either traffic or nontraffic generated), and costs. The maintenance plan also assigns responsibility for carrying out maintenance and requires an annual estimate summarizing the traffic over the road. In developing the maintenance plan, and in assigning proportionate shares, consideration is given to a variety of factors, including: the design service level of road, road length, type and volume of traffic, loads, expected maintenance by subcategories for traffic and nontraffic generated repairs, and payment options. The agreement also defines "extraordinary damage" and provides for restoration required as a result of unexpected natural occurrences. Third party Cooperators, or other commercial users included as part of "National Forest Traffic," are covered by other agreements, permits, or contracts so as to cover their proportionate share of total maintenance costs.

Lassen and Humboldt counties also use the agreement approach in conjunction with timber sales. Humboldt County enters into cooperative agreements with either the USFS or private timber companies. These maintenance agreements are generally concerned with light duty or unimproved (no structural base) roads. When unexpected damage occurs that is not covered by an agreement, maintenance is covered with budgeted road maintenance funds. Lassen County also enters into cooperative agreements with the USFS covering county roads involved in timber sales. The agreements provide for improvements and maintenance to the standards set by the USFS in conjunction with its own roads involved in the timber sale. When a subsequent user uses the same road, the county is limited to requesting that the latter user participate proportionately in the maintenance of the road.

The advantages of such a formalized agreement are as follows:

1. The agreement can be tailored to meet the specifics of the road situation, taking account of geographic conditions and proposed uses.

2. It identifies the specific existing condition of the road, i.e., structural section, alignment, volume of traffic, etc.

3. It identifies the items of maintenance or reconstruction to be covered by the agreement, the maintenance measures to be taken, and their anticipated costs.

4. The agreement assigns proportionate shares of the costs to the users.

5. Because the parties know the requirements and their costs in advance, costs can be budgeted into the overall project costs.

6. Potential use and impacts can be planned for in advance of their occurrence.

The disadvantages of the formal agreement are as follows:

1. The process may be time consuming due to difficulties in agreeing to the measures required and their extent, and also in agreeing to assignment of proportionate shares.

2. The agreement requires sufficient lead time prior to the proposed use for the agreement to be negotiated and signed.

3. The agreement may not anticipate, or accommodate, unusual road repairs which might be necessary.

County Use-permits. Mendocino County uses an approach which applies to unimproved roads having posted load limits, usually 9 tons. If this load limit will be exceeded, the hauler must obtain a county use permit which requires participation in the maintenance of the roads. The degree and nature of participation is negotiated with the county.

The advantages of the use permit approach are as follows:

1. The use permit process is an established procedure at the local level with which geothermal applicants are familiar.

2. The permit can be tailored to the requirements of the specific roads being considered.

3. It can be issued for a specific, limited time at the end of which it is subject to review and renewal.

4. It retains local jurisdiction, with road conditions being considered by those most closely familiar and concerned with them.

5. The process involves scheduled hearings involving public participation at the local level.

Disadvantages of the use permit include:

1. It is only useful where the county agency concerned has jurisdiction and authority.

2. It is only useful if required by ordinance. If an ordinance does not cover the situation adequately, then a situation may arise where

excessive damages can occur without a mechanism for proportionate sharing of costs.

3. It may require an unknown dollar amount to satisfy the required conditions. The applicant is placed in the position of not knowing costs and consequently not being able to budget for them.

4. The required hearing process is subject to appeals and delays.

Performance Bonds. A dual approach is used by Shasta County, usually in conjunction with timber sales, for unimproved roads. In advance of the sale, a meeting is held between county staff and potential users. The meeting, in conjunction with a site visit to the road in question, determines the maintenance requirements needed. A performance bond is then posted by the user, who is responsible for ordinary and extraordinary maintenance. Depending on the length of use, either periodic inspections or a final inspection are conducted. If a periodic inspection determines that the condition of the road is not acceptable, repairs must be made at the expense of the user. On final inspection, following termination of use, the bond is refunded if the condition of the road is acceptable. When a road has been determined by the county to be substandard, a use permit is required. As a part of this permit, conditions may be imposed requiring participation in maintenance.

Advantages of the bonding process are:

1. The process is relatively informal compared to other processes, and agreements on the nature and extent of maintenance requirements, and the amount of the bond can usually be reached quickly.

2. Once agreement is reached and bond is posted, maintenance becomes the responsibility of the user.

3. Minimum dollar investment is required up front with expenditures occurring as needed.

4. Both anticipated and extraordinary costs are accommodated.

Disadvantages of bonding are:

1. Uncorrected damages requiring repair costs in excess of the bond may have to be assumed by the local jurisdiction.

2. Performance bonds are generally limited to situations involving only a single user of a road.

3. A requirement for periodic inspection of performance exists.

4. The willingness of the applicant to take the initiative in correcting problems is assumed. Preventive maintenance may be neglected to the eventual detriment of the road.

5. Generally there is no public scrutiny of, or participation in the proceedings.

ANALYSIS

The roads in the Geysers-Calistoga KGRA area range from state highways to graded county roads. The volumes and types of traffic on the roads have resulted in a variety of maintenance problems. Solutions to some existing problems have included portions of the methods described above.

Socrates Mine Road had suffered significant deterioration as a result of geothermal traffic. An agreement was entered into in August 1981 between Lake County and Aminoil (representing a group of road users) for the reconstruction and maintenance of the road. The agreement defined who would pay for reconstruction, who would be responsible for ordinary maintenance, and who would be responsible for extraordinary maintenance. This agreement is similar to the formalized agreement process used by the USFS and other counties. The agreement defines in advance the nature and extent of roadwork required, assigns responsibility for reconstruction and maintenance, and provides for funding extraordinary maintenance in the future if maintenance levels exceed those planned for in the road design. It demonstrates that an approach used widely in areas other than the Geysers can be successfully applied in the Geysers, and that it can be successfully used for a variety of users including both steamfield developers and power plant operators.

Another instance of the agreement approach is Bottle Rock Road. In this case the agreement is between Lake County and a single power plant operator, the California Department of Water Resources. As in the Socrates Mine Road agreement, required improvements were agreed upon, but in this case an added feature is that, in the case of future geothermal users, the county will support DWR in efforts to obtain reimbursement for proportionate shares of the improvement costs.

The agreement approach was also used for Healdsburg-Geysers Road. Sonoma County and DWR, in conjunction with the South Geysers project, negotiated an agreement on payment of $900,000, which was the sum of the individual costs of specific improvement and repair projects to the road.

The bonding approach deals with the planned use of roads not presently utilized, but cannot solve the problems of those roads already receiving heavy use. A modification of the bond approach was used in conjuction with potential use of Healdsburg-Geysers Road by the Sacramento Municipal Utility District for construction of the SMUDGEO #1 plant. The original condition of the CEC Decision was to have SMUD make a payment, based on a formula agreed to by Sonoma County and SMUD, assuming a certain level of use, to mitigate impacts to the road resulting from construction traffic. SMUD subsequently requested relief from the payment on the basis that SMUD would not be using the Healdsburg-Geysers Road. Sonoma County insisted that the condition required SMUD to make the payment even if the road were not used, subject to proportionate refund depending on actual use at the end of construction. After considering the matter, and having been notified by SMUD that it will not use the Healdsburg-Geysers Road for construction traffic, the CEC voted to permit SMUD to post a payment bond with the County of Sonoma in full satisfaction of the payment requirements.

The permit approach has been used in Sonoma county, since January 1981 for all steamfield use permits, to require participation in Healdsburg-Geysers Road improvements. Prior to this date, permits, most notably for Union Oil, did

not contain this condition. The permits require the developers to join a special assessment district, if established, or to participate in such other means of upgrading the road as may be established. It is doubtful that a special assessment district could be formed because steamfield operators have apparently incorporated a requirement that the landowner assume responsibility for the cost of assessments. A district requires considerable time and effort to organize, and can be defeated by majority protest. Protest votes are based on assessed valuation, and the county does not normally go through the time and expense involved in forming a district unless it knows there will be no protest. In the case of Geysers-Healdsburg Road, the county received indications that a majority of property owners would protest the formation of an assessment district.

The approach of funding all road improvements and maintenance from regular budgetary processes seems to work satisfactorily where a road is experiencing planned levels of service. When traffic conditions vary significantly from planned conditions, extraordinary maintenance may be required. Under the strict budgetary approach, either a supplemental appropriation or an enlarged budget for a subsequent year would be required. Given the limited fiscal resources of most counties, this would require a showing of great need in competition with many other projects throughout the county. This may be difficult for a road serving a rural area with few residents and having lower overall traffic than competing roads.

Road Maintenance Algorithm

Staff proposes that the following algorithm be used as the basis for calculating the annual road mitigation fee for a specific road. The applicant's total mitigation payment would be the sum of the mitigation fees required for each road used by project truck traffic.

Mitigation fee = (project trips per year) x (percent of use) x (cost per trip).

An annual survey, based on information provided to the counties by geothermal road users, and road department maintenance cost records will be needed to obtain the data to be used in the algorithm. The responses to the survey would be used by the county to determine new projects, changes in project category, and percentage of road use. Each project's road maintenance fee will be calculated annually based on estimated traffic and actual extraordinary maintenance costs.

The three elements of the algorithm are determined as follows:

1. "Project trips per year"--Determine the total number of trips generated over a hypothetical project's lifetime for each of three different categories of projects: geothermal well exploration and development projects; power plants under construction; and power plants in operation. Divide each total number by the category's lifetime. (Assumption: geothermal well development projects have a 2-year lifetime; power plants under construction, 3-year lifetime; and power plants in operation, 30-year lifetime. If a particular project differs from these lifetimes this could be determined at the time of the first reporting period.) This element of the algorithm should remain constant from year to year.

2. "Percent of use"--Each project involved in a road maintenance agreement shall annually identify which roads are being used by the project and the percentage of project traffic associated with each road. An adjustment must also be made for this element of the algorithm if the project does not use the full length of the road. In such a case, the "percent of use" must be multiplied by the "percentage of road used."

   As an example, if a project uses a particular road for 20 percent of the time, but only travels half the length of the road, the factor to be used in the algorithm would be ".10" (20 percent times .5). This element of the algorithm would be subject to annual change in direct response to any changes in a project's pattern of road use.

3. "Cost per trip"--This element of the algorithm represents the extraordinary maintenance costs associated for a specific road divided by the number of trips involving all projects using the road. The extraordinary maintenance costs are determined from the county's road maintenance records. The data are not projected costs, but rather are actual costs for the previous year.

The use of projected costs was considered by CEC staff, but rejected for two primary reasons. First, the system is complicated, requiring not only the annual review of the previous year's costs, but also a debit/credit system for each project's account based on the previous year's mitigation payment. A second problem with projected costs is the temptation for the county to project high costs in order to utilize the extra interest realized on one year's use of unneeded mitigation fees. Even though the excess may be credited to the project's account at the end of the year, the potential exists for the cycle to repeat itself with the county again projecting high costs. For these reasons, staff recommends that actual costs be used in the algorithm.

Once extraordinary maintenance costs have been determined for a specific road, the remaining step in calculating "cost per trip" is determining the number of trips involving all projects using the road. This number is the sum of the individual project trips determined by multiplying the category constant for each project (the first element of the algorithm) by the "percent of use" factor for each project (the second element of the algorithm). As an example, consider the following table:

	ROAD X		
	(Category Constant)	x (Percent of Use)	= Project Trips
Project A	100 trips	20%	20
Project B	10 trips	100%	10
Project C	50 trips	100%	50
Project D	50 trips	50%	25
		Sum Total:	105 Trips

In the above example, 105 trips would be used as the basis for calculating the average extraordinary maintenance costs per trip for "Road X." Assuming extraordinary maintenance costs of $3,150 for the previous year, the average "cost per trip" would have been $30. Obviously, this element is very sensitive to the number of projects using a particular road, the percentage of

use by each project, the type of project, and the road's extraordinary maintenance costs.

This algorithm represents an equitable approach to the problem of mitigating road maintenance impacts. Mitigation fees are based on actual costs associated with specific roads, and the fees are allocated to the users based on frequency of use.

Although the CEC can only exercise jurisdiction over power plant siting applications, the same approach could be used by county governments when granting steamfield development use permits. Permit conditions could require participation in extraordinary road maintenance agreements for projects using roads affected by geothermal traffic. The counties also have the prerogative of requesting the California Division of Oil and Gas to require participation by geothermal exploratory well applicants in similar maintenance agreements.

If maintenance agreements could be required for all projects involved in geothermal exploration and development in the Geysers-Calistoga KGRA, the adverse impacts on the local road system would be largely mitigated.

CONCLUSIONS

Several general conclusions can be reached regarding road maintenance and reconstruction in the Geysers-Calistoga KGRA.

1. The county roads providing access to the KGRA were not designed to handle geothermal/industrial type traffic. As a result, these roads have progressively deteriorated, as a consequence of increasing geothermal development and increasing heavy traffic, requiring either extraordinary maintenance or reconstruction.

2. The most seriously affected roads are Healdsburg-Geysers Road and Cloverdale-Geysers Road in Sonoma County, and Socrates Mine Road in Lake County. Socrates Mine Road has been reconstructed.

3. With exploration and expansion of development, Pine Mountain, "Seven-Mile," Pine Flat, Bottle Rock, and High Valley roads will experience the same effects.

4. Extraordinary maintenance, as defined by Lake and Sonoma counties, is any maintenance required over and above the county-wide average cost for maintaining paved roads.

5. Because of post-Proposition 13 changes, the counties no longer have the funding flexibility to handle both capital reconstruction costs and extraordinary maintenance costs. In most cases the counties cannot adequately handle extraordinary maintenance costs.

6. Several approaches are available to cope with extraordinary maintenance costs including formalized agreements, county use permits, and performance bonds.

7. Extraordinary maintenance fees can be equitably assessed, and would be an ongoing expense as long as extraordinary costs are incurred.

8. Extraordinary maintenance costs will be significantly reduced when roads are reconstructed to an industrial-use standard.

9. A power plant proponent has responsibility to mitigate adverse road impacts attributable to the proposed power plant.

Based on the foregoing, Staff has adopted the following policy:

1. In the case of extraordinary maintenance, the formalized agreement approach is the preferable method of mitigating the adverse effects of geothermal development on the roads in the KGRA. This agreement should be reached prior to the submission of an application for the permitting of steamfield development and certification of a power plant.

2. The use of staff's extraordinary maintenance algorithm will be proposed as a condition of certification in CEC power plant siting proceedings if agreement cannot otherwise be reached between the applicant and the affected county. If a road maintenance agreement between the applicant and the affected county has not been negotiated 20 days prior to the start of the evidentiary hearings, staff will request that the matter be adjudicated as an issue during the evidentiary hearings. Evidence would be submitted to the Commission committee by CEC staff, the applicant, and the county regarding the specific roads anticipated to be used for the project, the percentage of project trips using each road, and the ordinary and extraordinary maintenance costs associated with each road.

3. When use of the extraordinary maintenance algorithm is required as a condition of certification, staff will propose an appropriate compliance requirement. This compliance requirement will require that the extraordinary maintenance algorithm be used to calculate the mitigation payment, and, following billing by the county, that the applicant verify to the CEC that payment has been made.

4. All projects subject to a road maintenance agreement should be surveyed by the county annually on July 1st. Bills should be mailed on or before September 1st.

5. County public works departments shall be responsible for maintaining accurate road maintenance cost records and for calculating the annual mitigation fee due from each participating project.

6. Staff recommends that the counties consider use of the extraordinary maintenance algorithm as one possible approach to be used when approving use permits for steamfield development.

APPENDIX C

'LAKE COUNTY WATER SUPPLIERS OF OVER 200 CUSTOMERS

APPENDIX C

LAKE COUNTY WATER SUPPLIERS OF OVER 200 CUSTOMERS

This appendix provides a brief summary of the service status for the 15 Lake County water suppliers having 200 or more active customers. The letters identifying each supplier correspond to those used in Figure C. 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 hookups): This district supplies water for residential and commercial use and for fire protection; system capacity now is 325 to 350 gallons per minute; with a reservoir and a back-up pump the system could serve up to 500 to 550 hookups. In March 1981 the Lake 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 hookups): This company is comprised of five separate systems formerly providing service to seasonal 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 C, 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 hookups): This 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 in the summer of 1980 and district is negotiating with a

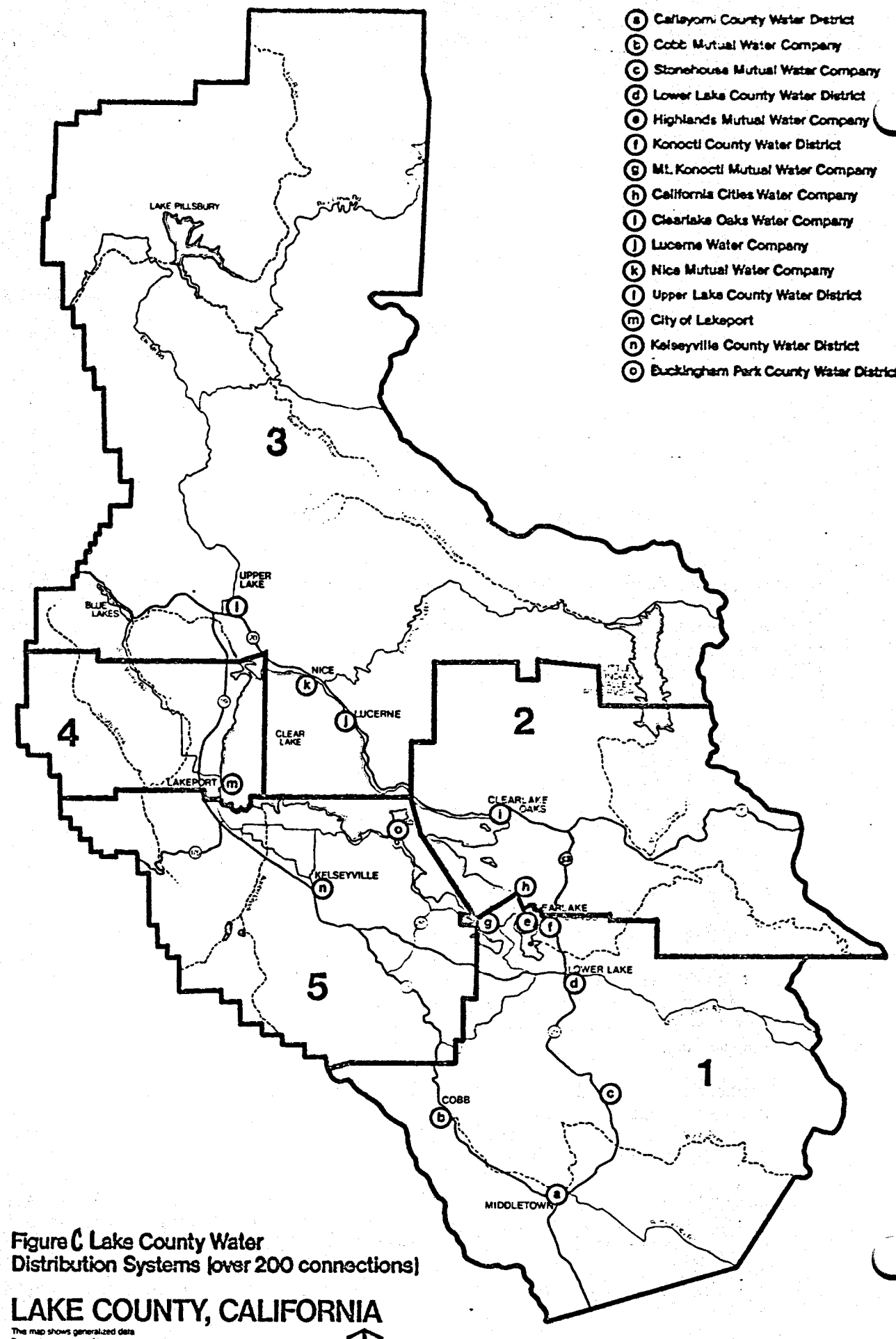


Figure C Lake County Water Distribution Systems (over 200 connections)

LAKE COUNTY, CALIFORNIA

This map shows generalized data. Detailed maps are on file with the Lake County Planning Department. 0 10,000 20,000 feet

Sedway/Cooke

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

developer to get a 1 million gallon storage tank. In May 1981 the Lake 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 hookups): This company currently providing 0.5 million gallons per day and anticipates future demand of 1.7 million gallons per day; upgrading purification plant and adding a new 2 million gallon storage tank; relatively unlimited service potential.

f. Konocti County Water District (1,235 active hookups): This district's peak summer demands of 300 to 325 gallons per minute 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 gallons per minute.

g. Mt. Konocti Mutual Water Company (450+ active hookups): This company 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 gallons per day, and capacity is 400,000 - 430,000 gallons per day.

h. California Cities Water Company (1,950+ active hookups): The average demand over past 3 years has been 730,000 gallons per day; storage capacity is 701,000 gallons per day, and pumping capacity is 1,008,000 gallons per day.

i. Clear Lake Oaks County Water District (3,000+ active hookups): This district provides water and sewer service; system pumping capacity of 500 gallons per minute 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 hookups): This company 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 hookups of 2 per month; district has applied for a loan to build a new treatment plant with a 500 gallons per minute capacity.

k. Nice Mutual Water Company (600+ active hookups): This company 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 hookups): This district 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): The 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 hookups): The 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 hookups): This company 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 D

RAW DATA ON WORK FORCE REQUIREMENTS

TABLE D-1

ESTIMATED POWER PLANT CONSTRUCTION WORK FORCE REQUIREMENTS IN THE GEYSERS KGRA 1979 - 1995

		PGandE 12-15,17,18	NCPA 2	SMUD Geo#1	DWR B.R.	OXY 1	PGandE 16	NCPA 3	DWR S.G.	PGandE 20	PGandE 19	PGandE 22	PGandE 21	PGandE 23	CCPA #1	MID/ Shell	CCPA #2	PGandE 24	SCENARIO 1 TOTALS	Geo. A	Geo. B	Geo. C	Geo. D	Geo. E	Geo. F	Geo. G	SCENARIO 2 TOTALS	
1979	M	275																	275								275	M 1979
	J	290																	290								290	J
	S	200																	200								200	S
	D	220																	220								220	D
1980	M	280	30																310								310	M 1980
	J	200	10																210								210	J
	S	160	25																185								185	S
	D	150	70																220								220	D
1981	M	90	90		10														190								190	M 1981
	J	25	50	35	20														130								130	J
	S	140	50	70	30														290								290	S
	D	230	50	70	40														390								390	D
1982	M	215	60	85	45														405								405	M 1982
	J	195	30	105	40	30													400								400	J
	S	195	15	125	65	75	20												485								485	S
	D	155	10	125	70	175	35												570								570	D
1983	M	85		100	85	215	20	25	65										595								595	M 1983
	J	20		75	85	215	30	30	45	20									520								520	J
	S			50	95	180	85	35	40	35									530								530	S
	D			25	75	105	105	50	25	20									405								405	D
1984	M				50	40	85	130	45	30									380								380	M 1984
	J				15	20	85	140	30	85									375								375	J
	S						105	135	35	105									380								380	S
	D						65	115	25	85									290								290	D
1985	M						50	75	25	85									235								235	M 1985
	J						25	20	25	105									175								175	J
	S							10	10	65		20							105								105	S
	D								10	50	35	35							130								130	D
1986	M								16	25	70	20	20						151								151	M 1986
	J										70	30	35						135								135	J
	S										85	85	20	20					210								210	S
	D										105	105	30	35	35				310								310	D
1987	M										125	85	85	20	70				385								385	M 1987
	J										125	85	105	30	70				415								415	J
	S										100	105	85	85	85				460								460	S
	D										75	65	85	105	105	35	35		505								505	D
1988	M										50	50	105	85	125	70	70		555								555	M 1988
	J										25	25	65	85	125	70	70		465								465	J
	S												50	105	100	85	85	20	445								445	S
	D												25	65	75	105	105	35	410								410	D
1989	M													50	50	125	125	20	370								370	M 1989
	J													25	25	125	125	30	330	35	20						385	J
	S															100	100	85	285	70	35						390	S
	D															75	75	105	255	70	20						345	D
1990	M															50	50	85	185	85	30						300	M 1990
	J															25	25	85	135	105	85	35	20				380	J
	S																	105	105	125	105	70	35				440	S
	D																	65	65	125	85	70	20				365	D
1991	M																	50	50	100	85	85	30				350	M 1991
	J																	25	25	95	105	85	85	35	20		365	J
	S																			50	65	105	85	70	35		450	S
	D																			25	50	125	85	70	20		375	D
1992	M																					100	85	85	30		325	M 1992
	J																					95	85	105	85	35	425	J
	S																					50	65	125	85	70	415	S
	D																					25	50	125	85	70	355	D
1993	M																							100	85	85	295	M 1993
	J																							95	105	85	305	J
	S																							50	65	105	240	S
	D																							25	50	125	200	D
1994	M																								25	100	125	M 1994
	J																									95	95	J
	S																									50	50	S
	D																									25	25	D
1995	M																											M 1995
	J																											J
	S																											S
	D																											D

TABLE D-2

POWER PLANT OPERATION WORK FORCE REQUIREMENTS IN THE GEYSERS KGRA

1979 - 2000

	SCENARIO 1: 2,426 MW										SCENARIO 2: 3,000 MW							
	PGandE 1-11	PGandE 12-18	NCPA 2-3	DWR B.R.&S.G.	SMUD Geo.#1	Oxy #1	PGandE 19-24	CCPA 1-2	MID/ Shell	TOTAL	Geo. A*	Geo. B*	Geo. C*	Geo. D*	Geo. E*	Geo. F*	Geo. G*	TOTAL
1979	102	10								112								112
80	102	20								122								122
81	102	20								122								122
82	102	25	8							135								135
83	102	30	8		20					160								160
84	102	30	8	23	20	20				203								203
85	102	35	16	23	20	20				216								216
86	102	35	16	32	20	20	5			230								230
87	102	35	16	32	20	20	5			230								230
88	102	35	16	32	20	20	15			240								240
89	102	35	16	32	20	20	20	20		265								265
90	102	35	16	32	20	20	20	25	20	290								290
91	102	35	16	32	20	20	25	25	20	295	5							300
92	102	35	16	32	20	20	25	25	20	295	5	5	5					310
93	102	35	16	32	20	20	25	25	20	295	5	5	5	5	5			320
94	102	35	16	32	20	20	25	25	20	295	5	5	5	5	5	5	5	330
95	102	35	16	32	20	20	25	25	20	295	5	5	5	5	5	5	5	330
96	102	35	16	32	20	20	25	25	20	295	5	5	5	5	5	5	5	330
97	102	35	16	32	20	20	25	25	20	295	5	5	5	5	5	5	5	330
98	102	35	16	32	20	20	25	25	20	295	5	5	5	5	5	5	5	330
99	102	35	16	32	20	20	25	25	20	295	5	5	5	5	5	5	5	330
2000	102	35	16	32	20	20	25	25	20	295	5	5	5	5	5	5	5	330

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

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TABLE D-3

CUMULATIVE POWER PLANT WORK FORCE DATA
SCENARIO 1: 2,426 MW

YR/Q	PPC	O&M	TOTAL	YR/Q	PPC	O&M	TOTAL	YR/Q	PPC	O&M	TOTAL
79 M	275	112	387	85 S	105	216	321	92 M	0	295	295
J	290	112	402	D	130	216	346	J	0	295	295
S	200	112	312	86 M	151	230	381	S	0	295	295
D	220	112	332	J	135	230	365	D	0	295	295
80 M	310	122	432	S	210	230	440	93 M	0	295	295
J	210	122	332	D	310	230	540	J	0	295	295
S	185	122	307	87 M	385	230	615	S	0	295	295
D	220	122	342	J	415	230	645	D	0	295	295
81 M	190	122	312	S	460	230	690	94 M	0	295	295
J	130	122	252	D	505	230	735	J	0	295	295
S	290	122	412	88 M	555	240	795	S	0	295	295
D	390	122	512	J	465	240	705	D	0	295	295
82 M	405	135	540	S	445	240	685	95 M	0	295	295
J	400	135	535	D	410	240	650	J	0	295	295
S	485	135	620	89 M	370	265	635	S	0	295	295
D	570	135	705	J	330	265	595	D	0	295	295
83 M	595	160	755	S	285	265	550				
J	520	160	680	D	255	265	520				
S	530	160	690	90 M	185	290	475				
D	405	160	565	J	135	290	425				
84 M	380	203	583	S	105	290	395				
J	375	203	578	D	65	290	355				
S	380	203	583	91 M	50	295	345				
D	290	203	493	J	25	295	320				
85 M	235	216	451	S	0	295	295				
J	175	216	391	D	0	295	295				

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

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TABLE D-4

CUMULATIVE POWER PLANT WORK FORCE DATA
SCENARIO 2: 3,000 MW

YR/Q	PPC	O&M	TOTAL	YR/Q	PPC	O&M	TOTAL	YR/Q	PPC	O&M	TOTAL
79 M	275	112	387	85 S	105	216	321	92 M	325	310	635
J	290	112	402	D	130	216	346	J	425	310	735
S	200	112	312	86 M	151	230	381	S	415	310	725
D	220	112	332	J	135	230	365	D	355	310	665
80 M	310	122	432	S	210	230	440	93 M	295	320	615
J	210	122	332	D	310	230	540	J	305	320	625
S	185	122	307	87 M	385	230	615	S	240	320	560
D	220	122	342	J	415	230	645	D	200	320	520
81 M	190	122	312	S	460	230	690	94 M	125	330	455
J	130	122	252	D	505	230	735	J	95	330	425
S	290	122	412	88 M	555	240	795	S	50	330	380
D	390	122	512	J	465	240	705	D	25	330	355
82 M	405	135	540	S	445	240	685	95 M	0	330	330
J	400	135	535	D	410	240	650	J	0	330	330
S	485	135	620	89 M	370	265	635	S	0	330	330
D	570	135	705	J	385	265	650	D	0	330	330
83 M	595	160	755	S	390	265	655				
J	520	160	680	D	345	265	610				
S	530	160	690	90 M	300	290	590				
D	405	160	565	J	380	290	670				
84 M	380	203	583	S	440	290	730				
J	375	203	578	D	365	290	655				
S	380	203	583	91 M	350	300	650				
D	290	203	493	J	365	300	665				
85 M	235	216	451	S	450	300	750				
J	175	216	391	D	375	300	675				

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

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APPENDIX E

MIDDLETOWN UNIFIED SCHOOL DISTRICT
STUDENT SURVEY (1980)

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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:

	TOTAL PUPILS ENROLLED 12/19/80	GEOTHERMAL OCCUPATIONS	GEOTHERMAL RELATED OCCUPATIONS
Grades K-8	412	96	51
Grades 9-12	162	22	19
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:

	TOTAL NEW STUDENTS	GEOTHERMAL RELATED OCCUPATIONS	
Grades K-8	108	36	(33%)
Grades 9-12	17	2	
	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

GEOTHERMAL

	COMPANY	JOB	GRADE	CHECK IF NEW IN 1980
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	

	COMPANY	JOB	GRADE	CHECK IF NEW IN 1980
51.	Union Oil	Welder	3	
52.	PG&E	Power Plant Operator	1	x
53.	PG&E	Instrument Repairman	3	x
54.	"	" "	8	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	8	
71.	Loffland	Driller	1	
72.	PG&E	Electrical Foreman	8	
73.	"	"	5	
74.	Atlantic Oil	Derrickman	4	x
75.	"	"	8	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

	COMPANY	JOB	GRADE	CHECK IF NEW IN 1980
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 = 15

* Drilling consultant - self employed = 2
Truck driver - Pellco 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 (Geysers) = 1

TABLE E

STAFF ANALYSIS OF
1980 MIDDLETOWN STUDENT SURVEY

Total Students Surveyed = 574

GEOTHERMAL EMPLOYERS

Total Students = 111

Developers

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

Steam Drilling

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

Power Plant Operators

PGandE Operation & Mtce.	31	
PGandE Construction Superv. etc.	17	
	48	
	111	= 43.2%

Geothermal Services

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

GEOTHERMAL-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
	19

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.

	Number	%
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

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APPENDIX F

LAKE AND SONOMA COUNTY
SCHOOL DISTRICT STUDENT SURVEYS

LAKE COUNTY SCHOOL DISTRICT
STUDENT SURVEYS
1981 AND 1982

TABLE F-1

SUMMARY OF LAKE COUNTY STUDENT SURVEY, 1981

District	Total Students	Question 4 (Power Plant)	Question 5 (Geothermal-Related Services)	Question 6 (Steam Drilling) And Development)	Total Geothermal (Questions 4-6
Middletown Unified	617	78	21	64	163
% of Students	100	12.6	3.4	10.3	26.4
Konocti Unified	2,185	85	29	42	156
% of Students	100	3.9	1.3	1.9	7.1
Kelseyville Unified	1,164	51	26	48	125
% of Students	100	4.3	2.2	4.3	10.7
Lakeport Unified	1,279	11	4	16	31
% of Students	100	0.8	0.3	1.2	2.4
Lucerne Elementary	197	4	0	0	4
% of Students	100	2.0	0	0	2.0
Upper Lake Union Elem.	431	17	26	13	56
% of Students	100	3.9	6.0	3.0	12.9
Upper Lake Union High	322	4	2	7	13
% of Students	100	1.2	0.6	2.1	4.0
County Office of Educ.	53	4	0	0	4
% of Students	100	7.5	0	0	7.5
County TOTALS	6,248	254	108	190	552
% of Students	100	4.0	1.0	3.0	8.8

Source: Cornelison, 1982; Lake County Office of Education, 1983.

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TABLE F-2

SUMMARY OF LAKE COUNTY STUDENT SURVEY, 1982

District	Total Enrollment	Total Geothermal Students	Percent Geothermal Students
Middletown Unified	697	180	25.94
Konocti Unified	2,378	231	9.71
Kelseyville Unified	1,244	142	11.41
Lakeport Unified	1,312	76	5.79
Lucerne Elementary	212	24	11.32
Upper Lake Union Elem.	449	41	9.13
Upper Lake Union High	323	14	4.33
County Office of Education	92	3	3.26
COUNTY TOTALS	6,707	711	10.60

Source: Merrill, 1983a.

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SONOMA COUNTY SCHOOL DISTRICT
STUDENT SURVEYS
1981

V.T. Hitchcock
René Auguste Chouteau

Schools Legal Counsel

Sonoma County Office of Education

County Administration Center
Room 111E
Education Building
410 Fiscal Drive
Santa Rosa, CA 95401

June 1, 1982

Mr. Joe O'Hagan
California Energy Commission
1111 Howe Avenue, MS 32
Sacramento, CA 95825

Re: Geysers Cumulative Impact Study

Dear Mr. O'Hagan:

Enclosed is a copy of the summary of the results in the Geysers impact survey conducted by the Sonoma County Schools.

Also enclosed is a copy of the survey form which was used.

Very truly yours,

René Auguste Chouteau
Legal Counsel

RAC:JEM

Student's Name:_____ Name of School_____

Parent or
Guardian's Name:_____ Name of District_____

	Yes	No
1. Is at least one parent employed:		
(a) at a Geysers' powerplant?	___	___
(b) by a Geysers' powerplant developer, construction contractor or subcontractor?	___	___
(c) by a company primarily working for or supplying services or materials to a power plant or power plant developer, contractor, or subcontractor?	___	___
(d) at a Geysers' steamwell?	___	___
(e) by a Geyser's steamfield developer, construction contractor or subcontractor?	___	___
(f) by a company primarily working for or supplying services or materials to a steamwell or steamfield developer, construction contractor, or subcontractor?	___	___

2. If you answered yes to any question in (1), please state -

(a) The name of the company for which you work:

_____

(b) The number of school children living with you and the grades which they are currently attending:

Number of Children	Grades
_____	_____
_____	_____
_____	_____
_____	_____

TABLE F-3

SUMMARY OF SONOMA COUNTY STUDENT SURVEY, 1981

District	Average Daily Attendance	Questionnaires Returned	Employed At Power Plant	Employed In Steam Development	Employed In Geothermal Services	Total Geothermal
Alexander Valley	91	-	-	1	-	1
Cloverdale	1,169	-	37	47	15	99
Geyserville	300	63	6	-	-	6
Healdsburg	2,341	-	23	5	16	44
West Side	93	21	-	-	-	-
Windsor	728	-	-	2	7	9
Cinnebar	198	-	2	-	-	2
Forestville	624	201	2	1	7	10
Liberty	164	-	-	-	2	2
Piner - Olivet	606	-	9	1	2	12
Roseland	676	124	20	-	6	26
Rincon Valley	2,651	-	10	5	11	26
TOTAL GEOTHERMAL RESPONSES			109	62	66	237

Source: Sonoma County Office of Education, 1982f.

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APPENDIX G

GOVERNMENTAL JURISDICTION OVER GEOTHERMAL DEVELOPMENT

APPENDIX G

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, which 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. The federal lands in the KGRA on which the majority of the current 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. These lease agreements also provide for royalty payments from the resource produced from the leasehold. The money generated from the leases and the royalty payments for the developed resource 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. Refer to Chapter V for additional discussion of AB 1905 and the revenues accruing to the four counties of the Geysers KGRA.

Prior to 1982 the Conservation Division of the United States Geological Survey (USGS) shared responsibility for portions of the lease management program. Generally, this unit of the USGS had responsibility for subsurface activities and BLM for the surface activities. In January 1982 the Minerals Management Service (MMS) was established by an order of the Secretary of the Interior. The new MMS was comprised of the Conservation Division of USGS and the Outer-Shelf Management Division of the BLM and reported directly to the Secretary of the Interior. The MMS was established as the operational arm of the Department of Interior for management of onshore and offshore leasing and royalty collection from oil, gas, and geothermal resources.

In December 1982 Secretary of Interior Watt issued Secretarial Order No. 3087, which further refined the responsibilities and orgnizational restructuring of the minerals management function within the Department of Interior. Under this order, the BLM has responsibility for environmental review of onshore mineral activities, resource classification, geoscientific and economic evaluation of leaseable mineral tracts, issuance of leases and permits, and approval and direct supervision (inspection and enforcement programs) of both pre- and postlease exploration and development operations. The MMS will have responsibility for royalty management, including those mineral revenue management activities currently within the BLM. In addition, the MMS will continue to exercise responsibility for offshore leasing and mineral management. Staff of the MMS who have been involved in the management of onshore minerals and leases will be reassigned to the state and district offices of the BLM. The Ukiah district of BLM and the Division of Minerals at the state office of BLM now will have overall responsibility for management of the leases and geothermal development in the Geysers KGRA.

The exploration for and development of geothermal resources on federal lands is governed by the Geothermal Steam Act of 1970 (Public Law 91-581). Under the terms of this act, once the land is leased, the geothermal developer must prepare a proposed Plan of Operation, which must be approved by the district office of the BLM. This plan is prepared, submitted, and reviewed in stages based upon the stages of geothermal development. The plan details the work that will be followed in preparing the well pads, drilling the wells, exploring for a viable steam resource, and, eventually, using the resource. The BLM reviews the plan and, after making any necessary changes, approves it. When reviewing the plan, the BLM 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 has the same responsibilities, and the lease bid revenues and steam royalties 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 regulations implementing the Geothermal Steam Act also require 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

- 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.

- Department of Conservation, Division of Oil and Gas--The Division of Oil and Gas 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 rests with the Division of Oil and Gas. 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 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.

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

- California Energy Commission--The CEC has state regulatory responsibility for the siting of all thermal power plants rated at 50 MW or greater. As shown in Tables 18 and 19 of the study most of the 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 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 CEC 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 CEC 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 Districts or Management Boards, Solid Waste Management Board, and the CEC. 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 public 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 public hearing on whether a conditional use permit should be granted.

- 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 BLM 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 CEC's siting proceedings, and their local requirements are incorporated into the CEC's decision. Following approval of a geothermal power plant, the CEC may delegate responsibility to the county building inspector and other representatives of the planning department to 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 Air Pollution Control Districts establishes the emissions limitations which must be met by the geothermal developers and users.

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