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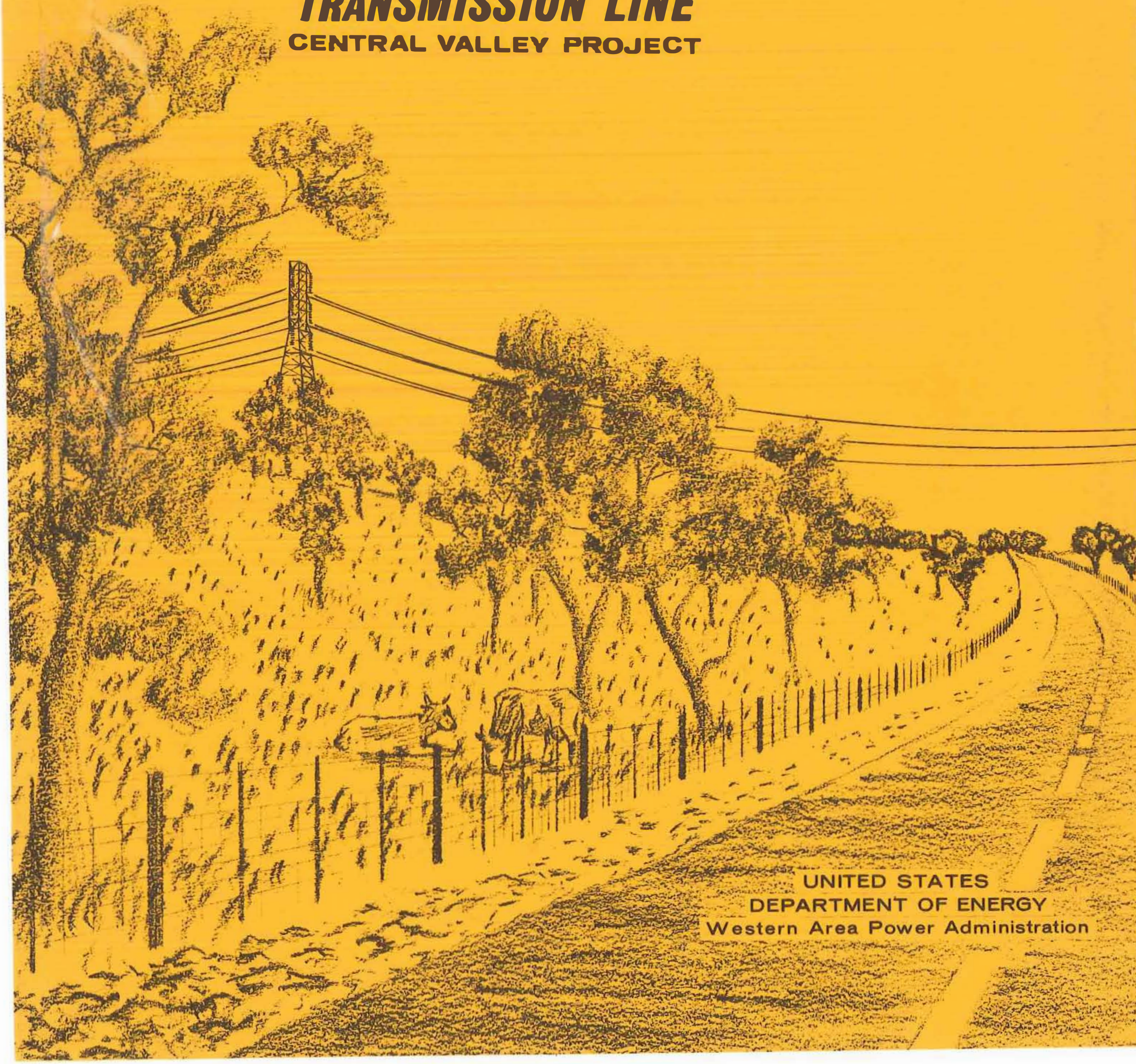
Final Environmental Statement

NEW MELONES 230 kV ELECTRICAL TRANSMISSION LINE

CENTRAL VALLEY PROJECT



UNITED STATES
DEPARTMENT OF ENERGY
Western Area Power Administration

DOE/EIS-0011

DEPARTMENT OF ENERGY

FINAL
ENVIRONMENTAL STATEMENT

Authorized

NEW MELONES
ELECTRICAL TRANSMISSION LINE
CENTRAL VALLEY PROJECT
CALIFORNIA

stet

Prepared by

Sacramento Office
Sacramento, California
Western Area Power Administration
Department of Energy

Gordon R Estes

Gordon R. Estes, Acting Area Manager

SUMMARY

( ) Draft (x) Final Environmental Statement
Department of Energy, Western Area Power Administration
Sacramento Office

1. Type of Action: (x) Administrative ( ) Legislative

2. Brief Description of Action:

This project entails construction of about 23 miles (37 km) of 230-kV electric transmission line from the New Melones Switchyard to the Pacific Gas and Electric Company (PG&E) Bellota-Herndon No. 2 line near Oakdale, California.

The line would be constructed in conformity with an agreement between the Department of Energy and the power company. It will deliver power into the PG&E grid and on to the Department of Energy load center at Tracy Switchyard over power company facilities crossing lands in Calaveras, Tuolumne, and Stanislaus Counties. Construction activities would occur for about 1 year.

3. Summary of Environmental Impacts and Adverse Environmental Effects:

A. The transmission line and associated access roads will have a visual impact on a predominantly rural and recreational area.

B. Soils and vegetation will be disturbed during construction.

C. Vegetation will be removed or trimmed as necessary for construction and to provide electrical clearances for conductors.

D. Wildlife habitats may be temporarily disturbed during construction and operation due to noise.

E. About 285 acres (115.4 ha) of land will be devoted to transmission line right-of-way and about 12 miles (19.3 km) of new access roads are required.

F. Reliable "clean" power will be furnished to the service area.

4. Alternatives considered:

A. Lines to the following substations: (1) Tracy; (2) San Luis; (3) Melones (115-kV); (4) Bellota; (5) Warnerville; (6) Parker; (7) Waterford.

B. Three alternative routes to the vicinity of the Warnerville Substation.

C. Partial underground system to the vicinity of the Warnerville substation.

D. No action.

5. <u>List of Entities receiving copies of the Final Statement (see next page)</u>.

6. <u>Data Made Available to Council on Environmental Quality (CEQ) and the Public</u>:

Draft statement: October 3, 1977

Final statement: 4/21/78

DISTRIBUTION LIST

FINAL ENVIRONMENTAL STATEMENT
NEW MELONES DIVISION, CENTRAL VALLEY PROJECT, CALIFORNIA

1. Federal Agencies (Transmitted by the Acting Administrator, Western Area Power Administration, Washington, D.C.)

   Department of the Interior
   - *Bureau of Indian Affairs
   - *Bureau of Land Management
   - *Bureau of Mines
   - *Bureau of Outdoor Recreation
   - *Fish and Wildlife Service
   - *Geological Survey
   - *National Park Service
   - Office of Water Research and Technology

   Other Federal Agencies
   - Advisory Council on Historic Preservation
   - *Department of Agriculture
   - Department of Commerce
   - *Department of Defense, Corps of Engineers
   - *Department of Health, Education, and Welfare
   - Department of Housing and Urban Development, Region IX
   - Department of Transportation, Region IX San Francisco
   - *Environmental Protection Agency, Region IX
   - *Federal Energy Regulatory Commission
   - ~~Federal Energy Administration~~

2. Federal Agencies (Transmitted by the Acting Area Manager, Western Area Power Administration, Sacramento, California)

   Department of the Interior
   - Bureau of Indian Affairs, Sacramento, California
   - Bureau of Land Management, Sacramento, California
   - Bureau of Mines, Spokane, Washington
   - Bureau of Outdoor Recreation, San Francisco, California
   - Fish and Wildlife Service, Portland, Oregon, and Sacramento, California
   - Geological Survey, Menlo Park, California
   - National Park Service, San Francisco, California
   - Regional Environmental Review Officer, San Francisco, California

   Other Federal Agencies
   - Department of Agriculture
     - Forest Service, San Francisco, California
     - Soil Conservation Service, Davis, California

DISTRIBUTION LIST (Cont.)

FINAL ENVIRONMENTAL STATEMENT
NEW MELONES DIVISION, CENTRAL VALLEY PROJECT,
CALIFORNIA

Other Federal Agencies (cont.)

Department of Defense, Corps of Engineers, San Francisco and Sacramento, California
Federal Energy Regulatory Commission, San Francisco, California

3. State and Local Agencies (Transmitted by the Acting Area Manager, Western Power Administration, Sacramento, California)

Board of Supervisors, Calaveras County, San Andreas, California
Board of Supervisors, Stanislaus County, Modesto, California
Board of Supervisors, Tuolumne County, Sonora, California
Calaveras County Water District, San Andreas, California
*California State Clearing House, Governor's Office, Sacramento, California (Office of Planning and Research)
City of Angels Camp, Calaveras County, California
City of Modesto, Stanislaus County, California
*City of Oakdale, Stanislaus County, California
City and County of San Francisco, California (Hetch-Hetchy Project)
City of Sonora, Tuolumne County, California
City of Waterford, Stanislaus County California
*Modesto Irrigation District, Modesto, California
South San Joaquin and Oakdale Irrigation Districts, Oakdale, California
Tuolumne County Water District No. 2, Sonora, California
Turlock Irrigation District, Turlock, California
*Oakdale Irrigation District, Oakdale, California
*California Public Utilities Commission, San Francisco, California

4. Other Agencies, Organizations, or Individuals

Audubon Society, Stockton, California
Calaveras County Library, Angels Camp and Murphys, California
Calaveras - Tuolumne Cattlemen's Association, Tuolumne, California
California Native Plant Society, Berkeley, California
California Water Resources Association, Glendale, California
Central California Council of Sportsmen
Environmental Defense Fund, Berkeley, California
*Friends of the Earth, Sacramento, California
League of Women Voters, Modesto, California
*Modesto Bee, Modesto, California
National Speleogical Society, Hughson, California
National Wildlife Federation, Sacramento, California
Natural Resources Defense Council, Palo Alto, California
*Pacific Gas and Electric Company, San Francisco, California
President, California Wildlife Federation, San Jose, California

DISTRIBUTION LIST (Cont.)

FINAL ENVIRONMENTAL STATEMENT
NEW MELONES DIVISION, CENTRAL VALLEY PROJECT,
CALIFORNIA

4. Other Agencies, Organizations, or Individuals (cont.)

Sierra Club, Northern California Regional Conservation Committee, San Francisco, California
Sierra Railroad, Oakdale, California
Stanislaus County Library, Oakdale Branch, Waterford Branch, and Central Modesto Branch, California
Tuolumne County Library, Sonora, California
Wilderness World, Pacific Grove, California
Yokut Wilderness Group, Modesto, California
*Friends of the River, Sacramento, California
Sam Carnes, Purdue University, West Lafayette, Indiana

* Comments on the draft statement received and included in the final statement.

ENVIRONMENTAL STATEMENT
PROPOSED NEW MELONES 230-kV ELECTRICAL
TRANSMISSION LINE
CENTRAL VALLEY PROJECT, CALIFORNIA

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A. DESCRIPTION OF THE PROPOSAL

1. Introduction

This environmental statement discusses the proposed development of an electrical transmission system for the New Melones Powerplant. The statement is submitted in compliance with the National Environmental Policy Act of 1969, Public Law 91-190.

A related environmental impact statement (EIS) on New Melones Lake, Stanislaus River, California, was prepared by the U.S. Army Engineer District, Sacramento, California, in May 1972, and subsequently revised June 21, 1972. That statement discussed the environmental impacts anticipated in connection with the construction of the dam and creation of the 2,400,000 acre-foot ($2.96 \times 10^9 m^3$) reservoir, 300,000-kW powerhouse, and 230,000-volt switchyard.[1] In addition, an EIS for Supplemental Data on Use of Conservation Yield was prepared by the Bureau of Reclamation and filed with the Federal Court in November 1972.

As authorized by Congress, the New Melones Project, upon completion of construction by the Corps of Engineers, will become an integral part of the Bureau of Reclamation's Central Valley Project (CVP). The responsibility of this line was transferred to the Department of Energy in October 1977. The location of the project is shown on plates 1 and 2. The electrical transmission system is shown on plate 3.

The line will be constructed by the Pacific Gas and Electric Company (PG&E) in accordance with an agreement between the Department of Energy (Department) and PG&E. Under this agreement, PG&E will construct and operate the necessary electrical facilities over a 50-year period for about $15,700,000 which is about $2,775,000 less than the cost of a federally constructed and operated line from New Melones to the Bureau's Tracy Switchyard near Tracy, California. The Tracy Switchyard has been established by contract as the delivery point of the power which will be used by the CVP.

This statement covers the impacts associated with the construction and operation of a 230,000-volt transmission line from the New Melones Switchyard to the PG&E Bellota-Herndon 230,000-volt electrical transmission line near Oakdale, California. The proposed line will be about 23 miles (37 km) long, as shown on plates 2 and 4.

The New Melones power output of about 420 million kWh (1512 TJ) annually will be delivered over the PG&E system to Tracy Switchyard.

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[1] See Glossary of Terms, Appendix A for words which are not in common usage.

Initial construction is tentatively scheduled to begin in January 1978 and be completed about a year later.

The Bureau of Reclamation consulted with the staff of the Federal Energy Regulatory Commission (Commission) in the preparation of this environmental statement, in light of the Commission's responsibilities with respect to the subject transmission line. In order to construct, operate, and maintain the line, PG&E must first obtain a license for the line from the Commission, under the Federal Power Act (16 U.S.C. §791a-875r). There is pending before the Commission an application by PG&E for such a license for the proposed line, designated Project No. 2781 by the Commission.

The long-term environmental impacts of this line will be physical and visual. Potential impacts on wildlife, vegetation, and archeological sites can, to a large degree, be mitigated. The line has been located to minimize the effects on historical sites and scenic areas.

PG&E has submitted an Environmental Data Statement covering the proposed facilities to the California Public Utilities Commission (PUC). The PUC issued a draft environmental impact report for Application No. 56725 in September 1977.

a. Legislative History and Authorization

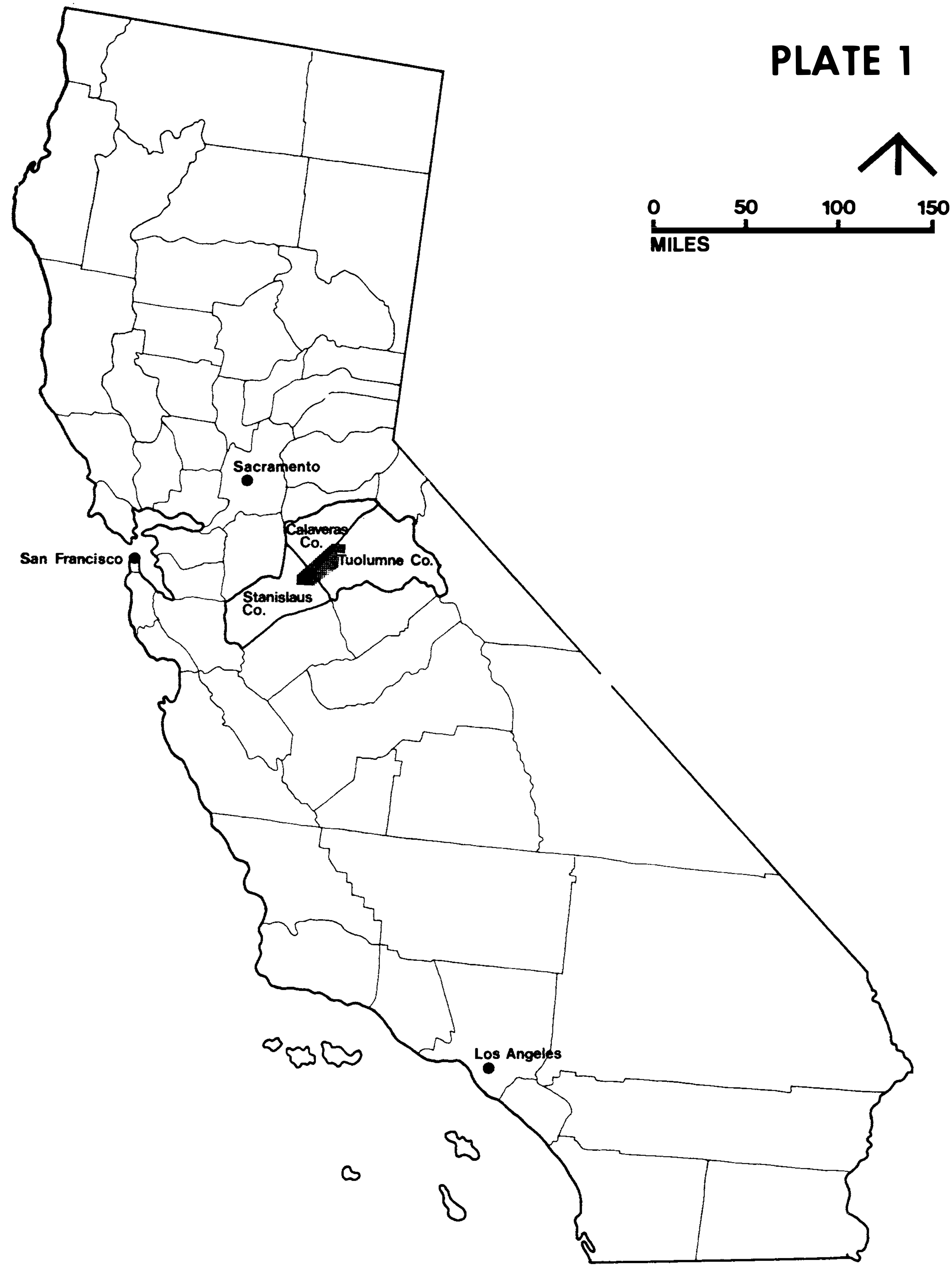
The New Melones Project was authorized by the Flood Control Act of December 22, 1944, substantially in accordance with the recommendations of the Chief of Engineers in Flood Control Committee Document No. 2, 78th Congress, Second Session. That authorization was subsequently modified by the 1962 Flood Control Act (Public Law 87-874). This project, as modified now, is under construction by the Corps of Engineers.

Public Law 87-874 contains the following provisions:

(1) ". . . .: Provided, That upon completion of construction of the dam and powerplant by the Corps of Engineers, the project shall become an integral part of the Central Valley Project, and be operated and maintained by the Secretary of the Interior pursuant to the Federal reclamation laws, ..."

(2) ". . . .: Provided further, That contracts for the sale and delivery of the additional electric energy available from the Central Valley Project power system as a result of the construction of the plants herein authorized and their integration with that system shall be made in accordance with preferences expressed in Federal reclamation laws except that first preference, to the extent as needed and as fixed by the Secretary of the Interior, but not to exceed 25 per centum of such additional energy, shall

PLATE 1



PROJECT LOCATION

(COURTESY P.G.&E.)

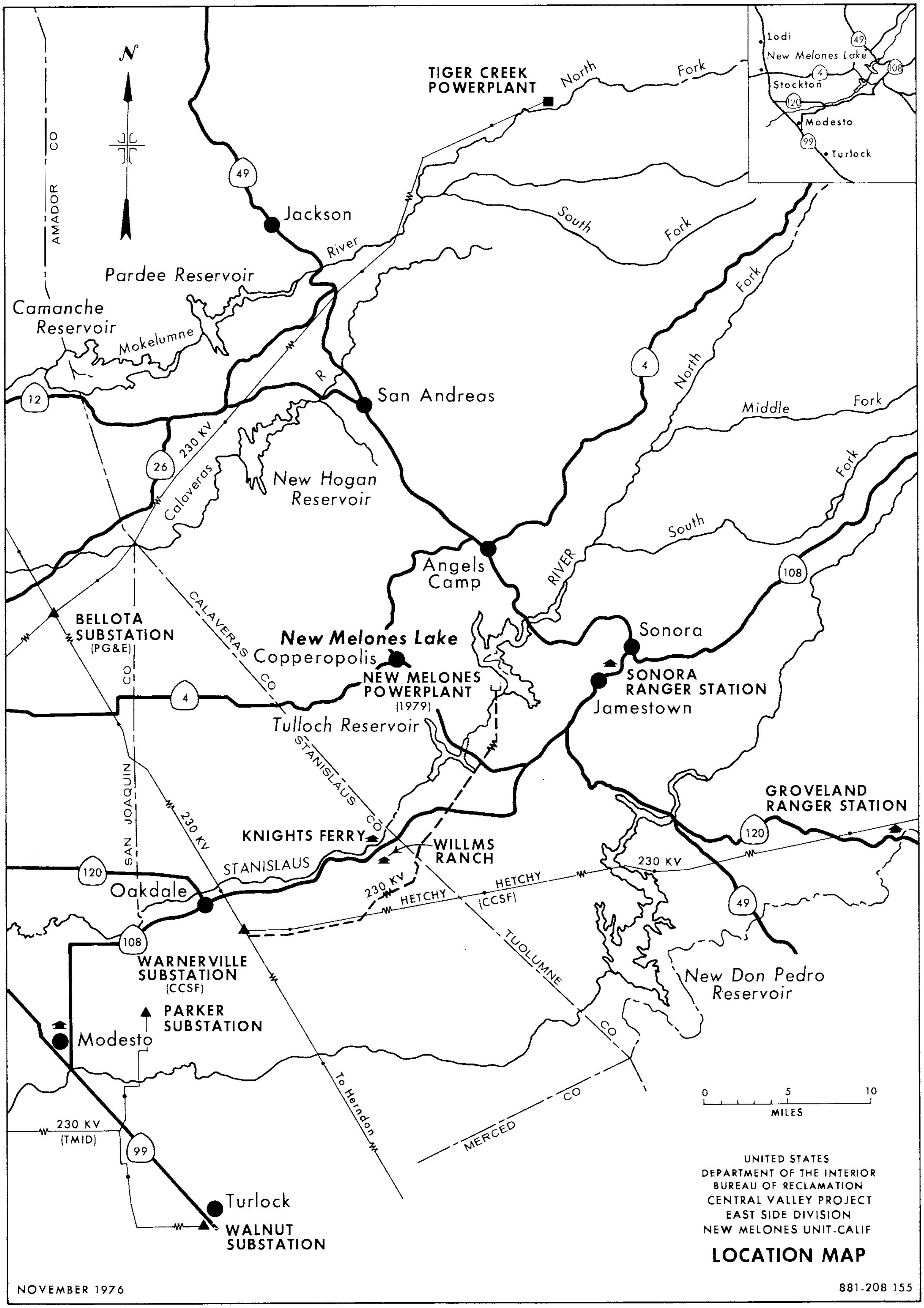
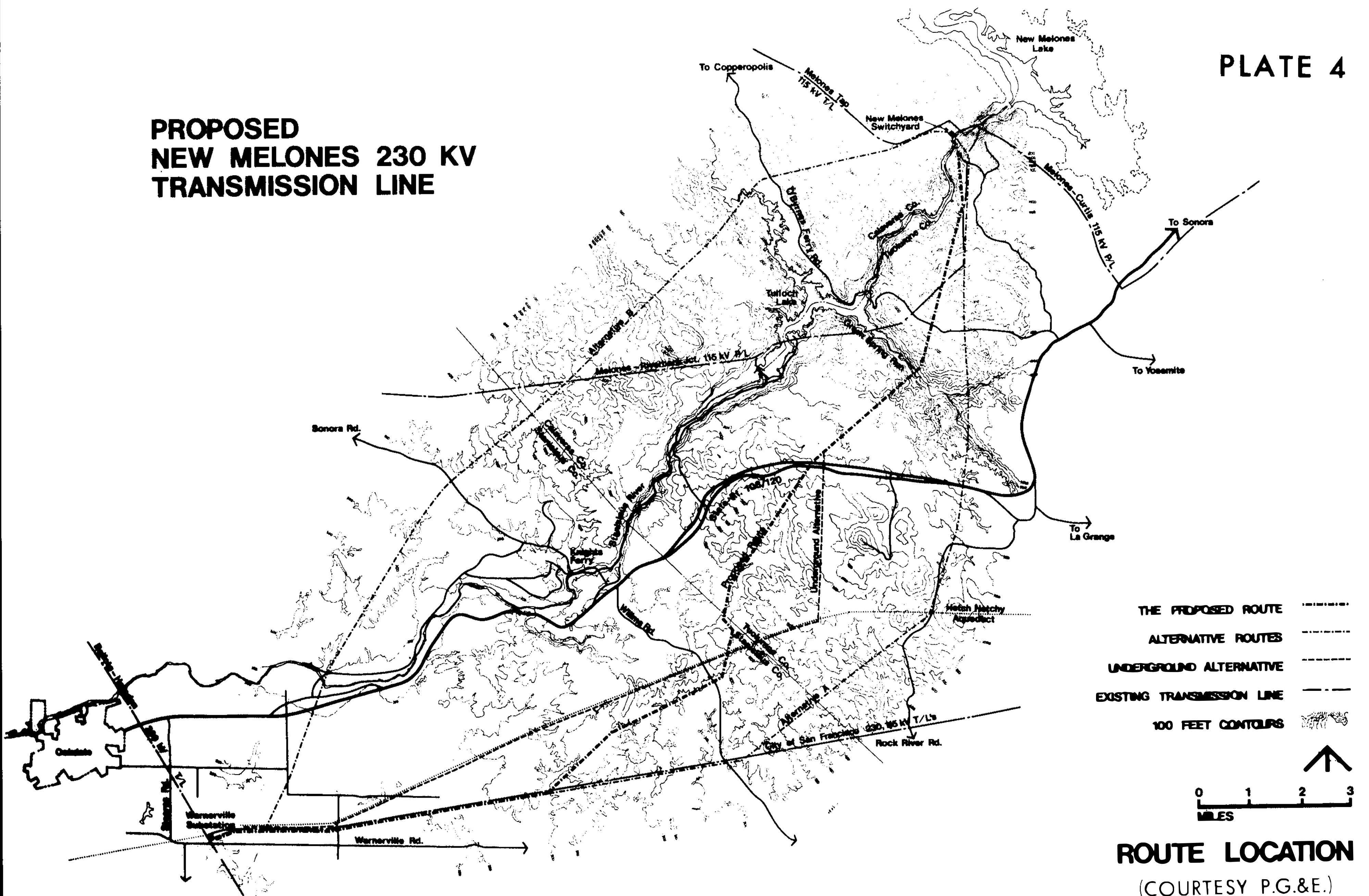

N
AMADOR CO
TIGER CREEK POWERPLANT
North Fork
South Fork
Jackson
River
Pardee Reservoir
Camanche Reservoir
Mokelumne
R
San Andreas
230 KV
Calaveras
New Hogan Reservoir
North Fork
Middle Fork
South Fork
RIVER
Angels Camp
BELLOTA SUBSTATION (PG&E)
CALAVERAS CO
New Melones Lake
Copperopolis
NEW MELONES POWERPLANT (1979)
Sonora
SONORA RANGER STATION
Jamestown
Tulloch Reservoir
STANISLAUS CO
SAN JOAQUIN CO
230 KV
KNIGHTS FERRY
WILLMS RANCH
GROVELAND RANGER STATION
230 KV
STANISLAUS
Oakdale
230 KV
HETCHY
HETCHY (CCSF)
WARNERVILLE SUBSTATION (CCSF)
TUOLUMNE CO
New Don Pedro Reservoir
PARKER SUBSTATION
Modesto
To Herndon
MERCED CO
230 KV (TMID)
Turlock
WALNUT SUBSTATION
0 5 10
MILES
Lodi
New Melones Lake
Stockton
Modesto
Turlock
49
4
108
120
12
26
99
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT
EAST SIDE DIVISION
NEW MELONES UNIT-CALIF
LOCATION MAP
NOVEMBER 1976
881-208 155

PLATE 3

PLATE 4

PROPOSED NEW MELONES 230 KV TRANSMISSION LINE



ROUTE LOCATION

(COURTESY P.G.&E.)

be given, under reclamation law, to preference customers in Tuolumne and Calaveras Counties, California, for use in that county, who are ready, able, and willing, within twelve months after notice of availability by the Secretary of the Interior, to enter into contracts for the energy and that Tuolumne and Calaveras County preference customers may exercise their option in the same date in each successive fifth year providing written notice of their intention to use the energy is given to the Secretary of the Interior not less than eighteen months prior to said dates: . . . ."

The so called Keating Amendment, which has been a part of appropriation bills since the early 1950's has the following language:

> ". . . provided further, That no part of this appropriation shall be used to initiate the construction of transmission facilities within those areas covered by power wheeling service contracts which include provision for service to Federal establishments and preferred customers, except those transmission facilities for which construction funds have been heretofore appropriated, those facilities which are necessary to carry out the terms of such contracts or those facilities for which the Secretary of the Interior finds the wheeling agency is unable or unwilling to provide for the integration of Federal projects or for the service to a Federal establishment or preferred customer:. . ."

b. Project Facilities

The East Side Division feasibility report in the 1960's envisioned an electrical transmission system which would integrate New Melones into the CVP system at Tracy Switchyard. A Farmington Switchyard, which was planned, would sectionalize the New Melones-Tracy 230-kV circuits and connect the Farmington, Cooperstown, and Montgomery pumping plants. Delays in authorization of the East Side Division required that an alternative plan be developed. Since the Department is required by contract to deliver CVP power to the Tracy Switchyard, the most likely alternative was assumed to be a 62-mile (100 km) New Melones to Tracy 230,000-volt line.

c. Litigation

In April 1973 the California State Water Resources Control Board issued the New Melones Project Water Rights Decision 1422. This decision would severely restrict the maximum storage permitted in New Melones Reservoir. The Department of the Interior contested the decision in U.S. District Court, and the court ruled for the United States, after which the State appealed. The appeals court upheld the lower court's decision, and the State requested

the U.S. Supreme Court to hear the case. Recently the Supreme Court agreed to hear the case. A decision by that court to uphold Decision 1422 would not negate the need for the proposed transmission line since the capability to generate power would still be present although reduced. Further discussion is presented on page 89.

2. Proposed Action

A 23-mile (37 km), 230-kV, double circuit, three-phase electrical transmission line to interconnect the New Melones Switchyard to the northern California power grid is to be constructed and operated by PG&E. This is a major action involving Federal funds. The line will loop into the existing PG&E Bellota-Herndon 230-kV transmission line No. 2 immediately south of the city and county of San Francisco Warnerville Substation. Plates 2 and 4 show the locations of the facilities.

3. Purpose

The proposed PG&E 230-kV electrical transmission line would tie the New Melones Powerhouse to the CVP Tracy Switchyard load center via the PG&E power grid. The power would be delivered to Department loads from Tracy Switchyard via the CVP power grid or wheeled over the PG&E system under various contractual arrangements.

4. Interrelationships With Other Facilities

a. New Melones

The line would tie to the switchyard at the New Melones Powerhouse which is being constructed by the Corps of Engineers. Initial plant testing is scheduled for January 1979.

b. Central Valley Project

The Central Valley transmission grid is shown in red on plate 3. The nearest potential point of delivery to the CVP is the Tracy Switchyard which is about 62 miles (100 km) away.

Power from New Melones, except for the Calaveras and Tuolumne County entitlements, has already been contracted.

c. PG&E Company

The proposed line would tie to the PG&E company system near Oakdale, California by looping into the PG&E Bellota-Herndon 230-kV No. 2 circuit. A schematic diagram is shown on plate 5. The power entering the PG&E system will be integrated with CVP power through various contracts with the company.

5. Transmission Line Location Methods

Independent preliminary line location studies were made by the Bureau and by PG&E. The primary purpose of the Bureau study was to estimate the cost of Federal construction of the line and to determine the most environmentally suitable alinement.

After a corridor analysis (described in Section 6 which follows) was made, alternative routes within the corridors were explored. The Bureau considered: (1) "Environmental Criteria for Electric Transmission Systems," published by the United States Departments of Interior and Agriculture[2] which is the official guideline used by the Bureau in the location, design, and construction of the transmission line, and (2) other documents including "Electric Power Transmission and the Environment"[3] and "Environment Guidelines."[4]

Aerial photographs were made to investigate existing facilities and were coordinated with Geological Survey topographic maps. Routes selected by the Bureau and PG&E were further refined by onsite inspection and helicopter flight.

The tower structures will be located in the field to avoid archeological sites to the greatest extent possible. Construction and operation and maintenance road easements will be selected using similar archeological criteria.

6. Corridor Analysis

a. Introduction

The corridor concept was used by the Bureau as a planning tool for determining a transmission line route from the New Melones Switchyard to the point of interconnection with the PG&E power system.

A corridor is a strip of land used in trasmission line planning which is sufficient in width to provide a latitude for locating a transmission line therein. A corridor may be several miles wide or more depending on the constraints. Lines located

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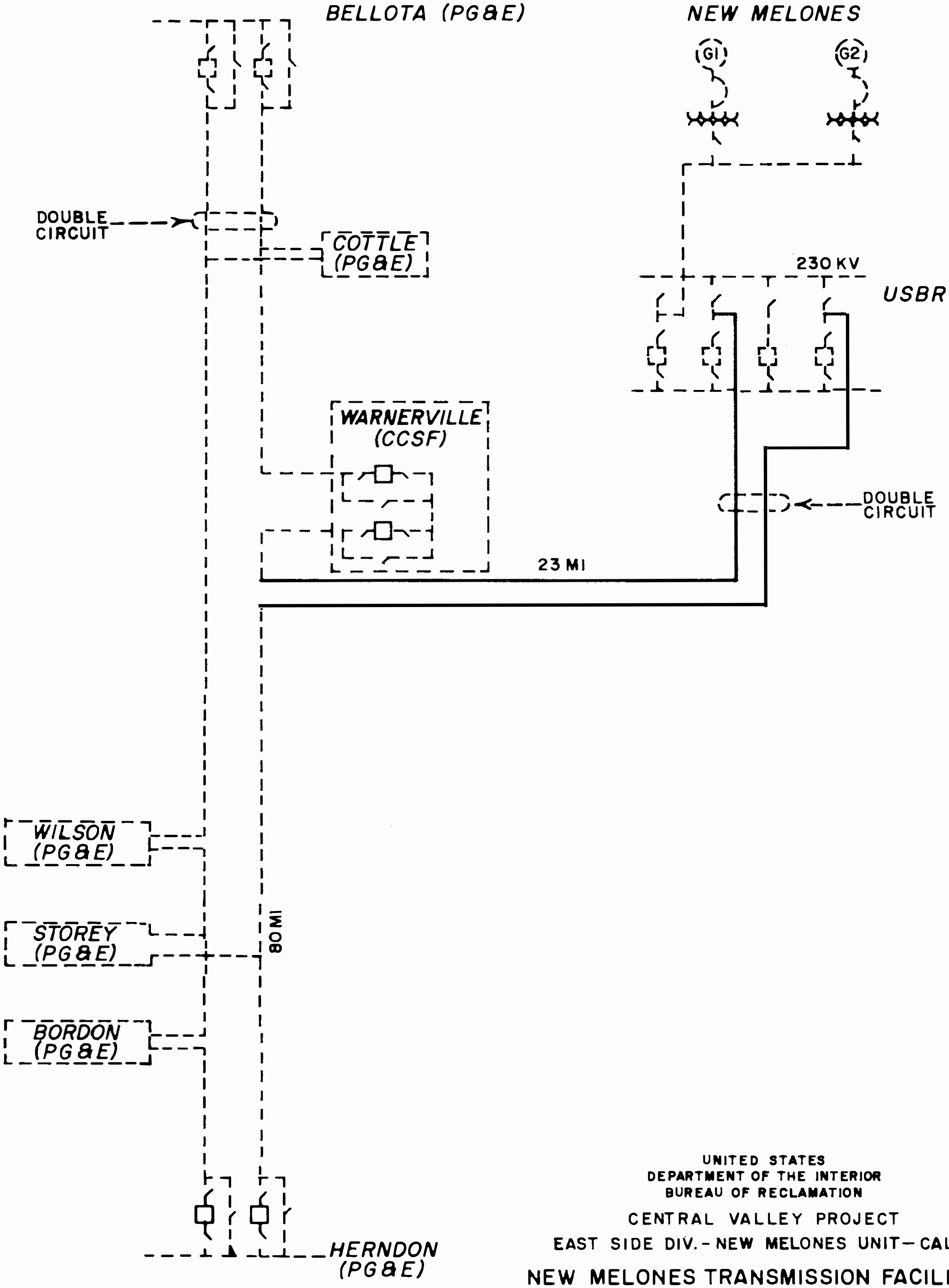
2 U.S. Department of the Interior and U.S. Department of Agriculture, Environmental Criteria for Electric Transmission Systems (Washington, D.C.: U.S. Government Printing Office, 1970)

3 U.S. Federal Power Commission, Electric Power Transmission and the Environment (Washington, D.C.: Federal Power Commission, 1970)

4 Western Systems Coordinating Council, Environmental Guidelines (Los Angeles, California; Western Systems Coordinating Council, 1972)



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CENTRAL VALLEY PROJECT
EAST SIDE DIV. - NEW MELONES UNIT - CALIF.

NEW MELONES TRANSMISSION FACILITIES
SCHEMATIC DIAGRAM

within a corridor may be in close parallel or vary in separation. Selection of a corridor provides a base for total land-use management planning which considers requirements to minimize environmental impacts and future land-use conflicts.

Aspects considered during the adopted and alternate corridor analyses include topography, economics, soils, present and planned land uses, visual impact, noise, vegetation, wildlife, and areas of social significance.

b. Corridors

The study area includes parts of Calaveras, Stanislaus, and Tuolumne Counties. The corridors are about 25 miles (40 km) long and are shown on plate 6. A northern and a southern corridor were considered.

The southern corridor begins at the New Melones Switchyard, crosses the Stanislaus River, and proceeds in a southerly direction adjacent to the PG&E 115-kV Melones-Riverbank line, crosses State Highway 108/120, the Hetch-Hetchy Aqueduct and associated 230-kV electrical transmission lines, the Sierra Railroad, several minor roads, and continues to the PG&E lines just south of the Warnerville Substation. It is primarily located in Tuolumne and Stanislaus Counties.

The northern corridor has the same terminals but skirts the northern part of an asbestos mine, crosses the northern arm of Tulloch Lake, the Copper Cove Subdivision, farmlands, and rural homes. It, also, has the Oakdale airport runway jutting into it.

7. Proposed Route

The results of the corridor analyses led to a route in the southern corridor. The corridors and alternative routes within the corridors which were investigated are shown on plate 6. Further route modifications were made by PG&E.[5] The proposed transmission line route is 23 miles (37 km) long.

The northeastern terminus of the transmission line will be in Calaveras County at the New Melones Switchyard, now under construction by the U.S. Army Corps of Engineers. The switchyard site is west of the Stanislaus River near Bean Gulch. From the switchyard, the line will head west to nearby structures. It will then turn to the southeast to cross the Stanislaus River, enter

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5 PG&E 1976 Environmental Data Statement

Tuolumne County, and head up a small draw into scattered trees toward Peoria Basin. There it will turn southwest continuing over Table Mountain, cross the Melones-Riverbank Junction 115-kV wood pole line, pass outside the Sierra Conservation Camp security fence and cross New Peoria Flat. The proposed line would then turn southwest about 3/4 of a mile (1.2 km) south of the New Peoria Flat Road, crossing Tulloch Lake at the eastern end of Green Springs Run (Federal Power Commission Project 2067). It would cross Owl Creek and State Highway 108/120 passing through scattered oaks and pasture. It will then turn slightly southeast along private dirt roads to the Stanislaus-Tuolumne County line. In Stanislaus County, the line turns slightly west and crosses the Hetch-Hetchy Aqueduct and then crosses open rolling foothills to a point just northeast of Willms Road. The line turns southwest until it crosses the city and county of San Francisco 230- and 115-kV powerlines and continues to the south side of the Warnerville Substation where it will interconnect with PG&E lines.

8. Structures

The entire line, except for two poles at the New Melones Switchyard will be supported by double circuit steel lattice towers. The self-supported square base structures will vary in height from about 90 to 155 feet (27 to 47 m). Span lengths will vary from about 500 to 2,000 feet (152 to 610 m). Typical tower designs are shown on plate 7.

9. Conductors

The main aluminum conductors will be 1,113 kcmil (696 mm^2), 61 strand, 1.216-inch (31.2 mm) nominal diameter, 19,700-pound (8 936 kg) rated strength, and weighs 1.045 pounds per foot (1.56 kg per m).

Two overhead ground wires will be installed for only the first 1-1/2 miles (2.4 km) from New Melones Switchyard to provide lightning protection. The ground wires will consist of seven-strand No. 8 AWG alumoweld, 0.385-inch (9.8 mm) nominal diameter, 15,900 pounds (7 212 kg), rated strength, and weigh 0.2618 pound per foot (0.39 kg per m).

10. PG&E Construction Criteria

a. Access

Existing roads will be used where available, but about 12 miles (19.4 km) of additional access roads will be required to meet construction needs. The additional access roads will be designed for multiwheel-drive vehicles and tractors.

PLATE 6

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT
EAST SIDE DIV. - NEW MELONES UNIT - CALIF.

NEW MELONES TRANSMISSION LINES
CORRIDOR STUDY

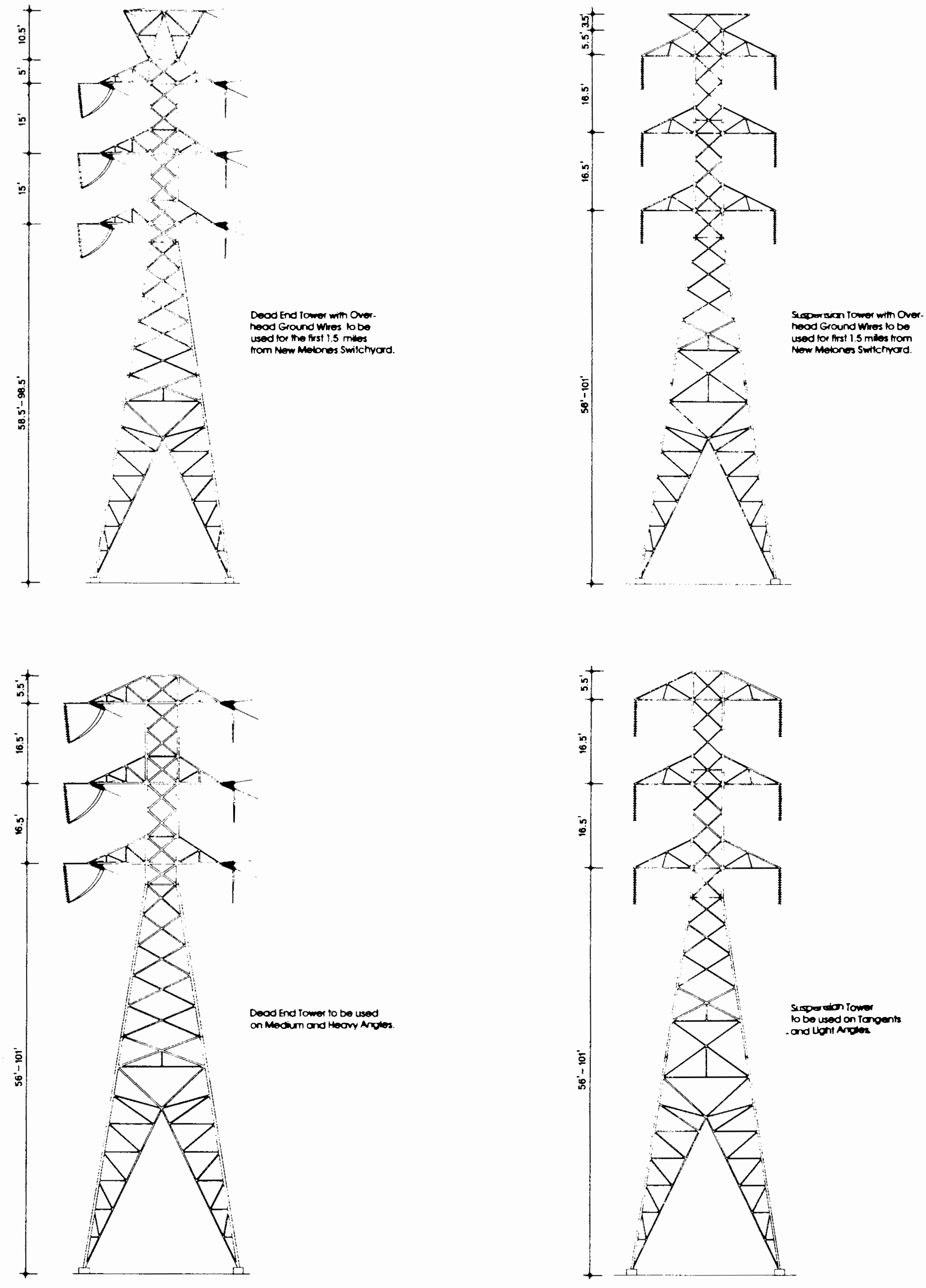

PLATE 7 : TOWER DESIGNS

(COURTESY P.G.&E.)

Existing access roads which were developed for the existing 115-kv wood pole line will be used at Table Mountain. An effort will be made to avoid developing a new access road across the plateau.

The area 1 mile (1.6 km) north of State Highway 120/108 to the point of intersection and parallel with the city and county of San Francisco's transmission lines will require a lesser amount of new road construction due to the existing access in the parallel section, and to the type of terrain.

b. Right-of-Way

(1) Requirements

There are about 28 land ownerships along the proposed line route. The proposed right-of-way for the line requires a total of about 265 acres (108 ha) of private land and 20 acres (8 ha) of Federal lands. In addition, there are several utility, railroad, and road crossings which will require agreements. The right-of-way width for the line is to be about 100 feet (30 m). This will provide adequate working space for construction and maintenance. Existing roads and trails will be used for access wherever feasible, but some new access roads will be required for construction and maintenance.

(2) Acquisition

Land required for the line right-of-way will be acquired in the form of an easement. The landowner would grant PG&E or its successors an easement to construct, reconstruct, operate, and maintain one electric transmission line together with all towers, crossarms, conductors, and such other structures used in the construction, operation, and maintenance of the transmission line across the right-of-way. The landowner will be paid just compensation based upon an appraisal. When a settlement, satisfactory to both parties, cannot be secured through negotiations, condemnation action will be taken. Whenever it is impossible to stay on the line right-of-way with the access roads for construction, operation, and maintenance, the same acquisition procedures will be used to purchase access road easements over existing private roads or on roads to be constructed across private property.

Right-of-way through Federal and State-owned lands will be obtained from the appropriate administering agency.

(3) Land Use

The private landowner will have the right to cultivate, use, and occupy the acquired right-of-way for any purposes which would not, by the determination of the PG&E company, constitute a hazard to human life, interfere with any of the rights and privileges granted to the company, or endanger any of its property. This is in accordance with the policy of encouraging multiple use of transmission line right-of-way. Generally, mineral deposits may be located, leased, or otherwise developed within or beneath transmission line easements or rights-of-way provided such activities do not interfere with operation and maintenance of transmission towers, conductors, or cables.

Use of right-of-way through Federal and State-owned lands will be at the discretion of the administering land-use agency, subject to the above considerations.

c. Clearing

Clearing will be in two stages: (1) clearing for structures, conductor stringing, line safety and roads, and (2) selected landscape clearing will be conducted after the structures and conductors are in place.

Selective clearing will be required along the line for conductor clearance. Clearing of the right-of-way will be limited to only that which is necessary to prevent interference of trees and brush with proposed transmission facilities. Tree topping and pruning techniques will be used to provide minimum conductor clearance.

The most extensive clearing will be required along the alinement between the New Melones Switchyard and the Tuolumne County line. The vegetation along this area is primarily scattered oaks and brush. A cleared construction area of approximately 50 feet (15 m) radius will be required around each structure location. In addition, 5- to 10-foot-wide (1.5 to 3 m) trails will be cleared in order to install the conductor on and between towers. The only other clearing will involve vegetation which would endanger the operation of the line.

Vegetation along the alinement between the Tuolumne County line and the connection point is primarily grass and pasture; therefore, clearing is not required.

d. Structure Installation

Foundations require auger or hand-dug holes. Reinforcing steel is placed in the holes and anchor bolts or base stubs are positioned. Forms are placed for the concrete pour above the ground. The forms and holes are then filled with concrete.

While the concrete is curing, the forms are removed and earth backfill is placed around each foundation. During this time the structural members are delivered to each individual structure location. After the concrete has cured, the structures are assembled and erected. The erection will generally be accomplished by the use of a mobile crane. In some selected areas, gin pole construction will be used for structure erection.

e. Conductor Installation

Temporary wood pole clearance structures will be installed at public and private roads and at locations where the new conductors could interfere with existing electric lines, communication facilities, or road traffic. After the conductors are strung, temporary structures will be removed and the ground will be returned to its natural grade.

Special sites (1 acre (0.4 ha) or less) are required to set up reels of conductor and related equipment for stringing the conductor (pulling and payout sites). Under some circumstances, the reel trailers can be placed along existing roadways with little or no effect on adjacent areas. Conductors, reel trailers, related equipment, and materials will be positioned at the payout site. Conductors will be attached to a vehicle or crawler tractor, where the terrain and vegetation would allow travel along the right-of-way.

In areas where vegetation and steepness of terrain prevent the use of ground vehicles, aerial or manual methods will be used to pull in a lead rope or a steel cable (sock line) which will be used to pull in the conductors. After the conductors are placed in the traveler sheaves, they are then pulled into a precalculated tension.

f. Site Cleanup

Clearance structures will be removed as well as debris such as packing crates and shipping materials. The Bellota-Herndon 230-kV transmission line will be temporarily relocated but restored to its former location after conductors have been placed in the final position. In areas where soils and vegetation may have become altered or disturbed, they will be restored to near natural conditions except where required where operation and maintenance prohibit it.

g. Tree Removal

Tree removal will be minimal but some will be required in the oak and pine growth areas as depicted on the predominate vegetation types map, plate 8. Those few requiring removal would be trees which would interfere with operation of the line and those on or near structures sites.

11. Tentative Schedule of Construction Activities

a. Access: January 1, 1978 to July 1, 1978

b. Clearing: January 1, 1978 to July 1, 1978

c. Structure Installation: April 1, 1978 to November 1, 1978

d. Conductor Installation: July 15, 1978 to January 1, 1979

e. Cleanup: September 1, 1978 to January 30, 1979

12. PG&E Operation and Maintenance

The proposed line will be patrolled and inspected by a ground patrol at least once a year to insure a high degree of service continuity. If electrical or mechanical trouble occurs either a ground or air patrol will be made to determine the location of the fault.

If line damage occurs, repairs will be scheduled during normal working hours unless the system dispatcher and local supervisors determine that immediate action is required. Emergency situations might require nighttime work. Minor repairs could be handled by crews who would carry tools and equipment on foot from their trucks to the worksites if road access were not available. These tools will normally consist of hand-operated tools and, for night work, a portable generator for lighting. In the rare event of major structural damage to a tower, repair will be handled in the same manner and with similar equipment as used in the original construction. (See Appendix B.)

Except for occasional planned outages for maintenance purposes and forced outages, the transmission system will be energized continuously.

Certain construction roads will be retained for operation and maintenance purposes. These roads are to provide access for PG&E maintenance personnel and vehicles for the purposes of keeping the transmission line in proper operating conditions. A right-of-way for use of the maintenance roads will be secured between PG&E and affected landowners or land-use agency. Existing roads will be used for maintenance purposes wherever possible to minimize the additional access surface disturbance.

Maintenance of the right-of-way usually consists of erosion control, seeding and sponsoring revegetation that is compatible with the transmission line, brush and tree trimming for vegetation which could interfere with the operation of the system, and repair of the maintenance roads.

Corridor Boundary
Valley Grassland (Pastures)
Foothill Woodlands or - grasses, Oaks, Pines - open for grazing
Chapparral or Shrubs - Pines
Rocky & Steep with Shrubs, Pines, Oaks
New Melones Project Boundary Line

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CENTRAL VALLEY PROJECT
EAST SIDE DIV. - NEW MELONES UNIT - CALIF.

NEW MELONES TRANSMISSION LINES
CORRIDOR STUDY

PREDOMINATE VEGETATIVE TYPES

NOVEMBER 1976 — 801-208-183

13. Engineering Criteria

The proposed PG&E 230-kV transmission line would be a three-phase, double-circuit tower line with a single, 1,113 kcmil (696 mm^2) aluminum conductor for each phase. The line will be supported by lattice steel structures except for the two turning poles at the switchyard. The towers will be self-supported, square base, lattice steel structures, varying in height from approximately 90 to 155 feet (27 to 47 m). The span length will range between 500 to 2,000 feet (155 to 600 m), depending on topography and design constraints.[6] The required right-of-way will be 100 feet (30 m) wide, except where it parallels the 230,000-volt Hetch-Hetchy lines. There it will be 103 feet (31 m) wide. The line will be designed to meet the criteria set forth in the California Public Utilities Commission General Order 95 and Federal Energy Regulatory Commission Guidelines. Line specifications are shown in Appendix C.

14. Safety and Health

All activities are subject to the Federal Occupational Safety and Health Administration (OSHA) provisions and California standards.

15. Power Facility Certification and Licenses

Certification by the State of California Public Utilities Commission and all licenses are being obtained by PG&E. They also applied for a transmission line license from the Federal Energy Regulator Commission on October 20, 1976. The Tuolumne County Planning Commission approved the proposed route on January 12, 1977. Calaveras and Stanislaus Counties have also approved the proposed route.

[6] Outlined in General Order 95 "Rules for Overhead Electric Line Construction," State of California Public Utilities Commission.

B. DESCRIPTION OF THE ENVIRONMENT

1. Existing Environment

The project area has social and cultural heritage developed from the California gold rush in 1849 and the years following when prospectors thronged to the Sierra Nevada foothills in search of gold. Prior to that time, Indians occupied the area in villages while hunting and gathering plant food. Many descendants of the gold rush days still remain in the study area. Historic buildings, abandoned mines, ferry sites, artifacts, and ruins remain. The mining activity has largely been replaced by agricultural and recreational activities.

There is a wide variety of historic, scenic, and recreational attractions which include historic sites and monuments, special geological features, lakes, reservoirs, mountains, camping, and hiking. State Highway 108/120 is one of the main routes to the Yosemite National Park and to parts of the Mother Lode area. In 1976, the average daily traffic (ADT) use on the highway was 7,400 near the proposed line crossing. By 1995, the ADT use is projected to be 12,000.

The O'Byrnes Ferry Road eminates from the highway and provides access to the New Melones Powerhouse, Tulloch Reservoir, and the Copperopolis Sierra Conservation Center. The ADT use at the proposed line crossing was 1,100 in 1976.

a. Climate and Air Quality

(1) Climate

The Stanislaus River Basin has a temperate, semi-arid climate characterized by hot, dry summers and cool, wet winters. Temperatures at the New Melones Switchyard area have ranged from a summer high of 113°F (45°C) to a winter low of 14°F (-10°C). Air temperature, precipitation and wind are shown on table 1.

Temperatures may drop below freezing for a few hours of several consecutive days during the winter, but no extended periods of subfreezing temperatures occur. Precipitation generally occurs as rain. Snowfall is rare. Fog may occur in the winter at the valley floor. The average midday relative humidity ranges from 75 percent in January to 55 percent in April, 39 percent in July and 47 percent in October. This information was derived from Columbia Airport records.

A report called, "Climate of the San Joaquin Valley Air Basin" was published by the State of California Air Resources Board in December 1974. Additional information is contained in it.

TABLE 1 - CLIMATIC DATA

	Jan	Feb	Mar	Apr.	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Average Air Temp. F													
Knight's Ferry 2S	47 (8.3 °C)	47 (8.3 °C)	54 (12.2 °C)	55 (12.8 °C)	64 (17.8 °C)	74 (23.3 °C)	77 (25 °C)	76 (24.4 °C)	74 (23.3 °C)	66 (18.9 °C)	51 (10.6 °C)	44 (6.7 °C)	61 (16.1 °C)
Modesto	45 (7.2 °C)	50 (10 °C)	54 (12.2 °C)	59 (15 °C)	65 (18.3 °C)	71 (21.7 °C)	76 (24.4 °C)	74 (23.3 °C)	71 (21.7 °C)	63 (17.2 °C)	53 (11.7 °C)	46 (7.8 °C)	61 (16.1 °C)
Sonora Ranger Sta.	44 (6.7 °C)	47 (8.3 °C)	49 (9.4 °C)	55 (12.8 °C)	61 (16.1 °C)	69 (20.6 °C)	77 (25 °C)	75 (23.9 °C)	71 (21.7 °C)	62 (16.7 °C)	52 (11.1 °C)	45 (7.2 °C)	59 (15 °C)
Precipitation Normal - inches													
Groveland Ranger Station	7.08 (18 cm)	5.78 (14.7 cm)	5.45 (13.8 cm)	3.81 (9.7 cm)	1.28 (3.3 cm)	.37 (0.9 cm)	.04 (0.1 cm)	.06 (0.2 cm)	.38 (1.0 cm)	1.62 (4.1 cm)	4.86 (12.3 cm)	6.73 (17.1 cm)	37.48 (95.2 cm)
Knights Ferry 2SE - 1974	1.89 (4.8 cm)	1.16 (3.0 cm)	4.72 (12.0 cm)	2.16 (5.5 cm)	0.00 (0.0 cm)	0.70 (1.8 cm)	1.50 (3.8 cm)	0.00 (0.0 cm)	0.00 (0.0 cm)	1.59 (4.0 cm)	1.11 (2.8 cm)	2.14 (5.4 cm)	16.97 (43.1 cm)
Modesto	2.15 (5.5 cm)	1.81 (4.6 cm)	1.64 (4.2 cm)	1.36 (3.5 cm)	0.38 (1.0 cm)	0.07 (0.2 cm)	0.02 (0.05 cm)	0.04 (0.1 cm)	0.16 (0.4 cm)	0.62 (1.6 cm)	1.52 (3.9 cm)	2.10 (5.3 cm)	11.87 (30.2 cm)
Sonora Ranger Sta.	5.69 (14.5 cm)	4.88 (12.4 cm)	4.92 (12.5 cm)	3.19 (8.1 cm)	1.19 (3.0 cm)	0.33 (0.8 cm)	0.03 (0.1 cm)	0.05 (0.1 cm)	0.35 (0.9 cm)	1.49 (3.8 cm)	4.21 (10.7 cm)	5.61 (14.3 cm)	31.94 (81.1 cm)
Wind (1974 - Miles)													
Knights Ferry 2SE	517 (827 km)	273 (437 km)	447 (715 km)	364 (582 km)	519 (830 km)	690 (1 108 km)	615 (984 km)	503 (805 km)	344 (550 km)	318 (493 km)	256 (410 km)	530 (848 km)	5,376 (8 602 km)

Source: Climatology Data--California Annual Summary 1974--U.S. Department of Commerce--Vol. 78 No. 13.

$$°C = \frac{°F-32}{1.8}$$

The location of these stations is shown on plate 2.

(a) Calaveras County

The climate in the western section of the county is hot during the summer and cool during the winter. Average January temperatures fluctuate between 38^{o} and $54^{o}F$ (3^{o} and 12^{o} C), while average July temperatures range between 61^{o} and $97^{o}F$ (16^{o} and $36^{o}C$). Going west to east, temperatures drop with a corresponding increase in elevation. Annual precipitation fluctuates between 20 inches and 50 inches (51 and 127 cm), of which over 90 percent occurs during the winter.

(b) Stanislaus County

The climate is hot during the summer and cool during the winter months, with the average January temperature range between 37^{o} and $53^{o}F$ (3^{o} and $12^{o}C$), while the average July temperatures range between 58^{o} and $94^{o}F$ (14^{o} and $34^{o}C$). A long growing season of over 260 days provides ample opportunity for growing a wide assortment of crops. Annual precipitation averages 11 inches (28 cm), the bulk of which occurs during the winter months.

(c) Tuolumne County

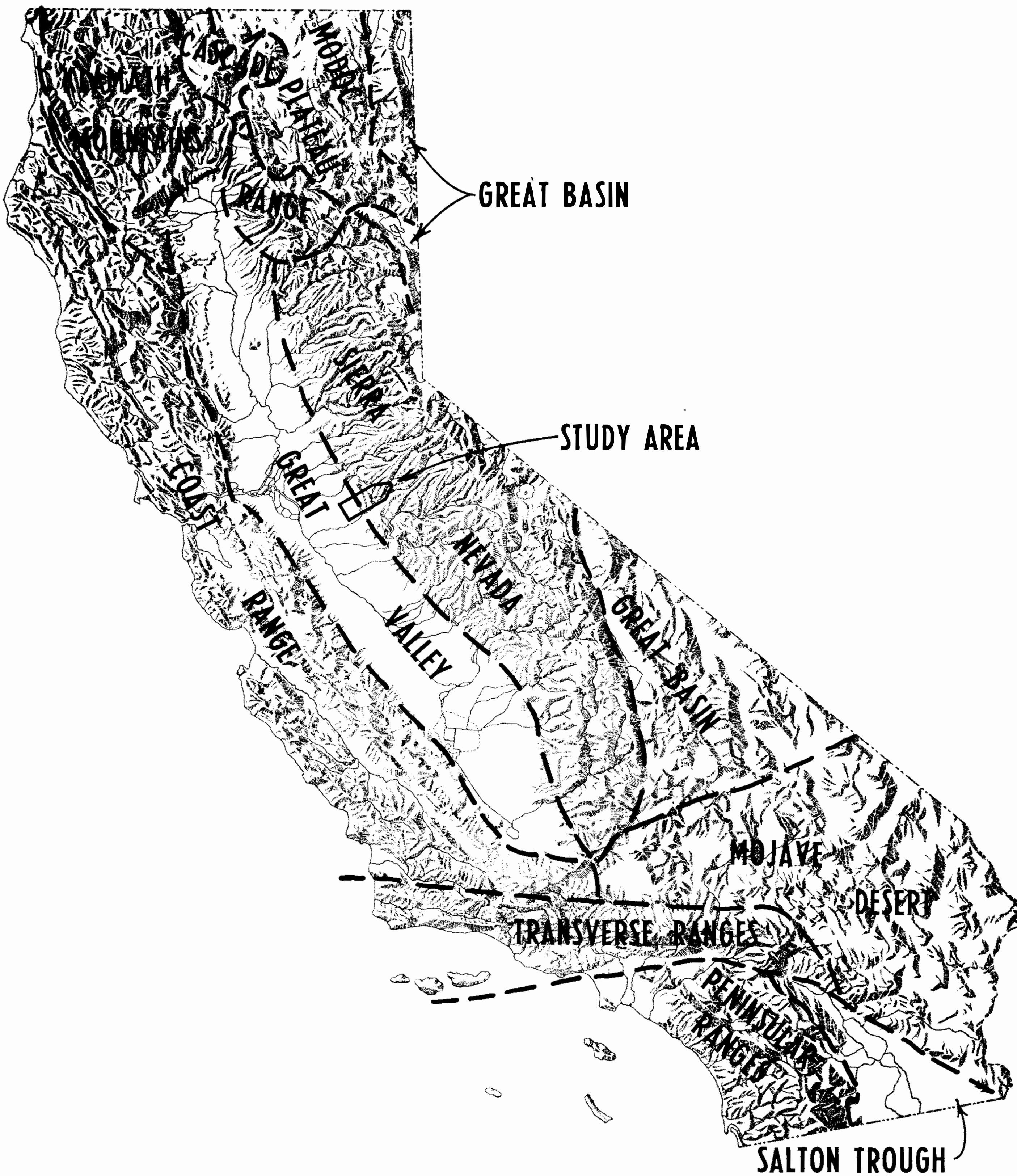
Climate varies with location and altitude. During the winter months, heavy snows fall in the eastern section of the county (Sierra Nevada), but there is no appreciable snowfall in the extreme western foothills. Rainfall increases when crossing the county from west to east with annual precipitation ranging from 30 inches (76 cm) in the western foothills to over 60 inches (152 cm) in the western section of the Sierra Nevada. Average January temperatures range between 34^{o} and $54^{o}F$ (1^{o} and $12^{o}C$), and during July the average temperature range is between 61^{o} and $95^{o}F$ (16^{o} and $35^{o}C$).

(2) Air Quality

Air ambient quality standards for California are given in Appendix M. California air quality data which pertains to the San Joaquin Valley air basin is given in Appendix N.

Stanislaus County is a nonattainment area (air quality standards violated) for oxidant (ozone), total suspended particles (TSP), and carbon monoxide (CO), but is an attainment area (air quality standards met) for nitrogen dioxide (NO_2).

Tuolumne County is a nonattainment area for oxidant and total suspended particles.



PHYSIOGRAPHIC AND PROVINCES MAP OF CALIFORNIA

Other pollutants have not been classified in these counties.

b. Topography and Drainage

(1) General

The transmission line corridors traverse portions of two physiographic provinces in northern California (plate 9; Physiographic and Province Map of California). The corridors begin at the New Melones Dam in the foothills portion of the Sierra Nevada province and then traverse southwest, essentially parallel to the Stanislaus River, crossing into the Great Valley province near Knights Ferry. The transition between the two provinces is marked by a distinct change in topography where the corridors cross from the low, rolling Sierra Nevada foothills to

the slightly undulating margin of the Great Valley. The Stanislaus River, with several intermittent tributary streams, is the primary drainage in the project area.

(2) Sierra Nevada

Generally, the topography of the corridors in the Sierra Nevada province consists of elongated, north-south trending ridges separated by broad, undulating high plateaus. Surface elevations vary from about 400 feet (120 m) at the western edge of the province to 1,916 feet (575 m) at Barth Mountain, about 4 miles (6.4 km) northwest of New Melones Dam. The Stanislaus River has carved a deep canyon through the foothills. Surface elevations of the river vary from about 650 feet (195 m) at New Melones Dam to 200 feet (60 m) near Knights Ferry. The canyon walls are steep sided throughout this section.

(3) Great Valley

In the project area, the Great Valley province is generally a nearly flat alluvial plain which has been cut by numerous intermittent stream valleys tributary to the Stanislaus River. Broad mesas and cuestas exist as erosional remnants between the tributary valleys. Elevations vary from slightly less than 150 feet (45 m) near Oakdale to about 400 feet (120 m) near Knights Ferry. Elevations of the Stanislaus River vary from 200 feet (60 m) to slightly less than 150 feet (45 m).

(4) Table Mountain

Table Mountain is the most unique topographical feature in Tuolumne County. This flat-topped mesa begins northeast of Melones Reservoir at an elevation of about 1,800 feet and trends in a southwest direction along the Stanislaus River. It slopes very gently along its length dropping to an elevation of about 600 feet where it terminates near the Stanislaus County line.

c. General Geology and Soils

(1) General

The varying topography described in the previous section reflects bedrock geology in the project area. A geologic map of the study area is shown on plate 10. The rolling Sierra Nevada foothills are composed primarily of Mesozoic metamorphic and igneous rocks, while the flatlands and dissected hills of the Great Valley are composed primarily of unconsolidated to semiconsolidated, Cenozoic sedimentary deposits. Soil cover in the proposed project area is also a reflection of bedrock geology. In the more resistant Sierra Nevada foothills, soil cover generally consists of a thin veneer of slopewash material, while a thicker soil horizon has developed on the less resistant Cenozoic strata of the Great Valley.

(2) Sierra Nevada

In the portion of the Sierra Nevada foothills crossed by the proposed corridors, metamorphic rocks of upper Jurassic age are predominant. At the eastern margin of the project area, a 3- (4.8 km) to 4- (6.4 km) mile-wide complex of major faults, large serpentine bodies, inclusions of Paleozoic metamorphic rocks, tectonic melanges, and Mesozoic intrusive rocks is called the Bear Mountains fault zone (part of the Foothills fault system). It is believed that the various faults in the Foothills fault system are actually late Mesozoic subduction zones along the plate tectonic boundaries.

Southwest of the Bear Mountains fault zone in the project area are metavolcanic rocks usually consisting of massive greenstones with some interbedded slates and other metasedimentary rocks. These are shown on the geologic map as being parts of the Logtown Ridge Formation and the Mariposa Formation (after Taliaferro and Solari, 1949).[7] Clark's regional studies (Clark; 1964)[8] suggest that these rocks may not correlate with the formations' type localities east of the Bear Mountains fault zone. He, therefore, named the sequence as follows, from east to west, youngest to oldest.

Copper Hill Volcanics
Salt Springs Slate
Gopher Ridge Volcanics

Along and near the southwestern margin of the metamorphic rocks in the project area, large, irregularly shaped, sill-like bodies of quartz porphyry appear to have intruded the metavolcanic rocks.

The Mesozoic metamorphic and igneous rocks described above are overlain in places by the Pliocene age Table Mountain Latite and associated sediments. The Latite forms a long, sinuous, flat-topped ridge and is generally considered to be a local member

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7 N. L. Taliaferro and A. J. Solari (1949), Geologic Map of the (1949), Geologic Map of the Copperopolis Quadrangle, California: Calif. Div. of Mines and Geol. Bull. 145 (map only).

8 Lorin D. Clark (1964), Stratigraphy and Structure of Part of the Western Sierra Nevada Metamorphic Belt, California: U.S. Geol. Sur. Prof. Paper 410.

PLATE 10

EXPLANATION

SYMBOLS

Geologic contact, solid where known, dashed where approximate

Surface trace of fault

Strike and dip symbols: 60; Vertical; 60 Overturned

STRATIGRAPHY

Cenozoic

- **Qal** — **Alluvium.** Recent stream and alluvial fan deposits.
- **Qt** — **Terrace Deposits.** Recent deposits of sands, gravels, and silts.
- **Qr** — **Riverbank Formation.** Pleistocene age deposits of gray to brown sand with minor clay and silt.
- **di** — **Diatomite.** Deposited in lake formed by damming of river by Table Mountain latite flows.
- **Qtl** — **Turlock Lake Formation.** Pliocene to Pleistocene age fluvial pebbly sand and gravel, interbedded silt and lacustrine clay.
- **Tpm** — **Mehrten Formation.** Pliocene age andesitic mudflow deposits, sands, and gravels.
- **Tpl** — **Table Mountain Latite.** Pliocene age lava flow which filled a former channel of the Stanislaus River.
- **Tmvs** — **Valley Springs Formation.** Upper Miocene age rhyolitic deposits of white tuffaceous sand, sandy clay, and gravel, interbedded with rhyolitic tuff.
- **Tc** — **Channel Deposits.** Eocene to pliocene age deposits of sand and gravel preserved beneath Table Mountain latite.
- **Tei** — **Ione Formation.** Eocene age deposits of clays, quartz sands, and conglomerate.

Unconformity

Mesozoic
Jurassic

- Quartz porphyry.
- Diorite and quartz diorite.
- Gabbro, diabase and related basic rocks.
- **Jsp** — **Serpentine.** Massive, locally intensely sheared.
- **Jm** — **Mariposa Formation.** Predominately slate with some graywackes and conglomerates.
- **Jlr** — **Logtown Ridge Formation.** Massive Metavolcanic rocks including local metamorphosed tuffaceous sediments and metachert.

Paleozoic

- **Cc** — **Calaveras Formation.** Undifferentiated upper Paleozoic phyllites, sandstones, limestones, schists, and volcanics. Local lenses of amphibolite.

NOTE: Geology for the eastern portion of map taken from "Geologic map of the Copperopolis Quadrangle" by N. L. Taliaferro and A. J. Solari — 1936-1944. Geology for the western portion of the map is from the "Geologic map of California, San Jose sheet," 1:250,000 scale; California State Department of Conservation, Division of Mines and Geology — 1966.

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GEOLOGY OF THE ALINEMENTS

SACRAMENTO, CALIF. NOV. 1976 | 881-208-165

of the lower part of the Mehrten Formation (described in paragraph (3) below). It was formed about 9 million years ago when a very extensive lava flow came down an ancient valley of the Stanislaus River. The lava-covered valley floor was then overlain by andesitic sediments of the Mehrten Formation and was subsequently exposed by erosion of the overlying and adjacent materials.

Soil cover in the Sierra Nevada foothills is sparse, generally consisting of only a few feet of slopewash materials.

The exception to this occurs in streambeds and channel fills along the flanks of Table Mountain and near Tulloch Lake, where recent alluvial deposits may exceed a few tens of feet in thickness. Soil deposits may also be thicker in alluvial deposits near the mouths of small tributary streams where they enter the channel of the Stanislaus River. Generally, soils in the Sierra Nevada foothills have been categorized as Classes VI and VII--fair to poor--(Soil Conservation Service Classifications)in terms of agricultural use.[9]

(3) Great Valley Province

In the Great Valley province, the Mesozoic rocks described above are unconformably overlain by a sequence of sedimentary strata of Cenozoic age which dip gently (3 to 8 degrees) to the southwest. The oldest of the Cenozoic strata in the project area is the Ione Formation which occurs as scattered erosional remnants on both sides of the provincial boundary. The Ione consists of clays, sands and conglomerate, and is Eocene in age.

The predominate Great Valley province formations in the corridors are--oldest to youngest--the Valley Springs Formation, the Mehrten Formation, the Turlock Lake Formation, the Riverbank Formation, and Modesto Formation. Recent alluvial and terrace gravels, sands, and clays occur in the flood plains and as channel fill in the streams.

The Miocene Valley Springs Formation is a northwest-trending belt along the border between the Great Valley and Sierra Nevada provinces. The formation is composed of rhyolitic stream deposits of tuffaceous sand, sandy clay, and gravel. These are interbedded with rhyolitic tuff which has been partially altered to bentonitic clay. The Valley Springs Formation is easily eroded, forming gently rounded hills in the project area.

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[9] Stanislaus Transportation Plan EIR--California Department of Transportation, January 1975, Volume 4, p-6-7 and Chart 5B.

The Pliocene Mehrten Formation consists of a sequence of andesitic mudflows, tuff lenses, sands and gravels. The mudflows consist of hard, subangular to rounded volcanic cobbles and boulders in a consolidated matrix of fine to coarse andesitic sediments. The tuff is fine-grained, hard and resistant to weathering.

The Turlock Lake Formation is Pliocene to Pleistocene. The formation consists of stream deposits of pebbly sand and gravel which are interbedded with lakebed deposits of silt and clay. These deposits consist of dissected rolling hills in the middle portion of the project area and form flat to mildly dissected plains in the southern portions of the project area.

The Pleistocene Riverbank Formation forms low, slightly dissected hills in the south portion of the project area near Dry Creek and on the north side of the Stanislaus River at Oakdale. These sediments consist of brown to gray, locally pebbly sand with minor amounts of silt and clay.

The Modesto Formation consists of brown to gray sands and silts with an even westward-sloping surface.

Soil cover in the Great Valley is thicker than in the Sierran foothills. The more easily eroded Cenozoic sediments have been reworked and deposited in the flood plains and channels of existing and ancient drainages. Topsoils in these flood plains--particularly in the flood plain of the Stanislaus River from Knights Ferry to Oakdale--have been classified as Classes I and II (prime) in terms of agricultural use. Soil cover on the surface of in situ formations consists of slopewash material, is thinner than in the flood plains and channels, and has been categorized as Class III to Class VI--marginal to fair--in terms of agricultural use.[10]

(4) <u>Seismicity</u>

The intensive deformation of the upper Jurassic metamorphic rocks and the complex faulting of the Foothills fault system shows that late Mesozoic deformation and fault activity were extensive. Prior to the August 1, 1975, Oroville earthquake, it was widely accepted that all of the Foothills fault system was seismically inactive. However, intensive geologic studies of the system by various agencies and a consulting firm as stimulated by the Oroville earthquake have revealed that there has been late Cenozoic activity along some segments of the Foothills fault system. Near Jamestown, east of the project area, segments of the Melones and Bear Mountains fault zones have offset the Table Mountain Latite by several tens of feet vertically, and have also offset soil horizons estimated to be

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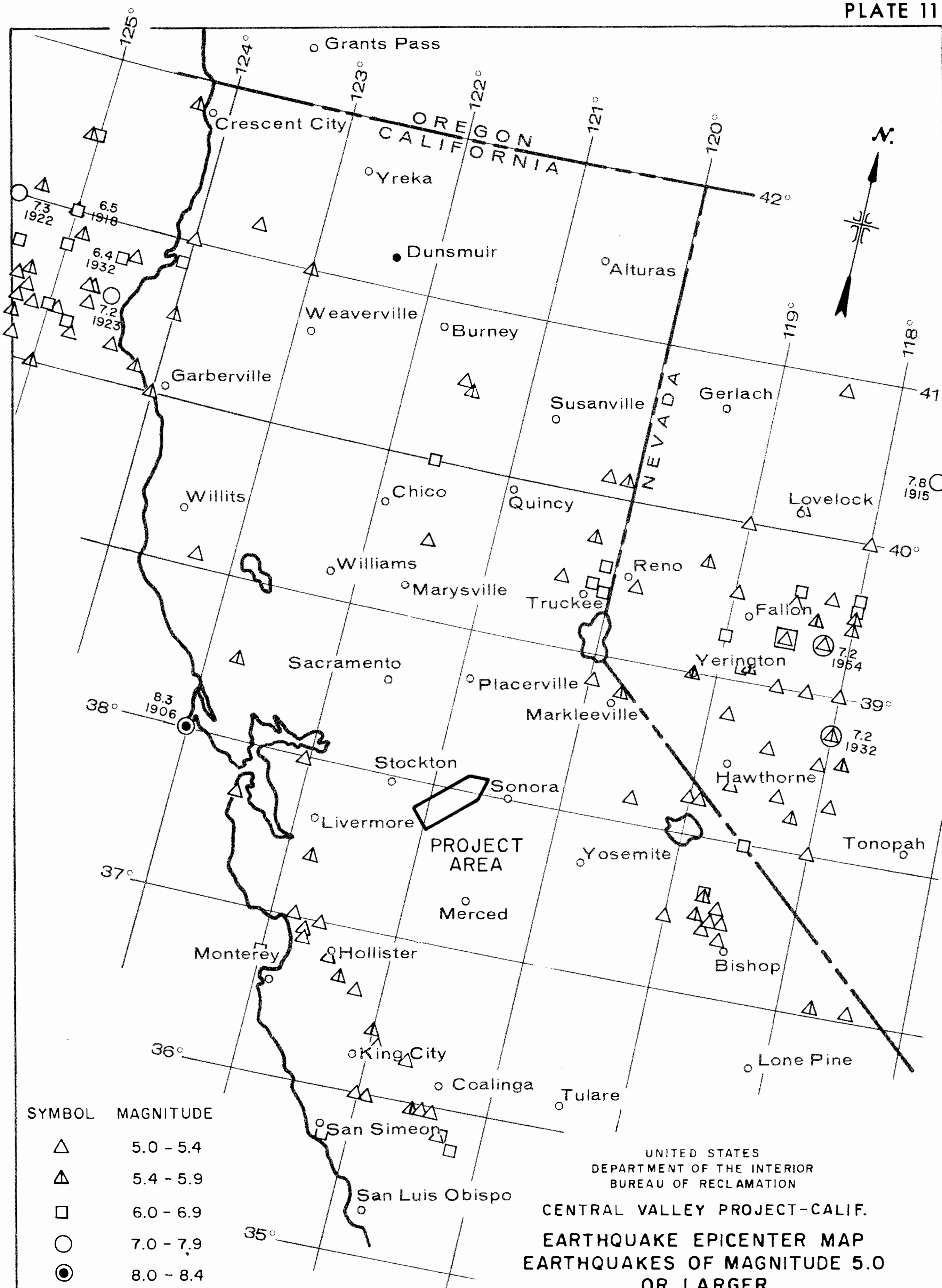
[10] <u>Ibid</u>.



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EARTHQUAKE EPICENTER MAP EARTHQUAKES OF MAGNITUDE 5.0 OR LARGER

ADAPTED FROM CALIF. D.W.R. BULLETIN 116-2.

NOVEMBER 1976

214-208-6116

100,000 years old and possibly younger. This has led to the conclusion that these segments of the Foothills fault system are "capable structures" under nuclear siting requirements. However, they are ancient features without associated historic seismic activity.

The maximum credible earthquake from future movements along these faults has been estimated to be of Richter magnitude 6.5. An earthquake epicenter map is shown on plate 11, indicating earthquakes of Richter magnitude 5.0 or larger. No 5.0 or larger earthquakes have been recorded in the project area.

d. Vegetation

The vegetation of the proposed alternative corridors varies with altitude, soil, moisture, aspect, and disturbance. Scientific names of plants are given in Appendix D. Three vegetation assemblages or communities are manifested along the proposed corridors and are described as follows:

(1) Valley Grassland

The valley grassland community is characterized by an open treeless grassland, with winter rain and hot, dry summers. Its species composition has changed markedly over the last 200 years. Originally, the valley grassland was composed of perennial bunchgrasses such as *Stipa pulchra*, *S. cernua*, *Poa scabrella*, and *Aristida divaricata*. Because of introduced seed, destruction by grazing pressures, and prolonged drought, the native perennials succumbed to the better adapted European annual grasses and forbs. Presently, the valley grassland is composed of *Avena* sp., *Bromus* spp., *Festuca* spp., *Hordeum* spp., and *Erodium* spp.

The valley grassland is governed by an average rainfall of 6 to 20 inches (15 to 51 cm), and a growing season of 7 to 11 months. Mean maximum summer temperatures are 88° to 102°F (31° to 39°C), and mean winter minimum temperatures are 32° to 38°F (0° to 3°C). The valley grassland ranges between 100 and 500 feet (30-152 m) above sea level.

(2) Chaparral

This vegetation community is composed of broadleafed evergreen sclerophyll shrubs, 3 to 6 feet (1 to 2 m) high. They display a dense, nearly impenetrable, vase-shaped branching pattern. Typical dominant species are *Adenostoma fasiculatum*, *Heteromeles arbutifolia*, *Arctostaphylos* spp., *Ceanothus* spp., and *Quercus dumosa*.

Chaparral is found on dry slopes and ridges at elevations 400 to 3,000 feet (120 to 900 m), usually on rocky, gravelly or fairly heavy soils. Although the occurrence of chapparal is edaphically determined, the presence of chaparral may also indicate a seral stage in community composition resulting from fire. The growth habit of many shrubs of this community exhibits stump sprouting which accounts for their fire adaptability.

The chaparral community experiences 14 to 25 inches (36 to 64 cm) of rainfall annually, with hot, dry summers and cool winters. Growing season is 8 to 12 months. Mean summer maximum temperatures are 82^{o} to 94^{o}F (28^{o} to 34^{o}C) and mean winter minimum temperatures are 29^{o} to 45^{o} F (-2^{o} to 7^{o}C).

(3) Foothill Woodland

An open or dense woodland with trees 15 to 20 feet (5 to 6 m) tall and scattered brush and grassland between the trees is characteristic of the foothill woodland community. It occurs in foothills and valley borders 400 to 3,000 feet (122 to 914 m) elevation, fingering upward on warm slopes to 5,000 feet (1,524 m). Species composition of this community is dominated by *Pinus sabiniana*, *P. coulteri* (at higher elevations), *Quercus douglasii*, *Q. wislizenii*, *Q. lobata*, *Umbellularia californica*, *Aesculus californica*, *Ceanothus cuneatus*, *Cercis occidentalis*, and *Eriodictyon californicum*.

Average annual rainfall of the foothill woodland is 15 to 40 inches (38 to 102 cm), with little or no fog. Growing season is 6 to 10 months with hot, dry summers. On the average, the last frost occurs late in March, except in the lowest parts of river bottoms where it occurs as late as mid-April. In autumn the first frosts generally occur in mid-November. Mean maximum temperatures are 75^{o} to 96^{o}F (24^{o} to 36^{o}C) and mean winter minimum temperatures are 29^{o} to 42^{o}F (-2^{o} to 6^{o}C).

e. Fish and Wildlife

The existing area at the north end involving all three possible alinements has trout, bass, and catfish in the Stanislaus River system. About 15 different kinds of fish may be found in these areas. Anadromous (migratory) fish are not able to pass above the Goodwin and Tullock Dam structures into this stretch of the river.

Small groups of resident black-tailed deer are located in the proposed project area and are shown on the Primary Areas of Wildlife Resource Population plate 12. Coyotes and bobcats are present but rare in this area. Some 14 other small mammals, 20 birds, and 6 reptiles may be found in the general areas of the three

PLATE 12

Corridor Boundary

Deer (Black Tail)

Small Mammals - Rabbits, other rodents, etc.

Upland Birds - Quail, Pigeons - in addition to Small Mammals

Pheasants

Raptor (eagle, hawks) Concentrations

General range of Raptor (eagle, hawks)

New Melones Project Boundary Line

UNITED STATES
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CENTRAL VALLEY PROJECT
EAST SIDE DIV - NEW MELONES UNIT - CALIF.

NEW MELONES TRANSMISSION LINES
CORRIDOR STUDY
PRIMARY AREAS OF WILDLIFE
RESOURCE POPULATIONS

851-208-164

alinements. The game animals and birds are the deer, bobcats, rabbits, grouse, quail, band-tailed pigeon, and the mourning dove. See the detailed listing in Appendix D.

(1) Rare, Threatened, or Endangered Fauna

The three alternate alinements are within the range of the endangered Southern Bald Eagle (*Haliaeetus leucocephalus leucocephalus*). There are, however, no known nesting sites on or near the proposed alinement or any of the alternative alinements studied.

(2) Rare, Threatened, or Endangered Flora

According to the inventory of Rare and Endangered Vascular Plants of California (1974) published by the California Native Plant Society, the Tuolumne coyote-thistle (*Eryngium pinnatisectum* Jepson) is present in the project area. Three additional plants of the project area are now being considered as candidate endangered or threatened species. They are: (1) a soap plant (*Chlorgalum grandiflorum*), (2) a member of the evening primrose family (*Clarkia rostrata*), and (3) a member of the sunflower family (*Pseudobahia bahiaefolia*).

The thistle was recorded in 1945 in Sections 33 and 34, R. 12 E., T. 2 N., MDB&M near the town of Copperopolis and in the NE 1/4, Section 3, R. 12 E., T. 1 N. No occurrence of this species has been recently reported, and the plant was not carried on the U.S. Fish and Wildlife Service proposed list of endangered species which was published in the Federal Register, Volume 41, No. 117, June 14, 1976.

f. Existing Recreation

Although recreation participation determinants such as visitor preferences and site characteristics are used to describe recreation areas, they are not helpful in assessing the existing recreation uses along the proposed powerline corridors. Areas of recreation are shown on plate 13. In this instance, land ownership largely influences recreation use, as it also affects access and entry to potential recreation areas. The various land ownership entities and the existing recreational uses are described as follows:

(1) Private Land

Almost all of the land within the proposed powerline corridors is held in private ownerships. This severely limits the availability of the land for recreational use, except to those persons having consent from the landowner. Some trespassing occurs from the general public, yet this is felt to be minimal because of fencing and patrol by the owner. Although no formal records are kept on recreation activity participation, it is assumed that some upland game hunting, hiking, and horseback riding occur.

(2) Corps of Engineers' Land

Land administered by the Corps of Engineers is located at the substation of New Melones Dam powerhouse. It will be administered by the Bureau of Reclamation during operation of the facilities. For security and public safety this area will probably be closed to the public.

(3) Tuolumne and Calaveras Counties

The proposed transmission route would cross the Green Spring Run Bay of Tulloch Reservoir more than 1/2 mile (0.8 km) from the upper end of the bay (south of Hammil's Mountain). There are no recreation developments in this portion of Tulloch Reservoir. Very little general boating is done here because it is shallow. Tuolumne County recreation developments are all farther south near the southern end of the reservoir.

All land 5 feet (1.5 m) or higher above the normal high waterline of the reservoir (515 feet/155 m) is private land except in the area of the Lake Tulloch Marina (County) and the private developments of Poker Flat, Black Creek Lodge, and Coppercove Resort in Black Creek Bay.

(4) Stanislaus County

The alternate route "B" would cross a potential recreation and water trail along the Stanislaus River at Section 3, R. 11 E., T. 2 S.

Authorization for the New Melones development is unique in that it also includes development of the lower Stanislaus River. Based on the authorization, the U.S. Army Corps of Engineers has proposed a lower river program for the river which includes:

(a) Acquire easements for flowage channel maintenance and fish and wildlife on 4,000 acres (1 619 ha) of riparian habitat and salmon spawning beds.

(b) Purchase of 12 public access sites which will make possible a water trail.

(c) Provide a 4-mile (6.4 km) kayak run below Goodwin Dam.

Corridor Boundary

Public Use Land

Private Land

New Melones Project Boundary Line

Public Hwy. R.O.W. (Approximation)

Existing Recreation Uses

Future or Potential Recreation (& Wildlife) Uses

Symbol of Recreation Use

2nd Home or Residence

Fishing

Off Road Vehicle

Bird Hunting

Degree of Use Size of Symbol

Low Moderate Heavy

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NEW MELONES TRANSMISSION LINES
CORRIDOR STUDY

RECREATION

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(d) Provide rangers to patrol the federally owned parks.

Acquisition of several public access sites has been completed and acquisition of other lands will be completed in the near future.

g. Land Ownership and Use

The study area for the proposed transmission line falls primarily within the areas zoned for agriculture. Land class, use, and ownership are shown on plates 14, 15, and 16, respectively. Agriculture Zone A-1 within Calaveras County is largely used for cattle grazing with recreation allowed in some areas. Most of the area within Stanislaus County is in an A-2, Exclusive Agricultural Zone with 10-acre (4 ha) minimum parcels. The majority of the study area within Tuolumne County is either under an Exclusive Agricultural Zone A-E with a 37-acre (15 ha) minimum lot size, or a General Agricultural Zone A-1 with a 10-acre (4 ha) minimum lot size. The study area also includes pockets of residential zone.

(1) Southern Corridor

The area traversed by the proposed route lies south of the Stanislaus River and is used primarily for dryland grazing. The boundary between Stanislaus and Tuolumne Counties, approximately 600 feet (180 m) in elevation, is the approximate dividing line between barren grazing land to the south and west and the grazing land to the north and east which is contrastingly covered with scattered oaks and brush.

Between Warnerville Substation, the western terminus of the corridor, and Emery Road, approximately 2.5 miles (4 km) east, the land has been developed as irrigated pasture. This is possible because the topography, between 250 feet (75 m) and 275 feet (83 m), is still gently rolling in nature. As the corridor proceeds east and north, the terrain becomes increasingly undulating, mountainous and undeveloped, making further irrigation difficult or impossible. However, many creeks, springs, and intermittent streams traverse the corridor along its entire length.

There are very few residences in the area and ownerships along the corridor are in large tracts and devoted to ranching and livestock operations. Located in the corridor approximately 2.5 miles (4 km) east of Warnerville Substation near the intersection of Fogarty and Emery Roads is a 40-acre (16 ha) feedlot. Also located in the corridor, approximately 4 miles (6.3 km) south of the New Melones damsite, the eastern terminus of the corridor, on O'Byrne Ferry Road is the Sierra Conservation Camp of the California State Department of Corrections.

In the upper elevations of the foothills, a number of limestone and marble quarries are in operation. One such quarry is located within the corridor approximately 2 miles (3.2 km) south of the New Melones damsite. Numerous operating, nonoperating, and abandoned gold mines and other prospects are located in the foothills; however, no mines are known operating within the corridor.

Due to the restricted access and ruggedness of the higher elevations within the corridor, there has been no recreational development in this area. In addition, there are no commercial, industrial or urbanized areas within the corridor.

Land use within the corridor is as follows:

Irrigated Pasture	11%
Dry Grazing	89%

Land ownership within the corridor is as follows:

Public Lands	2%
State of California	6%
Private Lands	92%

The southern corridor traverses O'Byrne Ferry Road, State Highway 108/120, Tulloch Lake, Hetch-Hetchy Aqueduct, Willms Road, Sierra Railroad, and Warnerville Road, as well as miscellaneous canals, laterals, powerlines and other surfaced, gravel and dirt roads. Towns, villages, and most ranches in the area have electricity and telephones.

(2) Northern Corridor

The corridor, which lies north of the Stanislaus River, traverses approximately six different land uses. These have been identified as irrigated pasture, rural homesites, dry grazing, dry crop, recreational homesites, and river wash. The rural homesite classification also includes ranchettes, orchards, and vineyards.

The Oakdale Airport is located 1 mile (1.6 km) north of the Warnerville Substation which is the western terminal of the corridor. The surrounding land, formerly used for dry grazing, has now been developed as irrigated pasture. This has been possible because the topography, between 200 feet and 250 feet (60 and 75 m), is still gently rolling in nature. Proceeding northeast, the corridor intersects and parallels the flood plain of the Stanislaus River. Excellent access, soil, topography, and proximity to the town of Oakdale, 4 miles (6.3 km) to the west, encourage a variety of uses as dry agriculture, poultry production,

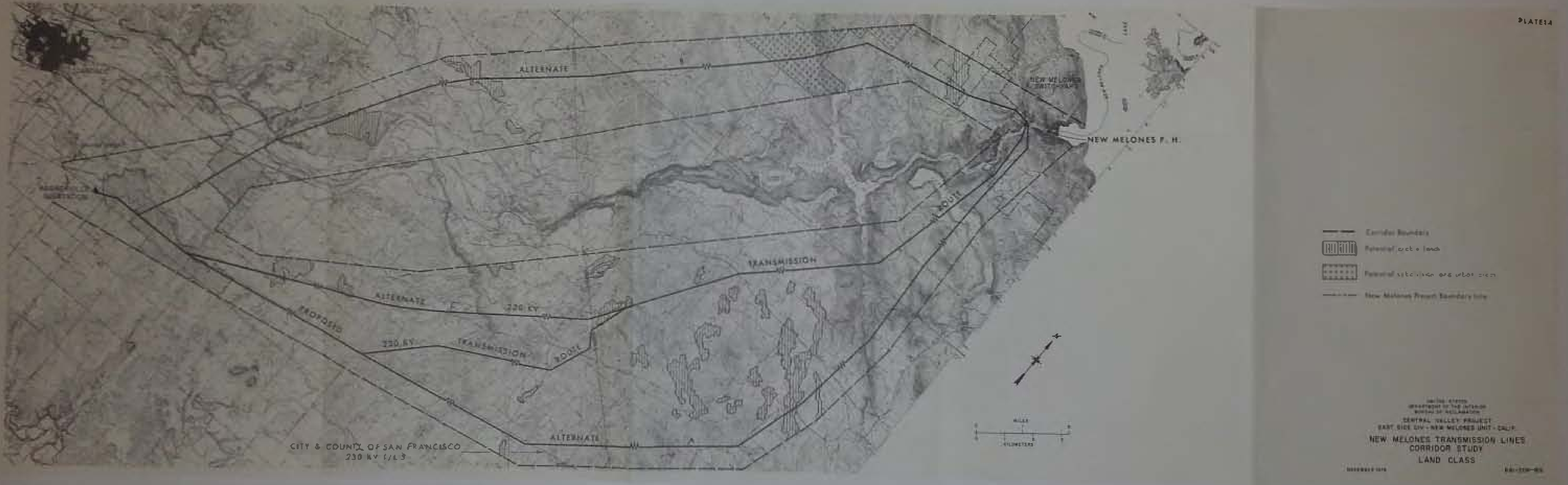
PLATE 14
ALTERNATE
NEW MELONES SWITCHYARD
NEW MELONES F. H.
ROUTE
TRANSMISSION
ALTERNATE
220 KV
PROPOSED
220 KV
TRANSMISSION
ROUTE
ALTERNATE
CITY & COUNTY OF SAN FRANCISCO
230 KV L/L 3
MILES
KILOMETERS
Corridor Boundary
New Melones Project Boundary line
UNITED STATES
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CENTRAL VALLEY PROJECT
EAST SIDE DIV - NEW MELONES UNIT - CALIF.
NEW MELONES TRANSMISSION LINES
CORRIDOR STUDY
LAND CLASS

PLATE 13

Corridor Boundary
Dry Grazing
Rec H Recreational Homesites
A M Asbestos Mine
Rural Homesites
IP Irrigated Pasture
Turkey Ranch
Dry Crop
River Wash
Airport
New Melones Project Boundary Line

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EAST SIDE DIV. - NEW MELONES UNIT - CALIF.

NEW MELONES TRANSMISSION LINES
CORRIDOR STUDY
LAND USE

NOVEMBER 1978

PLATE 16

Corridor Boundary

Public Land *

State

Private Land

New Melones Project Boundary Line

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NEW MELONES TRANSMISSION LINES
CORRIDOR STUDY
LAND OWNERSHIP

881-208-161

rural homesites, part-time farming operations, and a diversity of agricultural production, such as walnuts, almonds, peaches, grapes, and barley. Land in this area which is not adaptable to these uses because of soil and topography is utilized as dry grazing land. This diversity of use continues until the corridor leaves the river plain and proceeds into the foothills of the Sierras. Here the terrain is increasingly undulating, mountainous, and undeveloped, making irrigation difficult or impossible. Scattered oaks and brush are encountered at 400 feet (120 m) elevation and many creeks, springs, and intermittent streams traverse the corridor. Land use for the remainder of the corridor is primarily dry grazing.

Approximately 5 miles (7.9 km) west of the New Melones Switchyard the eastern terminus of the transmission line, the northern corridor crosses the Black Creek arm of Tulloch Lake. Because of view, access, topography, and location, both sides of the lake in this area have been significantly developed for recreational homesites of 1 acre (0.4 ha) or more. There are a number of fine homes, both seasonal and full-time, scattered throughout this area.

There are some residences in the area, and the size of ownerships along the corridor varies depending on land use. Ownerships are in small tracts, 5 to 40 acres (2 to 16 ha), throughout the areas utilized in connection with rural homesites, ranchettes, and part-time farming operations. In contrast, land used for grazing and field crop production is owned in large tracts. Located in the corridor, approximately 3-1/2 miles (5.5 km) northeast of Warnerville Substation, near State Highway 108/120, is a 20-acre (8 ha) turkey ranch.

In the upper elevations of the foothills, a number of limestone and marble quarries are in operation. No such quarries are known operating within the northern corridor; however, near the New Melones damsite, a large asbestos mine is currently in operation. Numerous abandoned gold mines and other prospects are located throughout the foothills.

There are no commercial, industrial, or urbanized areas within the corridor.

Land use within the northern corridor is as follows:

River Wash	2%
Dry Crop	2%
Recreational Homesites	7%
Irrigated Pasture	11%
Rural Homesites	12%
Dry Grazing	66%

Land ownership within the corridor is as follows:

Public Lands	2%
State of California	4%
Other	1%
Private Lands	93%

The corridor traverses O'Byrne Ferry Road, Sonora Road, Orange Blossom Road, Stanislaus River, Lancaster Road, State Highway 108/120, Tulloch Lake, Sierra Railroad, Wanble Road, and Warnerville Road, as well as miscellaneous irrigation canals, laterals, powerlines, and other surfaced gravel and dirt roads. Towns, villages, and most residences in the area have electricity and telphones.

h. Special Interest Points

(1) Geologic Points of Interest

As a portion of California's historic Mother Lode country, the Sierran foothills in general, are an area of geologic interest. Numerous mines--both operating, nonoperating and abandoned--dot the landscape. Deposits of gold, silver, copper, zinc, chromium, manganese, asbestos, slate, clay, and limestone are presently being mined in the portion of the foothills the proposed corridors traverse.

The deformation of the Mesozoic strata, as well as the variety and types of rock in the area, make the foothills an interesting geologic study area.

Picturesque Table Mountain, which actually represents a "fossilized stream channel," is another feature of special geologic interest.

(2) Natural Areas

The only known recreational natural area designated for public use is Kerr Park lying about 3 miles (4.8 km) west of the proposed alternative alinement "B" along the Stanislaus River.

(3) Regional History

Calaveras, Stanislaus, and Tuolumne Counties encompass an area rich in history and tradition. The area was inhabited by Miwok Indians. Gabriel Moraga was among the first explorers journeying into this area on several expeditions between 1806-1808. Other explorers who followed were: Jedediah S. Smith (1827), John Bidwell, John C. Fremont, and Kit Carson.

In 1848, the discovery of gold near Sacramento brought the first great influx of settlers. Many a disappointed 49er, however, turned to farming and service industries as the veins ran out. Currently, the three-county area has some of the most productive agricultural lands in the world, as well as a myriad of recreational facilities.

(a) Calaveras County

One of the oldest gold mining districts in the State, Calaveras County, was incorporated in 1850. Named for the Calaveras River, which in Spanish means skull, by Gabriel Moraga who discovered its banks strewn with Indian skulls, the county is in the heart of the Mother Lode country.

(b) Stanislaus County

Incorporated in 1854 by annexing a section of Tuolumne County, the county derives its name from the Stanislaus River. Explored in 1806 by Gabriel Moraga, who named it Rio de Los Dolores, the river was subsequently renamed after a Christian-educated Indian chieftan who adopted the name Estanisloa from the Polish Saint Stanislaus.

(c) Tuolumne County

It is an integral part of the Mother Lode country, and immortalized by such men as Bret Harte and Mark Twain. Tuolumne County is one of the 27 original counties in the State.

There are some old mines, an abandoned railroad bed, the Sierra Railroad, etc., located near the line routing.

During the historic period, and for an unknown span of prehistoric time, the Stanislaus River Basin, including the project area, was the homeland of Central Sierra Miwok Indians. In addition, the area was a part of California's historic "Gold Country." The area purchased for the New Melones Project is included in a proposed "New Melones Historic District" and has been declared eligible for inclusion in the National Register of Historic Places on the basis of its extensive historical and archeological resources.

(4) Historical Sites

An inventory of historic and prehistoric features is given in Appendix E. The remains of the gold rush community of Knights Ferry is in Stanislaus County.

In researching this subject, the PG&E company contacted the California State Office's Historic Preservation Officer. His response, which identified the Willms Ranch, is given in Appendix F. The Willms Ranch near Knights Ferry is designated as California Historical Landmark No. 415. It is shown on plate 17.

The PG&E Melones Powerhouse, located about 1/2 mile (0.8 km) upstream from the New Melones Switchyard, was constructed about 1927. Although it is nearly 50 years old, it has little historic significance.

(5) Archeological Sites

The PG&E company contracted for a Phase I (site identification) survey of 100 feet (30 m) on each side of the surveyed centerline as well as a survey for sights up to 300 feet (90 m) from the proposed route centerline. Access roads were also surveyed in a similar manner. A final report was provided to PG&E in January 1977.

Four of the seventeen archeological sites located are prehistoric. 4-TUO-S-441 is a bedrock mortar site, while NM-12 and NM-13 are habitation sites. NM-5 is a prehistoric habitation site with historic ranch structures. Eight of the thirteen historic sites are rock alinements. Site NM-1 is a historic dam. Site NM-2 is a historic ranch. Sites NM-14 and 4-TUO-S-442 are historic ditches. 4-TUO-S-453 is a placer mining area.

A Phase II (sight significance) survey was made by Billy J. Peck and Dudley M. Varner for PG&E in June 1977. Two of the Phase I sites were chosen for further investigations because of the proximity of the proposed transmission line and the surface descriptions. Investigations of these sites included a reexamination of surface content and minor subsurface testing consisting of auger holes and small excavation units. The two sites were found to contain significant subsurface materials which must be protected.

i. Socioeconomic Aspects

(1) Introduction

The socioeconomic setting for the proposed transmission line is given in the following paragraphs. The area of consideration is within Calaveras, Stanislaus, and Tuolumne Counties.

(2) Demography

Calaveras, Stanislaus, and Tuolumne Counties occupy a total land area of 3,104,190 acres, (1 256 221 ha), of which 31,640 acres (12 805 ha) are water-covered by lakes, reservoirs, and streams. Of this acreage, based on the 1974 County Agricultural Commissioner's Reports, 1,493,740 acres (604 495 ha)--or 48.6

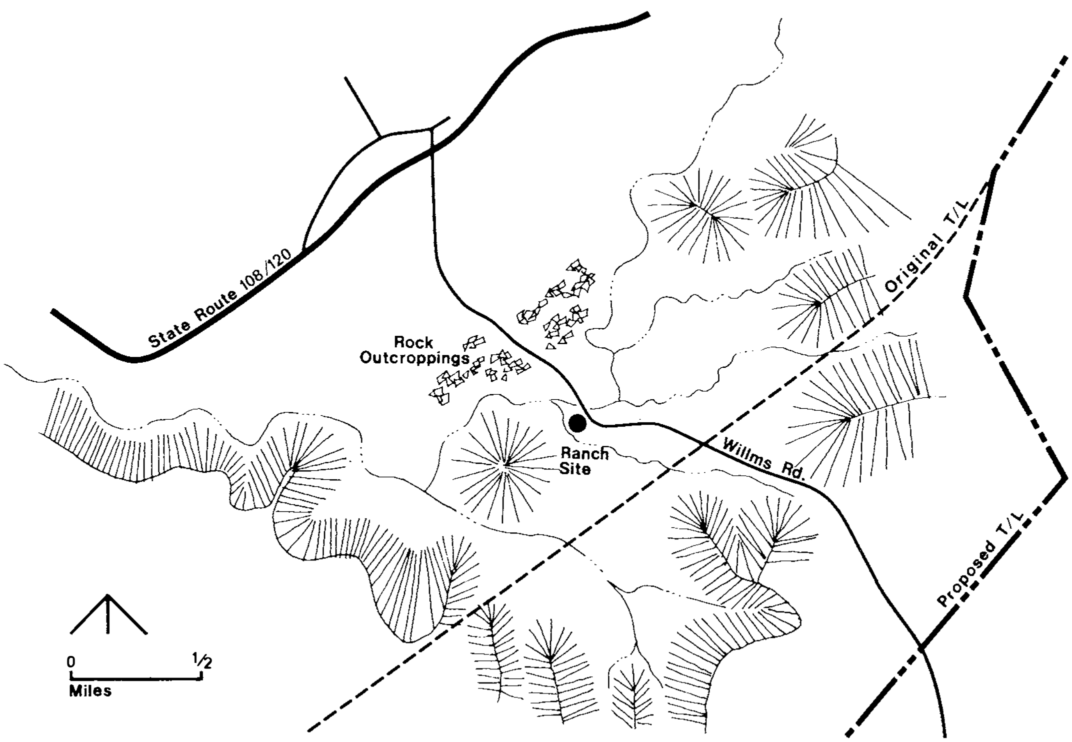

PLATE 17 : WILLMS RANCH

(COURTESY P.G.&E.)

percent of the available land area--were being farmed. The remaining 1,578,809 acres (638 921 ha)--or 51.4 percent of the available land area--was available for commercial, municipal, and residential, as well as recreational uses.

Although the three counties are contiguous, they are not homogeneous. Calaveras and Tuolumne are primarily rural counties without substantial, concentrated population centers. With an average population density of 15.87 and 12.05 persons per square mile (6.13 and 4.65 persons per square km), respectively, and with only one incorporated city in each, it is evident that the major proportion of these two counties' inhabitants reside in unincorporated areas.

In contrast, Stanislaus is a heavily populated county —average density per square mile is 143.2 persons (55 persons per square km)--with a nucleus of its inhabitants residing in concentrated population centers, thus providing for a much wider and diversified economic as well as social base.

About 30 percent of Calaveras and over 60 percent of Tuolumne Counties' land areas are within the Stanislaus National Forest or Yosemite National Park.

Table 2 depicts population distributions for each respective county in 1970 and 1975. A quick glance indicates that a substantial proportion resides in unincorporated (rural) areas and that population growth in the three-county region is expected to increase at an annual rate of around 2-3 percent.

Calaveras, Stanislaus, and Tuolumne Counties had a combined population of 230,260 in 1970, which was split 49.5 percent to 50.5 percent between males and females. The median age in each county was 38.5, 28.0, and 34.3, respectively. Minorities totaled 6,882 or about 3 percent of the total population, with the most numerous being: Blacks, American Indians, Filipinos, Chinese, and Japanese.

The majority of the inhabitants are married and native born, with an educational achievement level equivalent to a high school education. About 98 percent of the total population were organized within households, with the relative distribution of male to female family heads being 91 percent to 9 percent. The most prevalent languages spoken in the area were English and Spanish, with over 85 percent of the total population regarding these as their primary language.

The differences between the rural nonfarm and the rural farm populations were of some consequence. Although the median age for the rural farm population is higher, they are on the whole, better educated than their rural nonfarm peers.

TABLE 2 - POPULATION DISTRIBUTION (1970)

	1970	1975
Calaveras County		
Angels Camp	1,710	2,400
Unincorporated	11,875	13,450
TOTAL	13,585	15,800
Stanislaus County		
Ceres	6,029	9,375
Modesto	61,712	79,500
Newman	2,505	2,570
Oakdale	6,594	7,200
Patterson	3,147	3,740
Riverbank	3,949	4,230
Turlock	13,992	15,900
Waterford	2,243	2,240
Unincorporated	94,335	88,845
TOTAL	194,506	213,600
Tuolumne County		
Sonora	3,100	3,340
Unincorporated	19,069	22,360
TOTAL	22,169	25,700

(3) Education

The public school system for elementary and high school which exists in Calaveras, Stanislaus, and Tuolumne Counties offers a wide variety of courses which culminate with the graduation of the student from a college-preparatory curriculum. The active public school enrollment for the three-county area as of fall 1975 was 59,306, with a staff total of 3,209 based on 1973 figures.

The private and parochial enrollments within the three-county area were 4,867 students who attended 32 private or parochial schools in Stanislaus and Tuolumne Counties (since Calaveras has no private or parochial enrollment) where 131 full-time and 68 part-time teachers carried out their instruction.

There are two community colleges: Modesto Junior College in Stanislaus County and Columbia Junior College in Tuolumne County. Their enrollments were 18,269 and 2,769, respectively. Both provide a 2-year curriculum leading to the Associate of Arts or Associate of Science degrees, as well as providing ample opportunity for nonstudent citizens of the community to enrich and expand their educational horizons. Only one 4-year public institution, the Stanislaus Campus of the California State University system, is within the three-county area. With an enrollment of 2,700, this 4-year public institution provides a curriculum leading to either a Bachelor in Arts or Science in the humanities and in the sciences.

(4) Employment and Income

Calaveras, Stanislaus, and Tuolumne Counties are areas of persistent unemployment.[11] During the peak of the recent recession, 1975, unemployment rates in these three counties were almost twice the above-average rate of unemployment that persisted in 1970. The labor force and income of families are shown on tables 3 and 4, respectively.

Calaveras, Stanislaus, and Tuolumne Counties can be considered three of California's "middle income" counties. The median incomes of these three counties ranked 25, 30 and 34, respectively, among California's 58 counties, based on a personal income tax statistics comparison, by county, for the 1973 income year.[12]

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11 U.S. Department of Labor, Employment and Training Administration, "Area Trends in Employment and Unemployment: October, November, December, 1975" pages 16-17.

12 State of California, "California Statistical Abstract--1975," table D-4, page 35.

TABLE 3 - LABOR FORCE, 1970 (16 YEARS AND OVER)

	Calaveras County	Stanislaus County	Tuolumne County
Total Labor Force 13/	4,737	72,259	8,179
Civilian Labor Force 13/	4,712	72,015	8,172
Employed	4,278	65,232	7,428
Unemployed	434	6,783	744
Unemployment rate, percent	9.2	9.4	9.1
Total Employed, All Industries 14/	4,278	65,232	7,428
Agriculture, forestry and fisheries	302	7,099	405
Mining	97	153	81
Construction	481	4,073	945
Manufacturing	643	12,676	921
Transportation	22	2,057	187
Communications and public utilities	209	2,108	396
Wholesale and retail trade	776	14,218	1,570
Finance, insurance, and real estate	197	2,434	400
Services	1,225	17,030	1,953
Public administration	326	3,384	570

13/ State of California, Department of Human Resources Development, Employment Data and Research Division, "California Manpower Indicators From the 1970 Census: Summary of Manpower Indicators," July 1972, Table 6, page 8--for each of the three counties.

14/ Ibid., Table 10, page 12.

TABLE 4 - INCOME OF FAMILIES, 1969

	Calaveras County	Stanislaus County	Tuolumne County
Type of Income of Families 15/			
Total families	3,758	50,709	5,967
Mean family income 16/	$ 9,813	$ 10,085	$ 9,970
(Total positions filled)	3,651	51,627	5,884
Mean earnings	$ 8,573	$ 8,746	$ 8,642
With social security income	1,067	10,384	1,424
Mean social security income	$ 1,707	$ 1,604	$ 1,727
With public assistance income	249	6,301	413
Mean public assistance income	$ 1,228	$ 1,523	$ 1,276
With other income	1,636	16,461	1,995
Mean other income	$ 2,108	$ 2,041	$ 2,833
Total Families Below Poverty Level 17/			
Total families	351	6,002	559
Percent of all families	9.3	11.8	9.4
Mean income, all sources	$ 1,597	$ 2,100	$ 1,694

15/ State of California, Department of Human Resources Development, Employment Data and Research Division, "California Manpower Indicators From the 1970 Census: Summary of Manpower Indicators," July 1972, Table 12, page 14--for each of the three counties.

16/ *Ibid.*, Table 11, page 13.

17/ *Ibid.*, Table 13, page 15.

The following employment and income profiles were constructed for the three counties, based on 1970 U.S. Bureau of Census data.

(5) Economic Base

Although Calaveras, Stanislaus, and Tuolumne Counties are oftentimes classified as being rural, they derive a significant proportion of their revenues from industries other than agriculture. In Stanislaus, a very prolific agricultural county, over 81 percent of the work force is concentrated in service, support, and manufacturing industries. Calaveras and Tuolumne, in the heart of the Mother Lode country, have a significant tourist and recreation industry. Miscellaneous services which are available include the usual:

Welfare and Public Assistance
City and County (General)
Law Enforcement
Medical
Social and Religious
Recreation
Transportation
Mass Media
Housing
Family Life

j. Noise

Noise levels in the corridor locations can be largely attributed to the following sources:

Motor vehicle and road construction, Sierra Railroad, powerboats on Tulloch Lake, New Melones Dam construction, agricultural activities, mining, natural background sounds, aircraft, hunting, and paging systems. Noise levels were measured in the study area on July 26 and 27, 1976. Daytime levels ranged from 31 to 62 dBA, and nighttime levels were 26 to 56 dBA. Tractors and motor vehicles ranged from 50 to 80 dBA at 100 feet (30 m) when they passed.

2. Probable Future Environment Without the Project

Without the transmission line, the environment of the corridor would remain relatively the same as its present use because of soil, topographic, and access restrictions. No plans for major changes in land use are known to the writers at this time.

The slow changes in land use patterns now occurring in the area can be expected to continue. Recreation development of the

Black Creek arm of Tulloch Lake is just getting started and can be expected to expand considerably during the next few years. Likewise, the demand for rural homesites is also considerable, and this use will be continuously expanding throughout the area.

Agriculture and its supporting industries continue to be a substantial revenue producer in Stanislaus County. Calaveras and Tuolumne, with a less diverse base than Stanislaus, is expected to continue to experience problems in finding jobs for its people, and may experience some population outmigration, especially among the young. The prospects for these two counties to attract new industries and capital investments are unfavorable at this time. A general lack of concentrated population centers does not allow utilization of economies of scale for manufacturing and service industries or provide a potentially lucrative marketing area. Currently both Calaveras and Tuolumne Counties are taking advantage of their substantial recreational facilities and historical folklore in promoting a lucrative tourist industry.

C. ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

1. Indroduction

This section discusses the impacts the proposed line is expected to have during construction and after operations have begun.

Short-term and long-term impacts are considered. Short-term impacts occur mainly during construction while long-term effects occur during operation and maintenance.

Impacts for various landscape zones are described in this section. The transmission line traverses various landscape types. The visual effects of the proposed project are examined in table 5.

2. Construction Related Impacts

a. Physical Systems

Short-term minor disturbances of air, water, and land systems will occur during the 12-month construction period of the electrical transmission line. They include the following:

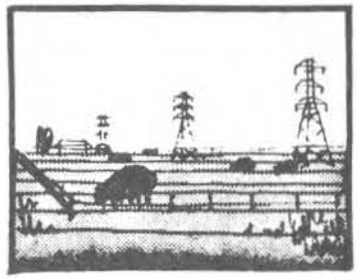
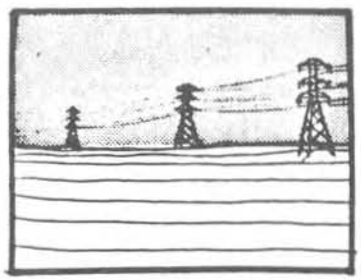
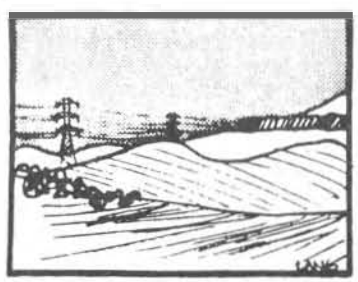
(1) Visual impacts associated with equipment and activity during clearing and construction will be temporary and local. Visual impacts are expected to be minimal since most of the line would be in relatively remote areas and construction activities are of short duration in any one location. Impacts on various landscape zones are shown on table 5.

(2) Highway 108/120 and zoned routes of travel will be crossed at or near right angles. Long tangents of the powerline should not be visible from these areas. Construction on ridge tops where the structures would be skylined will be avoided where possible; however, skylining will occur at Table Mountain and Green Spring Run. The impact at Table Mountain is reduced by its remote location as shown on plate 18.

(3) There will be small amounts of carbon monoxide and nitrogen oxides emitted from construction vehicles in areas now relatively free from vehicular traffic. An estimated 51 motorized construction vehicles and equipment shown on Appendix B will be dispersed along the line during various phases of construction; therefore, the exhaust fumes will not be concentrated in one area.

(4) There will be a local temporary effect on air quality from particulate matter released when burning of slash from clearing is permitted. In the extreme case, burning would likely

Table 5 Visual Effects of the Proposed Project (COURTESY P.G.&E)

Lsndscape Zone (line in zone)	Visual Quality Rating (See Text)	Zone With Transmission Line	Visibility (exposure and viewers)	Degree of Visual Impact/Preferred Route
irrigated pastures (1.3 mi., 2.1 km)	low		Line will be prominent in non-parallel section because it will be the major vertical element in this flat panoramic landscape. A few ranch house residents near the Warnerville Substation would be visually affected. Distant, 3-mile views of line will be possible from Highway 108/120.	A transmission line here would have low visual impact because the line parallels an existing line and thus does not create a new vertical element.
dry grazing lands (4.0 mi., 6.4 km)	low		The transmission line in this flat, relatively undeveloped landscape will be highly visible. However, few viewers will be affected, with no major roads or residences involved.	Lack of variety in this landscape and few viewers will make the visual impact in this zone low.
hummocky grasslands (6.3 mi., 10.1 km)	above average		The proposed line will be visible in this spacious undisturbed landscape. Scenic diversity in this zone is created by isolated conical hill forms, grey-black rock fences and jagged lichen covered rocks. There are few screening possibilities and a lack of existing transmission lines.	The introduction of a new line in this spacious and diverse landscape will change existing visual relationships significantly. Visual impact for viewers will depend on the value they put on this landscape type.

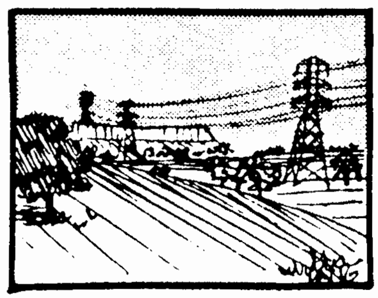
(COURTESY P.G.&E.)

Table 5 Continued

Landscape Zone (line in zone)	Visual Quality Rating	Zone With Transmission Line	Visibility (exposure and viewers)	Degree of Visual Impact/Preferred Route
riparian woodland (0 mi., 0 km)	high		Because of its relatively small enclosed scale and scenic nature, a transmission line would be highly visible to viewers in this zone. This riparian plain includes existing farms, a historical town site, proposed conservational and recreation areas; all of which will attract more viewers in the future.	Preferred route does not traverse this zone.
rolling oak woodland (8.9 mi., 14.3 km)	average		Visibility of the line will depend on siting in this landscape zone. Topography and vegetation vary affording some potential screening. A major part of Highway 108/120 runs through this zone.	A low visual impact can be accomplished in this area with sensitive tower siting and construction practices because views can be blocked by vegetation and linear quality of line can be broken.
dry scrub oak/ digger pine slopes (2.1 mi., 3.4 km)	high		Minimal line visibility is possible in many areas because of great diversity in topographic and vegetative backdrop. More visitors will visit this landscape with the completion of Melones Dam and continued recreational use of Tullock Lake.	Similar to oak-woodland but in few open areas where Table Mountain is visible impact of line would be significant. Location in screened areas can minimize impact in this zone.

(COURTESY P.G.&E.)

Table 5 Continued

Landscape Zone (line in zone)	Visual Quality Rating	Zone With Transmission Line	Visibility (exposure and viewers)	Degree of Visual Impact/Preferred Route
Table Mountain formation (0.4 mi., 0.6 km) (Total 23.0 mi., 37.0 km)	high		A span up the unique Table Mountain formation from the digger pine zone could be highly visible depending on where it is sited. At times the mesa runs near the highway becoming a visual feature.	Because the Table Mountain formation is a distinctive landscape feature, there is a high potential for visual impact. The preferred transmission route crosses this mesa once. This crossing is at a visually isolated location out of view from travelled roads or developed areas.
New Melones Switchyard Area	high		The visitors to the public overlook will see the panorama.	Tower, pole and insulator coloring, background and vegetation reduce the impact. Special conductors will reduce their visibility.

affect local air quality for about 30 days through the 1-year construction period. Chipping will be one method of slash disposal. Some brush may be piled for wildlife habitats. Open burning will be subject to air pollution regulations. A chipping machine will cause noise intrusions in relatively quiet areas.

(5) Water quality could be adversely affected if construction wastes such as oil, concrete, and sanitary wastes were accidently introduced into surface waters. This spillage could also possibly affect ground water through percolation. The magnitude of the impact would be dependent on the nature of the accident and the number and location of occurrences. All local, State, and Federal laws and regulations regarding disposal of wastes, will be followed during construction. An emergency contingency plan for actions to be taken in case of an accidental spillage will be prepared. The Bureau, the State Water Pollution Control Board, and Federal Environmental Protection Agency (EPA) will be notified if spillage occurs which has the potential to pollute stream or ground water.

(6) When construction vehicles cross unbridged streams, there will be some temporary localized turbidity introduced into the waterflow. Access roads across unbridged streams will be eliminated if possible. It is anticipated that five culverts will be utilized for stream crossings during construction. No live streams will be crossed by access roads.

(7) Raw or exposed soils in the foothill areas which are exposed to construction activity will be subject to erosion. The topsoil along with much of the organic material on the steep slopes could be lost from disturbed areas. Typical steep slopes are located above the switchyard, Table Mountain, and Green Springs Run as shown on plate 18A.

Foothill terrain subject to erosion would be at structure sites and where new access roads are constructed. Some erosion could occur and turbidity could be introduced into nearby streams draining the area. With application of normal erosion control measures, this turbidity will not be severe, and aquatic ecosystems downstream should not be adversely affected.

Borrow areas for aggregate and backfill are not anticipated since commercial aggregate sources will be used and excavated material will be adequate for use as backfill around structure foundations.

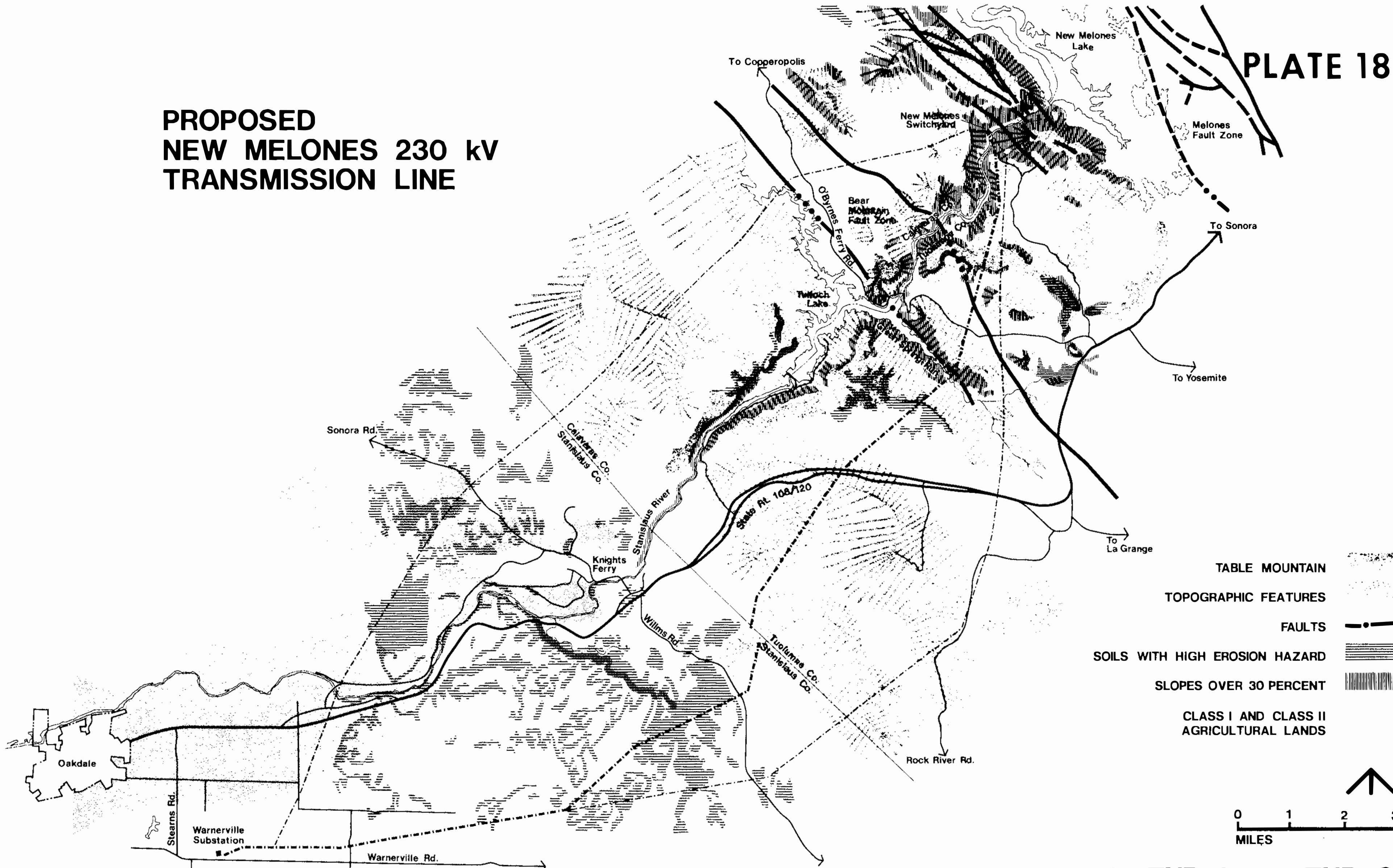
(8) Where traffic occurs, there will be some soil compaction. If the same route is used repeatedly, the compaction will cause the soil to lose its ability to hold water and maintain vegetation. This impact will be confined to the area used by vehicular traffic, including heavy construction equipment. About 5 acres (2 ha) of land will be impacted.

PLATE 18 : U.S.B.R. VISITOR CENTER OVERLOOK

COURTESY P.G.&E.

PLATE 18A

PROPOSED NEW MELONES 230 kV TRANSMISSION LINE



NATURAL FEATURES

(COURTESY P.G.&E.)

(9) Access roads will be mutually designated by agreement between PG&E and the respective landowners. About 12 miles (19.3 km) of new access roads which include about 30 acres (12 ha) of land will be needed. These roads will be stabilized and maintained to acceptable standards to prevent damage to both the road and adjacent areas. The roads will be closed to the public. No roads would be used during powerline construction where excessive damage to the area would occur. A helicopter may be used at the Stanislaus River Crossing.

(10) There will be dust raised during dry periods by traffic, construction activity and by periodic blasting. This dust will have a short-term and very localized effect on air quality and will coat vegetation in the immediate vicinity of the activity.

(11) No major interference with agricultural work is expected.

(12) Over three-fourths of the proposed alinement is on open rangeland. No prime agriculture land is crossed. About 285 acres (115.4 ha) of right-of-way are needed for the 23-mile (37 km) line of which 3 acres (1.2 ha) are for tower locations. The impact on grazing due to disturbances during construction will be very limited.

(13) No relocations of living accommodations, historical landmarks, or of buildings with redeeming social values are necessary. The only historic location near the line is the Willms Ranch site which is over a mile (1.6 km) away.

(14) Materials required for the line will be hauled over existing roads which may cause some traffic congestion.

(15) Blasting may be required which will cause short-term noise.

(16) Archeological resources along the selected transmission alinement are not expected to be impacted by the construction or operation of the line. The report on the archelogical survey (Phase I) indicated several sites are so located that they have the potential to be adversely affected by the proposed alinement. However, the investigating archeologist concluded that if special construction methods are used any adverse effect on the sites would be avoided.

PG&E has conferred with the staff of the California State Historic Preservation Officer on a course of action designed to protect the archeological and historic resources that might be subject to impact by the construction or operation of the proposed transmission line. The Federal Energy Regulatory Commission will act as the Federal agency official and the "Procedures for the Protection of Historic and Cultural Properties" (36 CFR 800) will be followed.

(17) The proposed line would have little or no effect as a barrier to deer migration activities. The line's right-of-way will not be fenced, and therefore, the lines presence will not be a problem to deer or other major mammals.

(18) It should be recognized that the usual annual spring and fall migration flights of small birds and movements of the larger raptors are common to all areas and that the transmission line would pose a very limited interference. Any predominant flight routes of the major migratory waterfowl species (ducks, geese, pelicans, etc.) of the Pacific Flyway border on the more westerly positions of this transmission line alinement over the valley grasslands where the line would parallel the existing steel tower lines.

b. Biological Systems

Short-term disturbances of the biological systems will be minimal. Some tree and brush clearing will be needed in Tuolumne County. This would be mostly oak which will be staked for wildlife refuges, cut for firewood or disposed of depending on the agreement with the landowner.

(1) Impacts on Vegetation

Some vegetation clearing is necessary for the construction of towers, access roads, conductor stringing, conductor clearance, and assembly areas. The effect of vegetative clearing for a transmission line can be appraised in part of vegetative-type density, productivity and recovery rate. Generally, the growth habit of a plant (i.e., grass, shrub, tree) will determine the necessity of clearing as well as the plant's ability to recolonize an area after it has been cleared. Table 6 displays this information.

TABLE 6 - VEGETATION CLEARING

	Approximate acres	Relative necessity to clear	Propagation rate to assume original dominance
Annual Grass	1 (.4 ha)	Very low	1 year
Perennial Grass	1 (.4 ha)	Very low	Extinction
Chaparral	2 (.8 ha)	Low to moderate	4 to 6 years
Trees	7 (2.8 ha)	Moderate to high	20 to 50 years
Total	11 (4.5 ha)		

(2) Impacts on Wildlife

The impacts on wildlife should be temporary. Animals should return to their habitat when construction is completed. About a 10-acre (4.1 ha) reduction in habitat will occur due to clearing.

c. Socioeconomic Systems

(1) Introduction

Construction of the transmission line will require a maximum of 50 skilled, technical, and unskilled people who will be employed during the 12-month construction period. PG&E construction crews will commute to the area or locate temporarily. Their families are not expected to relocate.

The additional public services required for these people should be negligible if the employees commute from towns near the construction area, such as Oakdale, Jamestown, and Sonora. Additional police and fire protection, medical and dental care, and utilities, sanitary, education, and commuication services should be minimal.

On the other hand, the local economic activity can be stimulated by the additional employment for the line, and services required to accommodate increased purchase power of local and transient employees for groceries, motels, trailer parks, auto maintenance, etc. In addition, the local tax base would increase by the addition of the line. Such activitiy should increase the quality of life for lcoal residents in a very small measure.

Landowners will be compensated for the right-of-way easement in proportion to its appraised value. Property values now range from $300 to $1500/acre. The right-of-way compensation is a portion of that amount.

Mining, manufacturing, and shipping of the needed materials and equipment will have a small stimulus to the national economy.

The electrical power delivered by the facilities will reduce dependence on fossil fuels and add to the economic well-being of the Bureau of Reclamation customers and the nation.

(2) Demography

Since 1970, this area has grown 10.81 percent, growing from a population of 230,260 to 255,150. Although more recent figures are not available, when compared to earlier data the

1970 census data indicate that Calaveras and Stanislaus and to a lesser extent, Tuolumne Counties were losing a significant proportion of their populations in the 20-24 age range. Both Calaveras and Tuolumne counties have a higher than average proportion of senior citizens.

The area is expected to continue to grow between 10-18 percent every 5 years, with the population in the two mountainous counties (Calaveras and Tuolumne) continuing to have a large percent of senior citizens. Calaveras and Tuolumne Counties may provide an attractive area for urban dwellers to relocate. Stanislaus county will continue to concentrate the major proportion of its population inurban areas as individuals leave the rural areas for the cities.

The presence of about 50 workers over a 12-month period will have a very minor impact. Their impact on the rural setting for line construction will be short-term and is not expected to have a significant impact.

(3) Education

The construction of the transmission line will not create any problems as far as displacement and relocation of pupils. Nor should there be any physical problems regarding the alteration of existing school district boundaries, or the dissolution and creation of new school districts.

No influx of the workers and their families is expected. There should be no significant effect on the school systems. There is presently no evidence of overcrowding. Fall 1973 figures show pupil-teacher ratios for the 3-county area being a comfortable 18.66, which is well below the State of California standard 25.00 pupils per teacher.

Since there are no displacement relocation problems, there seems to be no evidence of a negative or a beneficial side effect to this sector.

(4) Employment and Income

The project, based on April 1975 figures, will cost approximately 4.3 million dollars and employ up to 50 skilled and unskilled workers. The construction operation will have a technical core of workers who will move to work on the project, but no permanent jobs are anticipated for the local inhabitants. A net economic benefit to the regional economy will be the demand for goods and services by the construction-related workers. It does not appear likely that businessmen will make any substantial capital investments necessary for any sort of an economic recovery since the project in itself will not create a large enough demand. The total payroll should be nearly one-half million dollars over the 1-year construction period.

(5) Economic Base

The impact of the line upon this 3-county area will affect the local economies only slightly. The immediate potential benefits derived from the facilities are twofold: 1) increases in the tax base, and 2) the presence of the workers should provide a small economic stimulus to a depressed economic system. However, the magnitude of this benefit will be small and will not be of such intensity to necessitate the expansion of existing service and support industries.

(6) Miscellaneous Services

The impacts on miscellaneous services are given in table 7.

Materials for the line, except concrete, will be delivered from PG&E supplies outside the area by their transportation facilities.

Since no families are expected to relocate, only short periods of motel or trailer park use are anticipated. Workers will commute to their homes on weekends.

3. Operation and Maintenance Related Impacts

Operation and maintenance related impacts are long-term impacts. Impacts on various systems are discussed in the following paragraphs.

a. Physical Systems

(1) Portions of the construction roads will be used for operation and maintenance which will make these roads a permanent part of the landscape for at least the 50-year life expectancy of the line. Existing operation and maintenance roads will be used when possible. About 12 miles (19.3 km) of new roads will be required.

(2) Some soil erosion may occur at structure sites on the completed transmission line and the associated maintenance roads. If continuing erosion occurs, water quality would be adversely affected near the project by the introduction of some turbidity into streams. No live streams will be crossed by access roads. Erosion could also cause deterioration of the soil horizons, eventually making reestablishment of vegetation in the area difficult. Dust raised from maintenance vehicles using the access roads in dry

TABLE 7 - IMPACTS OF MISCELLANEOUS SERVICES

	Service	Impact	Significant Yes	Significant No
(i)	Welfare and Public Assistance	Some additional work		x
(ii)	City and County (General)	Right-of-way recording		x
(iii)	Law Enforcement	No new personnel expected		x
(iv)	Medical	Ample facilities already available		x
(v)	Social and Religious	Facilities should be adequate		x
(vi)	Recreation	Minor crowding may occur		x
(vii)	Transportation	Minor traffic increase		x
(viii)	Mass Media	Little		x
(ix)	Housing	Requirement for about 50 temp. workers		x
(x)	Family Life	No home relocations		x

season could also cause a temporary localized decrease in air quality. Dust will be very minor as inspection of the line by ground patrol is not a frequent occurrence.

(3) If emergency maintenance is needed during bad weather conditions, heavy equipment could cause extensive road and vegetative damage depending on the nature and location of the line trouble.

(4) Electrical effects will be present in the vicinity of all energized electric lines; the magnitude of the effect will depend on the physical distance to the line, the line voltage, conductor diameter, conductor heights, phase configuration, spacing, etc. The electrical effects are the result of:

(a) Partial ionization of air known as corona. Associated with corona is radio reception quality, television reception quality, audible noise quality, and air quality.

(b) Electrostatic and electromagnetic induction relative to annoying nonhazardous induced currents and voltages on conductive objects exposed to the field.

When air is stressed by an electric field called a gradient (volts per unit length) in excess of a certain critical value, the air is partially ionized and corona occurs.

In the case of overhead transmission lines, the maximum field gradient is at the surface of the conductor and is a function of the operating voltage, the radius of the conductors, the spacing and position of the phase conductors, and the height of the conductors above ground. For corona to occur, the maximum surface gradient of the conductor must exceed the breakdown gradient of air sufficiently to provide the energy necessary for breakdown. The breakdown gradient for air is a function of air density and is, therefore, affected by temperature, pressure and altitude. In practice, transmission lines are designed to have maximum smooth surface conductor gradients of 0.6 to 0.8 of the theoretical value of critical surface gradient required to start corona. However, with discontinuities such as dust, insects, snowflakes, and raindrops, the surface gradient no longer is necessarily less than the critical surface gradient. At these points, corona discharge may begin.

The effects of transmission line corona, called radio interference (RI), are primarily in the AM standard broadcasting band (535 to 1605 kHz). The effects fall off rapidly with increasing frequency; therefore, FM and TV reception are largely unaffected. The radio interference atenuates quite rapidly in the lateral direction and, therefore, is limited to short distances from the line. The acceptable radio noise level is dependent upon signal strength, ambient noise levels and the characteristics of the radio receiver. The signal strengths vary considerably depending on location and atmospheric conditions. The characteristics of all radio receivers are not equivalent. Occasionally, interference may be experienced on some receivers when tuned to a very distant station and the receiver is near the line.

As a practical matter, PG&E's experience with hundreds of miles of existing 230-kV transmission lines indicates that the construction and operation of the proposed 230-kV line will not adversely affect any of the existing radio, television, telephone, microwave or other communication circuits.

Special consideration was given to the Sierra Conservation Center radio and television system. (See Appendix J).

Audible noise associated with the operation of a 230-kV transmission line is mostly a foul weather phenomenon. Audible noise level under fair weather conditions is generally undetectable to negligible. During rain or heavy fog conditions, a low-level crackling or buzzing sound may be produced which is generated by corona discharges primarily from water droplets on the lines or insulators.

Under worst weather conditions, the corona noise at 100 feet (30.5 m) from the outer conductor of the proposed 230-kV line is expected to be 30 to 40 dBA. This level of noise would be slightly audible to inaudible under quiet ambient conditions.

In considering the six major ambient air pollutants governed by Federal EPA and California Standards, photochemical oxidant, carbon monoxide, nitrogen dioxide, sulfur dioxide, suspended particulate matter and hydrocarbons, only very small amounts of photochemical oxidants, primarily ozone, and even smaller amounts of nitric oxide (which transforms into nitrogen dioxide) will be produced by the high voltage electric power transmission line. No lead particulates or hydrogen sulfide (also controlled by state standards) will be produced by the powerline.

High concentrations of ozone can adversely affect animal and plant life, as well as contributing to photochemical smog under certain conditions. However, the line is not expected to produce such high concentrations. Ozone concentrations comparable to the global background concentrations of 0.015 to 0.030 parts per million (p/m) would be expected in the predominantly rural setting of the route. The types of conductors and structures being considered for the transmission line would add only insignificant amounts to the ground level ozone concentrations near the line, even under the worst weather conditions. In the worst weather conditions, representative ground level concentrations for a 230-kV transmission line and a conductor height of 43 feet (13.1 m) would be .01013 parts per hundred million at a lateral distance of 40 feet (12.2 m) from the center phase.[18] This concentration would rapidly decrease a short distance from the line. Since the line is routed away from major traffic or population areas, the other factors necessary to create photochemical smog would be avoided.

It is anticipated that there will be no harmful effects due to electrostatiscally induced currents or electromagnetically induced voltages resulting from the proposed 230-kV line on humans and animals. The design of the transmission line is based on: 1) minimum conductor to ground clearances that satisfy the State of California Public Utilities Commission General Order 95 entitled "Rules for Overhead Electric line Construction," 2) electrostatically induced currents that do not exceed the human perception level, and 3) electromagnetically induced voltages that will not cause annoyance because no line location is proposed which will parallel any existing long, continuous, insulated, conductive object such as a wire fence. Perception level of steady-state currents occurs at approximately one milliampere. This is the value of current at which a person is able to detect a slight tingling sensation in one's hands or fingers.

(5) The Warnerville and Herndon Substations are the remote line terminals. Warnerville belongs to the city and county of San Francisco and is located at the end of the proposed line. Herndon is located north of Fresno. No significant change of facilities is contemplated.

b. Biological Systems

(1) During initial phases of operation, vegetation in disturbed areas will be reestablished by invader species or through rehabilitation. This will result in localized secondary succession within the ecosystems. The periodic pruning of trees and shrubs to maintain electrical clearance will tend to maintain a stabilized subclimax-type vegetative cover. With the type of clearing proposed for this transmission line, there will not be complete removal of the climax species.

Vegetation at lower elevations is primarily rangeland and agricultural lands. The natural rangeland vegetation should return shortly after disturbance, since this vegetation comprises an early seral stage.

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[18] Letter from V. L. Chartier, Advance Technology Research and Design Engineer, Westinghouse Electric Corp., Nov. 22, 1972.

(2) The transmission line will initially be an unfamiliar object in the ecosystem and as such, may cause some temporary disturbance to usual wildlife habits. This disturbance is expected to have a limited impact.

(3) The clearing and pruning of dense chaparral and forested woodland vegetation communities in some portions of the transmission line right-of-way will tend to have an "edge" or ecotonal effect for wildlife populations. This effect is due to an overlapping of vegetative communities which occurs when one community is removed and another type of community is reestablished. This tends to naturally increase the variety and the total amount of wildlife species--particularly game species which are usually known as edge species. This segment of the wildlife disperses into the adjacent open grasslands during the nocturnal or quiet daylight periods. Some of the original organisms of the forest and plains are able to survive in the manmade forest edge, whereas those organisms especially adapted to the forest edge, notably many species of weeds, birds, insects, and mammals, often increase in number and expand their ranges as a result of creating new edge habitats.

In areas where natural flora dominates, weed establishment is desirable for soil stabilization and erosion control. Where the line crosses rangeland, no vegetative control will be necessary. If brush becomes too thick to permit maintenance through forested lands, control measures will be required to permit access. The areas around the towers will be reseeded to provide a cover similar to the original. Areas cleared for stringing the conductors and electrical clearance will reseed themselves. Because of the limited amount of noxious vegetation, only minimal amounts of herbicides will be used within the easement. The chemicals will be plant specific. Typical products that PG&E uses for vegetative control include:

Tree and Brush Control

1. Slo-Gro (Maleic Hydazide) 1, 2 - Dihydro - 3, 6 - pyridazinedione

2. Maintain "A" or CF-125 (Chloroflurenol)

Grass and Weed Control

1. Amino Triazole 3 Amino - 1, 2, 4 - Triazole (Amazol Weedazol)

2. Roundup Isopropylamine Salt of Glyphosate

3. Simazine (Princep 80 W) 2 - Chloro - 4, 6 - Biscelhylamino - S - Triazine

4. Spike 1, - (5 - tert. bytyl - 1, 3, 4 - thiadiazol- 2 yl)- 1, 3 - dimethylurea

These herbicides will be applied in minimal amounts so that they will not leach into the ground water which averages 50 to 100 feet below the surface. An annual inspection of vegetation growth will be made for interference with transmission line operation. Spraying intervals will range from 1 to 10 years with an average of about 5 years. In any event, Environmental Protection Agency standards will be met.

(4) Although all access roads will have locked gates, there may be a minor increased hunting pressure on game species during the hunting seasons as a result of new maintenance roads. During the nonhunting seasons, the periodic intrusions by PG&E vehicles may displace the game. The degree of displacement will depend on the kind of intrusion and the frequency of maintenance road use. However, no major displacement will occur.

(5) Off-season poaching of game may increase as a result of new and/or better roads only where permanent roads would be open to the public as determined by the company and the respective land administering agencies or landowners.

(6) Minimal forage and habitat for domestic and wildlife species will be lost where structural foundations protrude from the ground at structure sites and along cleared maintenance access roads.

(7) Cases of illegal shooting of avifauna (raptors) perched on the structures and conductors of the transmission line may occur at public use sites since they will be conspicuous targets for people with firearms. The transmission line will not be an electrocution hazard for avifauna. As shown in Appendix A, the size of the line, the conductor spacing, and the spacing between any conductor and ground far exceeds the wingspan of any raptor.

(8) Transmission towers and conductors will provide perching and hunting sites for birds of prey. This increased use will occur mostly in intensively developed agricultural areas with high rodent population. Raptors will use the structures and conductors for perching and have easy visibility of their prey.

c. Socioeconomic Systems

The following socioeconomic system impacts were considered:

(1) The transmission line will be an unnatural object on the landscape and will detract from the scenic values of the

area. These visual impacts will result from the transmission structures, conductors, necessary clearing of right-of-way, and operation and maintenance roads. They are briefly summarized on tables 5 and 6.

(2) The impact on historical sites will be limited to an occasional maintenance vehicle passing on a nearby road. The primary occurrence is the Willms Ranch (plate 7).

(3) Certain segments of the transmission line may be visible from portions of the U.S. Bureau of Reclamation Overlook at the Visitor Center (plate 18), Table Mountain-Sierra Conservation Center (plate 19) O'Byrnes Ferry Road (plate 21), and State Route 108/120 (plate 22) near the Warnerville Substation (plate 23). The known presence of the line may detract from the quality of experience sought by back-country users. The line will cross Highway 108/120 once about 5 miles (8.1 km) east of Knights Ferry.

The transmission line is not expected to impair scenic values of Tulloch Lake; nor will it affect storage. See plate 20.

(4) The transmission line will have, at most, a minimal effect on Tulloch Lake and the adjoining recreational and residential use developments. Less than 2 miles (3.2 km) of line will cross the recreatinal land near the New Melones Switchyard, and less than 1/2 mile (0.8 km) at Green Spring Run. The transmission line will be on a double-circuit structure, and the visual impact would be of the structures and six conductors.

(5) All non-Federal lands occupied by the transmission line right-of-way are designated on the county land use plans for agricultural use. The transmission line and access roads may inhibit some types of possible future land uses. The land under the conductors will be available for wildlife habitat, hunting, dryland farming, grazing, and other uses consistent with right-of-way agreements, and traversing by vehicle or foot. Exploration or exploitation of mineral deposits should not be limited appreciably. Some changes in land use may be preempted by the presence of the line and access road. Residences will not be permitted under the conductors because of the electrical safety hazards. Other construction may be permitted only where it would not interfere with use of the right-of-way. All right-of-way usage not restricted by the right-of-way agreement will be determined by the landowner and appropriate local governmental regulations.

During periodic operation and maintenance of the line, there will be intrusions on the privacy of landowners whose land is traversed by the line.

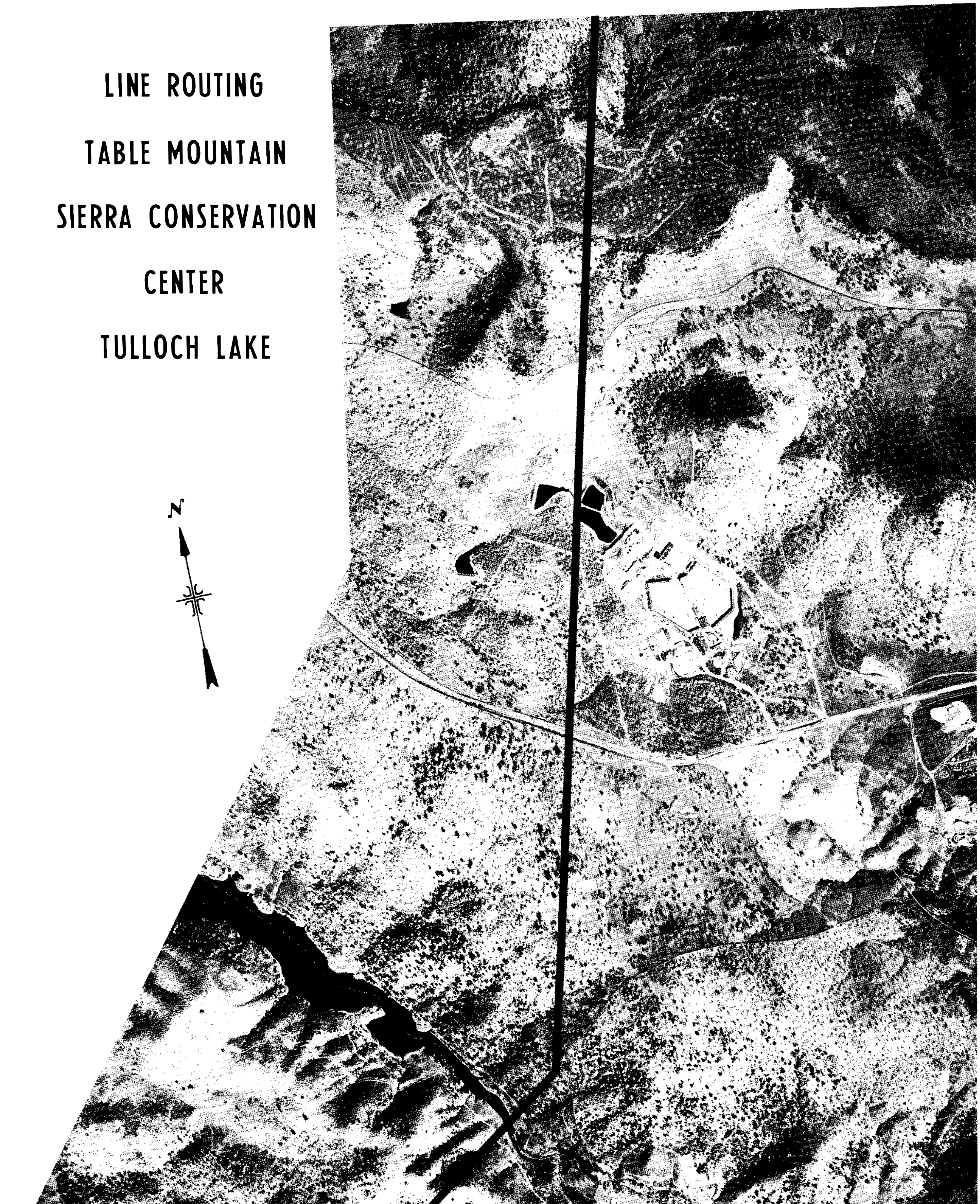
LINE ROUTING

TABLE MOUNTAIN

SIERRA CONSERVATION

CENTER

TULLOCH LAKE



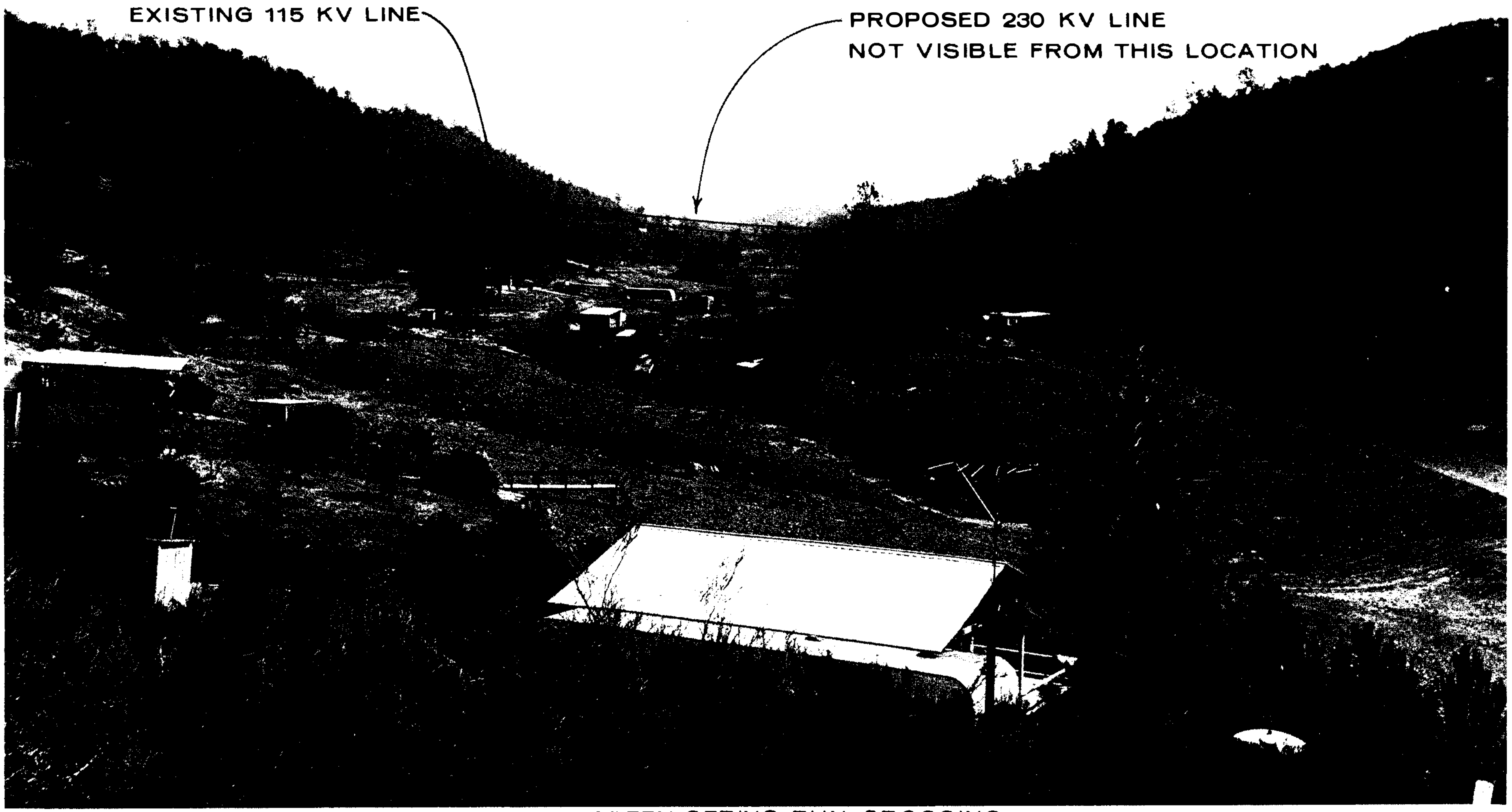


PLATE 20 : GREEN SPRING RUN CROSSING

PLATE 21 : O'BYRNES FERRY ROAD CROSSING

PLATE 22 : STATE ROUTE 108/120 CROSSING

COURTESY P.G.&E.

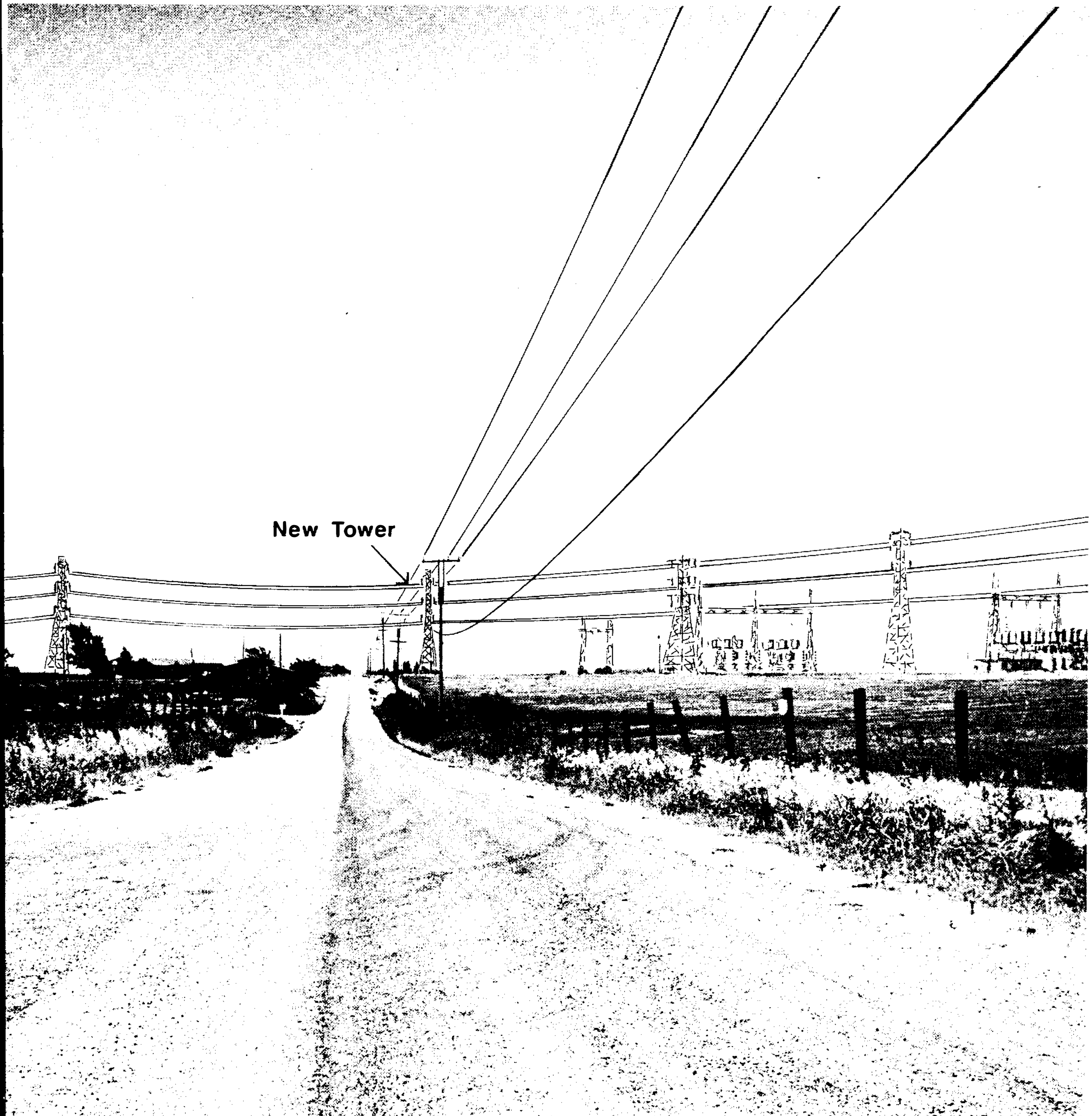


PLATE 23 : CONNECTION NEAR WARNERVILLE SUBSTATION

COURTESY P.G.&E.

(6) Some of the recreational potential associated with "natural" terrain may be adversely affected by the presence of the transmission line.

(7) The line could interfere with exploration and/or development of some mineral resources. However, the line does not cross any actively mined or known commercial deposits of any minerals. Commercial deposits of asbestos do occur in the vicinity of Alternate B in the area southwest of the New Melones Switchyard.

Although the likelihood of commercial deposits is small, any interference with possible future mineral development would result in (1) higher cost of extraction due to relocation of the transmission line or working around the line and structures, and (2) increased safety hazards. The line and structure may restrict the size or types of equipment used under or in the immediate vicinity of the line.

(8) The transmission line will have minor effects on cultivated and grazing lands. The effects include: (1) the land surface area utilized by permanent roads and protruding structure foundations will be removed from vegetative production, and (2) structures in cultivated lands will complicate farming operations. These effects will occur throughout the length of the line although effects on cultivated areas will primarily be in the vicinity of the Warnerville Substation. About 12 miles (19.3 km) of new access roads which include about 30 acres (12 ha) of land will be needed.

(9) In some areas the line may make conversion to dry land irrigation more costly. The structures will restrict the size and/or type of systems that can be used. The conductors will also introduce an electrical hazard to some types of sprinkler and/or pipe systems which may accidentally approach or contact the high voltage conductors. The Oakdale Irrigation District has no existing plans to add any irrigation systems along the line.

(10) The transmission line could pose an electrocution threat caused by occurrences or activities in the vicinity of the line. In event of a structure failure, the line would automatically fault out and be deenergized upon hitting the ground. An animal or human could be electrocuted if hit directly by the conductor prior to contacting the ground.

(11) The proposed transmission line is not expected to affect navigable air space.

(12) The impact on employment is not expected to be significant in terms of the overall economy. The tax base increase due to the additional facilities should more than offset the effects on social institutions.

(13) Mining operations, which would interfere with operation and maintenance of the line would not be allowed within the line easement. This will have little or no impact on mining operations in the area.

D. MITIGATING AND PROTECTIVE MEASURES

1. Introduction

This section presents mitigating and protective measures which have been developed by the Pacific Gas and Electric Company for design, construction, operation, and maintenance.

2. Construction Related

a. Physical Systems

(1) To maintain visual and esthetic integrity, the following criteria and guidelines are established to mitigate the adverse esthetic impacts:

> The transmission line design will use topographic and vegetative screening, whenever possible, to blend the line into the landscape. The proposed route was located to create the best opportunity to blend structures with the background.
>
> In clearing for the construction of the transmission line special care will be taken to minimize the damage to the vegetative cover and soil when removing trees or moving structure components. Dust abatement control by watering where needed and soil management practices will be observed.
>
> Limited clearing for access roads, structure sites and for conductor clearance will help minimize the impacts from soil erosion on the watershed. Along access roadways, culverts will be installed at waterways. Cross drains, rolling dips and water bars will be used to control water flows on the roadways. The cut and fill areas will be seeded during construction.
>
> Many of the areas along the proposed alinement will not require road construction for access. The terrain is such that it can be traversed without cutting or filling. Existing roadways will be used where practical. Normally, these roadways are stable and require very little work by construction crews. In some areas small check dams may be installed to control sedimentation.
>
> Tree topping and pruning techniques will be used where possible to soften right-of-way clearing. Low growing shrubs and other deciduous species will not be removed unless they present a safety hazard to the line.

(2) Highways and zoned routes of travel will be crossed at or near right angles. Long tangents of the powerline should not be visible from these areas. Construction on ridge tops where the structures would be skylined will be avoided where possible.

(3) Structures will be designed to blend with their surroundings as much as possible. This could include varying the spacing between structures, painting, and other means currently available. Leveling and benching will not be allowed. Double circuit towers proposed for the line are shown on plate 7. Galvanized lattice steel structures, because of their open appearance, blend effectively with the landscape at a distance. Weathering will reduce sun reflections from the structures.

(4) Special treatment of insulators and conductors is undertaken in areas of high visibility and in areas of heavy population concentration. Special treatment will be taken with the four structures which will be visible from the USBR overlook. the structures will be color treated to conform to plans of the Army Corps of Engineers and the Bureau of Reclamation. Nonspecular conductors for the transmission line will be used in areas of high visibility or in areas of heavy vehicular traffic. Brown insulators will be used in the New Melones Project area.

(5) Transmission line location will be in accordance with the guidelines set forth in the "Environmental Criteria for Electric Transmission Systems," published by the U.S. Depatments of Agriculture and the Interior. Access will be considered in tower site selection.

(6) An effort will be made to locate structures for the new line adjacent to structures in existing lines to minimize visual impact and the number of new spur roads needed. This will be accomplished for a stretch of about 6 miles (9.7 km) east of the Warnerville Substation.

(7) Three areas which would have high public exposure were given special consideration. These were the Visitor's Center near the Dam and Powerplant, Green Spring Run on Tulloch Lake and the State Highway 108/120 crossing.

The line below the Visitor's Center (Visitor's Center Overlook) will span the river and be partially hidden by a small ridge. Plate 18 shows the screening effect of the selected route. The two lattice steel towers below the overlook will be painted to blend with their background.

Plates 19 and 21 show the effect of crossing Table Mountain and the Sierra Conservation Center and the O'Byrnes Ferry Road.

Two tubular poles will be installed on the hill west of the switchyard to harmonize with the switchyard structures. These poles are for the river crossing. They will be painted or have a Cor-ten finish.

The crossing of Tulloch Lake (FPC Project 2067) at Green Spring Run was moved to a remote location and elevated to avoid the area used by most recreationalists without an undue line length increase. The approximate impact is shown on plate 20. The screening effect of the State Highway 108/120 is shown on plate 22. Plate 23 shows the proposed connection near the Warnerville Substation.

(8) As described under "impacts," special construction techniques will be utilized by PG&E to avoid all adverse impacts on archeological resources. The PG&E Company will continue to consult with the State Historic Preservation officer, and the procedures for the Protection of Historic and Cultural Properties: (36 CFR 800) will be followed.

If any additional archeological sites are uncovered during construction, they will be investigated by a professional archeologist before construction work is continued.

(9) The Willms Ranch which is shown on plate 17 is a California Historic Landmark. The ranch is located about 2 miles (3.2 km) south of Knights Ferry in a bowl-shaped valley. The line was routed to screen the line from view of the ranch buildings. This was coordinated with the California State Historic Preservation Officer.

(10) The Table Mountain Natural Area would be crossed by the proposed line. Special soil conditions create an edaphic plant community which is found on the flat table mountain tops. PG&E contacted Mr. Leslie Hood, executive director of the California Natural Areas Coordinating Council. He recommended that a botanist survey the area for the edaphic plant community. He said that the line construction should not be incompatible with the plant community if proper caution is used. PG&E has contracted for a survey to be completed before construction begins.

(11) To minimize fire hazard during construction, fire safety procedures will be used, spark arresters will be used on equipment, an approved slash disposal plan will be followed. Any burning will be controlled by appropriate laws and regulations.

(12) To minimize danger to aircraft, any aircraft hazard areas will be marked as required by the Federal Aviation Administration (FAA).

(13) About 30 miles (48.3 km) of existing roads and trails will be used to reduce landscape scarring. In addition, about 12 miles (19.3 km) of new access roads will be required. This represents about 15 acres of land. The access roads will generally follow the contour of the land and will not be located in the bottom of drainages. Road surfaces will be properly drained, stabilized and maintained. Roads not needed for powerline maintenance will be obliterated, revegetated, and erosion protective measures taken.

(14) Construction criteria clearly convey management's desire for environmental control. The company maintains strict control of all road construction needs and utilization. Separate provisions specifically require the restoration of impacted areas after construction is complete. This is normally closely coordinated with the governmental and private agencies concerned.

(15) Rubber-tired vehicles will be used to the extent possible so that damage will be minimal. Track equipment will be limited to conductor installation and temporary work to maintain service during construction.

(16) Vehicles will be equipped with emission controls as required.

(17) "Tension stringing" is utilized to install conductors. This method eliminates the need for driving down the right-of-way with tractors to place the conductors. Therefore, trees can be trimmed instead of removed, and underbrush is left undisturbed except for trails.

(18) Construction techniques which will minimize adverse impacts on surface and ground water resulting from turbidity, pollutant discharge or spillage will be used.

(19) Care will be taken to avoid placing towers directly astride known seismic faults, landslides or other areas of potential geologic hazard.

PG&E procedures in locating transmission structures include a land stability assessment by experienced engineers. In areas of special concern, opinion from the geological staff is elicited.

It is not always possible to locate transmission lines away from faults; however, the inherent characteristics of the lines allow a lesser degree of concern about an earthquake shaking or fault movement than for an inhabited structure. The materials used to construct overhead lines have the physical flexibility to withstand substantial movements. Additional precautions that can be applied include crossing the fault(s) as near to a right angle as possible, locating crossing towers as far from the fault as possible, and employing the use of suspension rather than strain insulators on crossing towers to the degree practical.

Insofar as the effects of seismic loads induced by earthquakes on faults at various distances from structures, operating history has shown this to be a minimal problem. Structures such as the ones to be used on this project are designed for laterial wind and broken conductor loading that would exceed any seismic loads.

A final consideration deserves mention. The proposed line constitutes but one segment of a system designed and operated to remain functional after the occurrence of a low probability event such as a damaging earthquake.

b. Biological Systems

When trees and shrubs are cleared from specific areas those cleared materials may be piled as cover for wildlife instead of burning if the landowner requests it. The State Department of Fish and Game recommends this procedure as a mitigation practice benfiting the terrestrial biology system.

In effect this will serve dual purposes of enhancing revegetation, and mitigating wildlife habitat. Disturbed areas not required for operation and maintenance will be revegetated to restore the area to a near natural condition.

Areas cleared for conductor installation and electrical clearance will not be revegetated as these regenerate naturally. At structure locations the area used to erect the structure will be redressed to natural contours and seeded. Clearing required for the construction of access roadways will be seeded while soils are soft and will accept seeds. Grass types that will be used in the revegetation of the right-of-way will be oats, annual ryegrass, perennial ryegrass and smooth brome. Fertilizers adaptable to the area will be used.

c. Socioeconomic Systems

Some of the adverse socioeconomic impacts will be mitigated as follows:

(1) Landowners will be compensated for right-of-way easements in accordance with its appraised value.

(2) The line is routed to avoid any major relocations or disruptions of historical sites. Major populated areas will be avoided.

(3) Any television or radio problems caused by the line will be corrected by PG&E.

(4) The use of the right-of-way will be restricted so as to utilize as little land as is practical.

3. Operation and Maintenance Related

a. Physical Systems

(1) To maintain visual and esthetic integrity, the following criteria and guidelines were established to mitigate the esthetic impacts during operation and maintenance.

(a) Structures will be maintained in a manner that will present a minimum impact on the environment.

(b) Total right-of-way clearing will not be used. Fire safety procedures and special equipment will be used.

(c) Gates to access roads will be closed.

(2) Care will be exercised not to disturb livestock or crops.

(3) Measures to mitigate damage to the soil and watershed will include specified quality of road and regular periodic maintenance. These measures will ensure protection of the resources. Any other erosion related to the presence or operation of the line would also be controlled.

(4) Extensive road and vegetative damage caused by emergency maintenance during bad weather conditions will be repaired as soon as conditions are such that further damage will not occur. Damaged areas will be restored to such condition that erosion would be controlled and the natural appearance restored.

(5) Corona discharge and the possible ozone generation, radio interference, and noise would be minimized through selection of conductor size and proper maintenance. Where problems occur, it is the PG&E policy to try to solve them with the people involved.

b. Biological Systems

(1) Clearing will be held to a minimum. Soil distrubances and vegetative damage will be minimized by using existing roads. Annual seeding and planting along cut and/or fill slopes of permanent roads will be repeated until the areas are satisfactorily revegetated and stabilized. The same general criteria on revegetation will be

used on all Government and private lands. Access during routine maintenance and operation activities will be confined to that which is necessary to assure the proper functioning of the project.

(2) Public access along the corridor would be limited by private landowners or the land administering agencies. This controlled access will serve to limit disturbances to wildlife and to avian species, an reduce the potential fire hazards associated with public use.

(3) Structures and conductors are separated sufficiently to prevent electrocution of raptors.

c. Socioeconomic Systems

The visual impact of the completed project will be mitigated by the design, location, and construction techniques. Fences and utility crossings will be grounded by the company to eliminate inductive hazards. Control safety features will minimize the electrocution hazard in the event of a conductor or structure failure. In the event of a failure, automatic safety features will deenergize the conductor.

4. Energy Conservation

Structural steel will be delivered to each structure location by vendor to reduce handling of structural members. In areas where this type of delivery cannot be accomplished, structural members will be transferred from the vendor's trucks directly to company vehicles to keep the handling to a minimum.

The material (hardware, insulators) and stringing equipment will be packaged in the construction yard ahead of time so that only one trip to a structure site will be necessary to distribute and spot material.

The transmission line is designed to minimize losses and make efficient use of materials consistent with costs.

Losses in a transmission line are governed mainly by the electrical power being transmitted, the line voltage, the line length, and size of conductors. The line length is considered the shortest possible consistent with land use and environmental constraints. The power to be transmitted is determined by the electrical demand of the system the line supplies or generator capability.

A conductor size was chosen to transmit the energy with minimum losses consistent with efficient use of materials and costs.

Mitigation

Larger conductors would reduce losses but would increase costs and tonnage of steel and aluminum (Both of which require energy to produce) disproportional to the slight decrease in losses.

E. UNAVOIDABLE ADVERSE EFFECTS

1. Design and Construction Phase

a. Physical Systems

(1) Some air pollution will be caused by dust raised during dry periods by construction vehicles and from earthwork operations. Also, air quality will be temporarily affected by exhaust emissions from construction equipment and vehicles. These disturbances would be seasonal, localized, and of short duration. Actual work would only occur for periods of 1 day to 1 week for each of the construction operations, which include excavating footings, setting stub angles and pouring the concrete, erection of structures, and stringing conductors. These activities would occur intermittently at all structure sites for the 12-month construction period.

Air pollution may result from slash burning, which will be permitted only under special conditions. Air quality standards are not expected to be exceeded in the air basin involved.

(2) Fire hazards will exist because of construction activity and the presence of construction personnel.

(3) Temporary localized turbidity will occur in streams and rivers at some vehicular crossings. No live streams will be crossed by access roads. Turbidity will be introduced into the streams during installation of culverts; however, the effects would be temporary. Some sediments would be deposited in the stream bottom during culvert installations. The amount of deposits are not anticipated to be in quantities that would stifle the aquatic organisms. Most deposits would be scoured away during high-flow periods.

(4) Wherever construction activity occurs in the vicinity of transmission lines, there will be a safety hazard associated with possible equipment entanglement which could result in electrocution and interruption of power delivery.

(5) Minor disturbances of livestock may occur.

b. Biological Systems

(1) Vegetation will be removed at tower sites in the selectively cleared areas and where road construction occurs. This may be considered incompatible with the surroundings until vegetation is reestablished, which could take a year for grasses and invader species and possibly 5 to 10 years or longer for brush and trees. The Oak-Woodland and Digger Pine Communities will be affected. A limited amount of firewood of commercial value will be removed. There will be intermittent voids under the conductors and cleared corridors for roads in tree-covered areas.

(2) Since this construction activity is an intrusion on the natural environment, the normal movements of wildlife would be temporarily disturbed by construction activity. Reproduction processes may be interrupted during construction.

(3) About 10 acres (4.1 ha) of wildlife habitat will be disturbed initially; however, revegetation should eventually reestablish most of the habitat which is lost.

(4) Temporary noise and dust will occur.

c. Socioeconomic

(1) Noise, caused by construction equipment and the limited blasting, will occur periodically during construction throughout the length of the line.

(2) The construction of the transmission line will result in an unavoidable adverse impact on the esthetic and visual qualities of the areas immediately adjacent to the alinement because of the clearing requirements and the intrusions made by the structures and conductors.

(3) Temporary disruptions of traffic at the four road crossings will occur during the weekdays.

2. Operation and Maintenance Phase

a. Physical Systems

(1) The proposed transmission line, and access roads, will be introduced into a predominantly rural landscape and will, therefore, be esthetically undesirable to some local residents.

(2) Entry of line patrols at least once a year will occur with possible additional incursions if major repairs are required.

b. Biological Systems

(1) Topping and pruning of trees may render some species of trees more susceptible to disease.

(2) Loss of about an acre (.4 ha) of wildlife habitat in the Peoria Basin Wildlife Management area.

(3) Periodic invasion of fauna habitats during maintenance will cause a minor temporary reclocation. This would be similar to owner-management activities now occurring. The increase in poaching, hunting, and fishing activities, if any, will be negligible because access roads gates will be kept locked.

(4) Temporary disruptions of some nesting birds may occur between February and June due to line patrols or maintenance.

c. <u>Socioeconomic</u>

(1) The line will be visible to travelers where it crosses main routes of travel and rural roads, and it will detract from the quality of experience for back-country users.

(2) Some land users may experience some adverse impacts such as property value depreciation due to the presence of the line on or near their property.

(3) A strip of land approximately 100 feet (30.5 m) by 23 miles (37 km) long will be dedicated to transmission line right-of-way easement. This could be considered to be adverse by landowners who might wish to use this land for purposes that will not be permitted.

(4) Humid atmospheric conditions, icing on the lines, and a loosening of conductor mounting hardware might cause a low humming from the conductor. The humming would be of low pitch and be audible up to an estimated 300 feet (91.4 m) from the line. Trees and other vegetation would tend to absorb some of the noise and reduce the distance that the noise is audible. Any noise from the line would detract from the esthetic mode of remote, undeveloped, or rural areas usually visited only by hunters, hikers, fishermen, farmers, and ranchers.

(5) Electrical hazards would result from the presence of the transmission line. People could climb a structure regardless of warning signs at each tower; however, after climbing, accidental contact with a line conductor would be very unlikely. Injury by falling would be more probable. Entanglement in the conductors by rare occasional helicopters on patrols or low-flying airplanes could occur. Contact by the movement of irrigation or other tall equipment is another potential hazard associated with the New Melones-Warnerville transmission line. Most accidental human contact with the <u>conductors</u> results in death.

F. SHORT- AND LONG-TERM ENVIRONMENTAL USES

Construction and operation and maintenance of the transmission line will result in both short-term and long-term uses of the environment. There would be short-term disturbances of the landscape in the vicinity of the transmission line. Some grazing land will be temporarily disturbed during construction. Excavations would be required for foundations and some vegetation would be disturbed. After construction, the disturbed areas would be rehabilitated by grading and revegetating with native or adaptive plant species. Short-term employment will be available to construction workers. Only a minor effect is anticipated on local economies. Construction workers and equipment may have a short-term effect on wildlife movements.

A long-term esthetic effect will result from the presence of the transmission line and permanent access roads in the landscape. A long-term commitment of land is required for the structure locations. No major effect on wildlife is anticipated. Maintenance roads may increase the accessibility to some areas. This should not materially increase trespassing or vandalism because all access roads will have gates that are locked.

Additional "clean" energy will be provided to the CVP loads. Preference agencies in Calaveras and Tuolumne Counties can make application for and receive up to 25 percent of this energy. The occupancy of the right-of-way by the transmission line preempts the use of the land for some other future uses. Most of the land can still be used for grazing dryland farming, or recreation. The line could, in the future, be relocated but considerable thought was given to establishing a route that would avoid the nessessity of relocating the line in the foreseeable future.

G. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS

Numerous resources are involved in the construction and operation of the transmission line. Resources involved include the land on which the structures are located, raw materials such as steel, aluminum, and concrete, vegetation disturbed and removed by construction and the construction equipment, and manpower.

The resources committed irreversibly and irretrievably, due to the construction of this project, are mainly materials and labor. The structures, insulators, and conductors could be salvaged, but the concrete work could not be.

The fuel used by motor vehicles would be an irretrievable commitment.

Some of the major resources required would be approximately as follows:

1. Steel — 920 tons (828 t)
2. Aluminum — 420 tons (378 t)
3. Concrete — 950 yd^3 (726.8 m^3)
4. Right-of-way — 285 acres (115.4 ha), plus about 12 miles (19.3 km) of access roads

Since the proposed project is considered "permanent", the visual effect of the transmission line is another direct, relatively permanent, irreversible environmental change associated with project implementation. However, in the event the line becomes obsolete, the facilities could be removed and the land returned to its original use.

H. ALTERNATIVES TO THE PROPOSED ACTION

1. Introduction

A discussion of the array of alternatives that were considered is presented below. The selection of alternatives was influenced by the following criteria:

a. The need to find a delivery point capable of accepting the power output under varying conditions of the 300,000-kW New Melones Powerplant.

b. The transmission facilities available in the area as shown on plate 24.

c. Existing contract requirements.

2. Transmission Line Alternatives

a. Overhead Single- and Double-Circuit Alternatives

Although rated plant output could be delivered over a single-circuit, 230-kV line; a double-circuit line was chosen for the reasons that follow:

(1) Reliability criteria established require rated plant output with one circuit out for maintenance.

(2) The plant can be looped into an existing line, thus eliminating the need for additional remote terminal facilities.

(3) Reduction in energy losses under normal operation.

(4) Savings over two single-circuit lines in costs and right-of-way, and other impacts.

b. Voltage Levels

The choice of voltage level for the proposed line was influenced by transmission needs, reliability, economics, and compatibility with the existing system.

Voltages considered were 115-kV, 230-kV, and 500-kV.

(1) <u>115-kV</u>. The existing 115-kV transmission facilities in the area are incapable of accepting the power output of the New Melones Project. A 115-kV double-circuit tower line would be inadequate for the power to be transmitted, and the power losses would be more than for the proposed 230-kV system.

(2) 500-kV. There is no 500-kV system available in the immediate area. The capacity of this class of facilities is greatly in excess of the requirement. Both cost and land use would be excessive.

(3) Direct Current. The use of d.c. would be exceedingly expensive for terminals and is not considered appropriate.

c. Materials

(1) Structures

Supporting structures are available in several categories based on the materials and shapes. Poles or tubular construction generally use bulkier members than lattice and tend to be used in the urban areas. Alternative supporting structures considered are listed below:

(a) Wood pole

Wood pole structures were considered but were not favored for the following reasons:

1 Although they tend to blend into the wooded areas, they are more massive than lattice structures and are more visible from a distance.

2 They are subject to fire and woodpecker damage.

3 More structures per mile are required which requires more maintenance roads and increases their visual impact.

4 Shorter spans reduce the flexibility of structure placement.

5 More maintenance is required than for metal poles or towers.

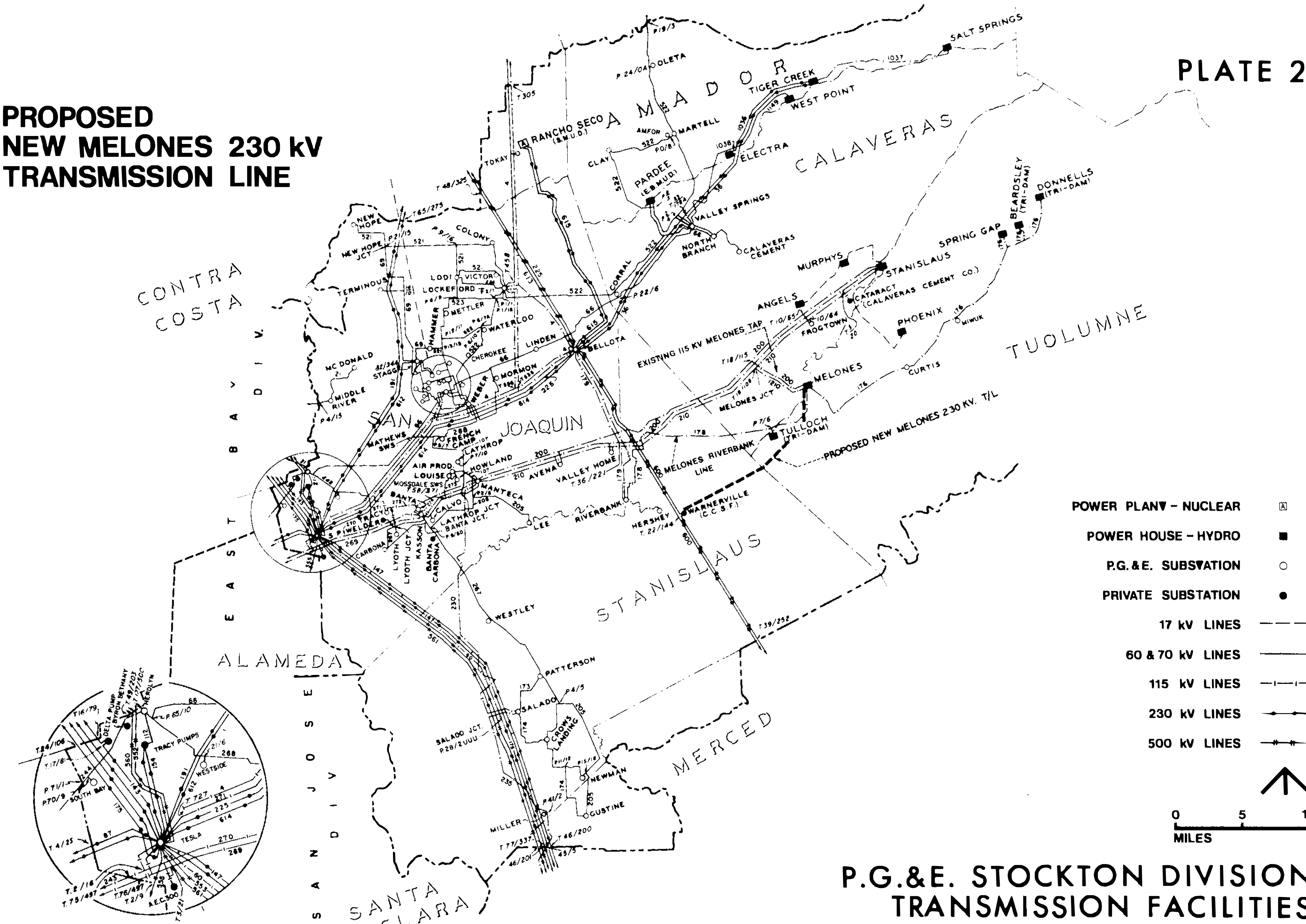
6 The limited supply of wood poles could be more aptly used elsewhere.

7 Double-circuit wood structures are not readily available.

8 Two single-circuit wood structure lines would require significantly more right-of-way.

PLATE 24

PROPOSED NEW MELONES 230 kV TRANSMISSION LINE



P.G.&E. STOCKTON DIVISION TRANSMISSION FACILITIES

(COURTESY P.G.&E.)

(b) Tubular Steel

Tubular steel structures were considered for installation south of the Stanislaus River and at the State Highway 108/120 crossing. The increased cost of about $14,000 per structure did not seem to be justified.

The clean, straight lines of the tubular steel towers are more compatible with high-density use in subdivided areas. A comparison with lattice structures for various backgrounds is shown on plates 25, 26, 27, and 28.

The esthetic characteristics of an object consist of form, color, texture and pattern. The esthetic characteristic which differentiates the tubular from lattice structure is form. The tubular pole has a solid form and mass, thus making it visible from greater distances. The lattice tower has an open form; its mass is diffused.

Seen closeup, the base of the tubular pole is smaller and is more symmetrical and appears less massive than that of the lattice tower. Potential closeup viewing of the transmission structures which may occur along the proposed route and alternative routes A and B are as follows:

	Proposed	Alternative A	Alternative B
State Highway Crossings	1	1	1
County Road Crossings	3	6	5
Housing	Rural residences near Oakdale	Rural residence near Oakdale	Rural residence near Oakdale
			Copper Cove Subdivision and near Orange Blossom and Lancaster Roads

The State Highway 108/120 crossing is partially screened and structures would be more than 500 feet from the highway. At this distance, the visual impact should be less for towers than poles. A similar condition exists at the O'Byrnes Ferry Road. The Table Mountain crossing would be viewed from a distance in excess of 1 mile. As pointed out in the "Mitigation" Section (page 55), the two structures at the Visitor Center Overlook will be camouflaged with a grey-green paint to match the terrain.

(c) Weathered Steel

Weathered steel (ASTM A-588) turns rust colored when it weathers. Some people consider that they blend well with a wooded backgound. Insulator contamination may become excessive and cause flashovers due to iron oxide bleeding over insulator strings. Corrosion occurs at conductor connections.

(d) Aluminum

Aluminum structures tend to be more massive than steel. Special designs are required. They also have bright surfaces which are difficult to paint or treat. Anodized aluminum is very expensive.

(e) Concrete and Specialty

Considerable potential exists for esthetic treatment using concrete and specialty structures. The additional costs involved to develop these structures have not been justified.

(2) Insulators

An insulator is a bell-shaped object of nonconducting materials such as porcelain, glass, or plastic used to suspend the conductor from the structure. Individual insulators are strung together in the length required by the voltage of the line. Various colors are available. Brown was selected to harmonize with the native background near the switchyard. Glass insulators with a greenish cast will be used elsewhere.

(3) Conductors and Overhead Ground Wires

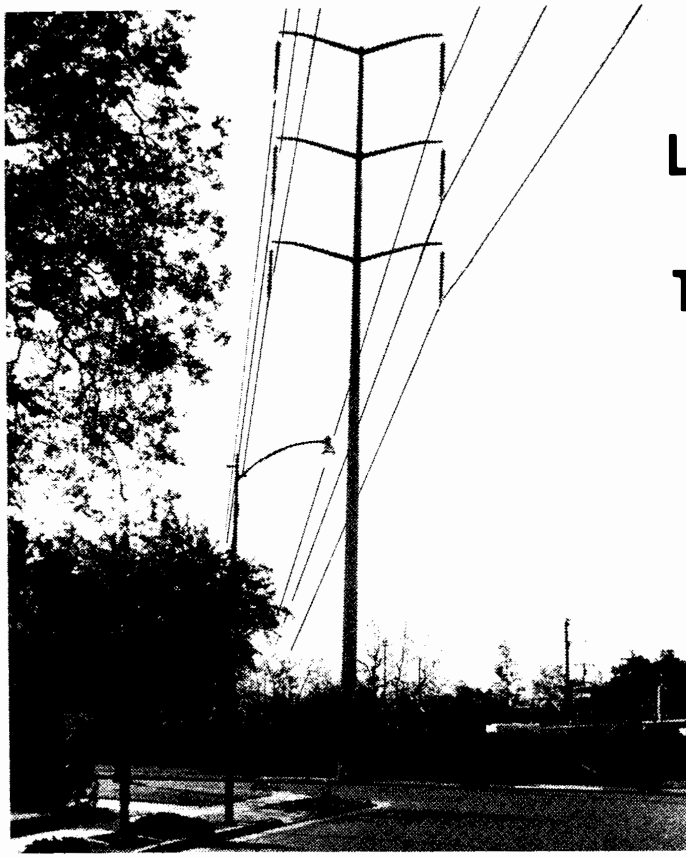
Each alternating current circuit has three-phase conductors. Conductors may consist of one or more subconductors depending on the line requirements. The most common type of conductor is aluminum with or without steel supporting cores.

Standard aluminum conductors are slightly cheaper but can cause a minor amount of glare. Nonreflective conductors were selectively chosen for use in two 1 and 1/2-mile (7.9 km) sections at (1) the New Melones Switchyard, and (2) State Highway 108/120.

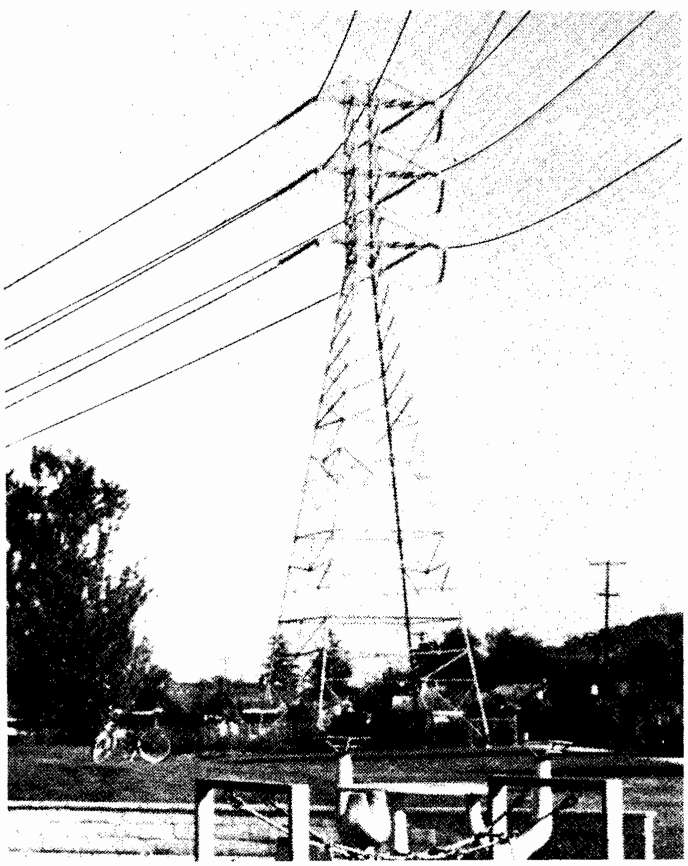
The 1113 kcmil (696 mm^2) conductor size selected is one that is commonly used by PG&E so that accessories and fittings would be readily available from stock. It is also an economic conductor size for the capacity involved and exceeds the minimum size needed to keep corona noise and radio interference within acceptable levels.

PLATE 25 :

LATTICE TOWER AND TUBULAR POLE PROFILE



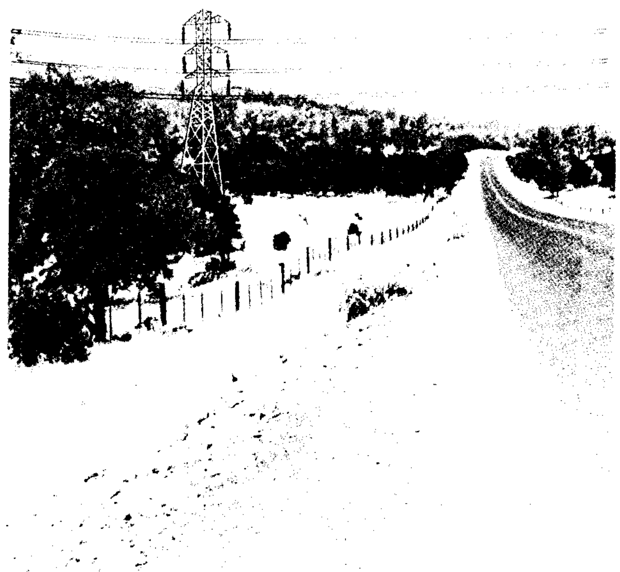
Tubular Steel Transmission Pole



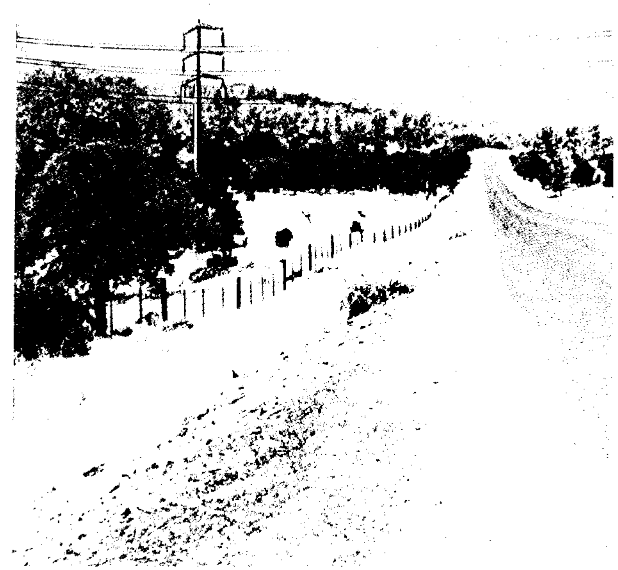
Lattice Transmission Tower

(COURTESY P.G.&E.)

Before



Lattice Tower

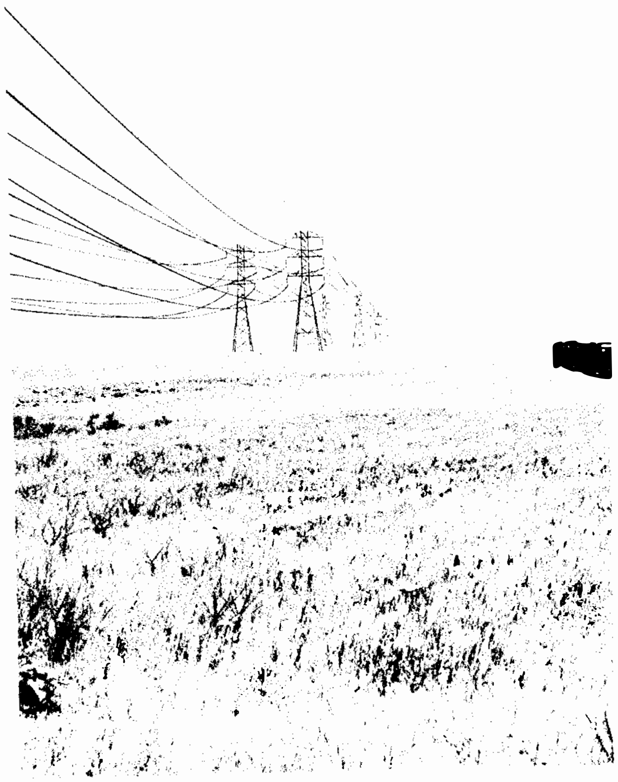


Tubular Pole

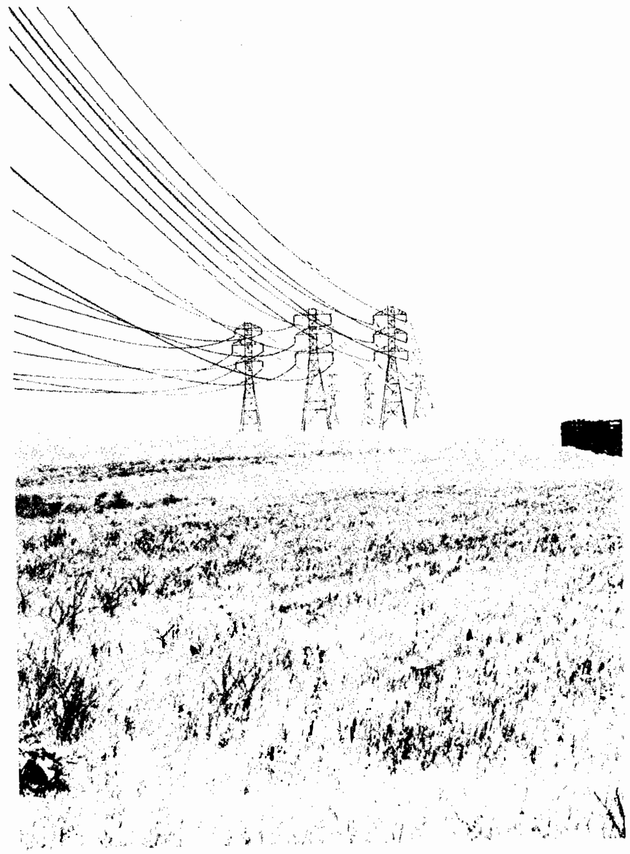
PLATE 26

WOODED FOREGROUND

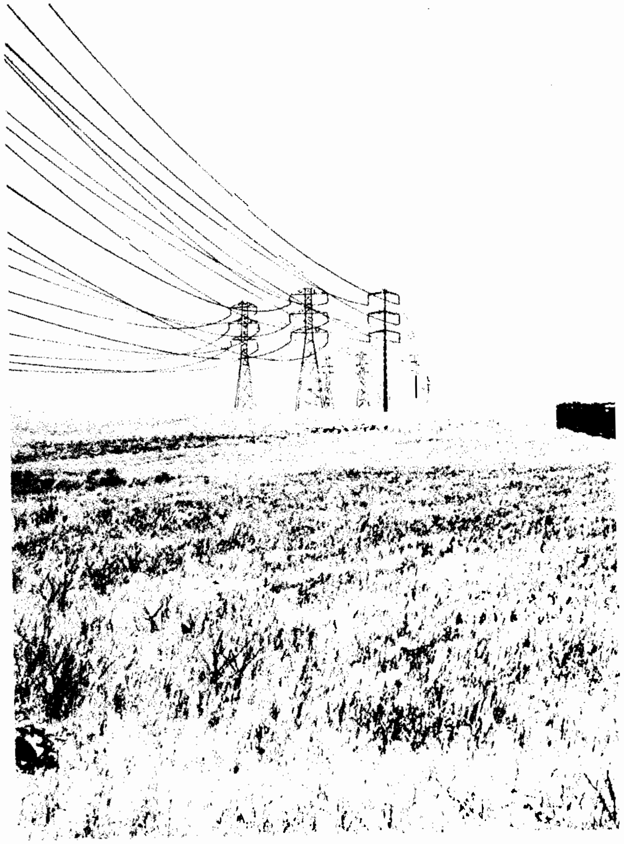
(COURTESY P.G.&



Before



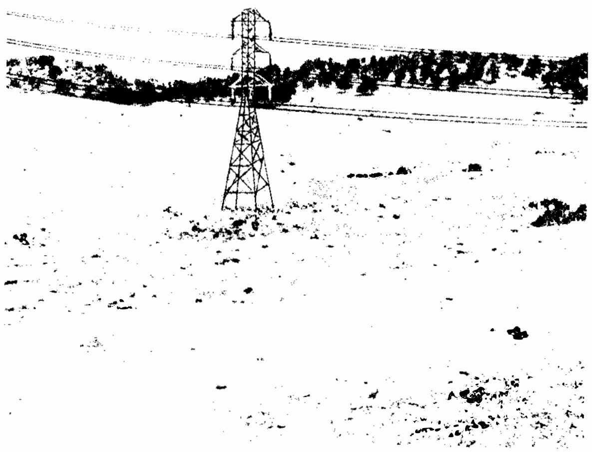
Lattice Tower



Tubular Pole

PLATE 27
FLAT FOREGROUND
(COURTESY P.G.&E.)

Before



Lattice Tower

Tubular Pole

PLATE 28
ROLLING BACKGROUND
(COURTESY P.G.&E.)

Steel-strand overhead ground wires are provided over the first 1 and 1/2 miles (2.4 km) of the line from the New Melones Switchyard to shield the phase conductors from direct lightning strokes. Direct lightning strokes to phase conductors can cause damage to any component connected to the conductors within a mile or so of the direct stroke. To protect expensive switchyard equipment against damage from direct lighning strokes, it is good practice to install overhead ground wires over the switchyard and over a mile or so of the line from a switchyard. When lines are located in areas where the number of lightning storms per year are low as in this case, it is normally acceptable to omit the overhead ground wires from the portions of the line that are more than about a mile from a switchyard. Direct lightning strokes to these portions of line can, on occasion, cause damage to conductors or insulators but the cost of replacing such items is not great, and the risk is therefore acceptable. The above basis was used in providing overhead ground wires. Omission of overhead ground wires near the New Melones Switchyard would result in a small reduction of visual impact but would jeopardize switchyard equipment.

d. Alternatives to the Warnerville Connection

It is necessary that the power generated at the New Melones Powerplant be delivered to Bureau loads. Investigations were made to select a delivery point which would have the least adverse environmental impacts consistent with economical constraints. Power flow cases were run to determine the most promising delivery point. The alternative terminals considered are discussed in the following paragraphs.

(1) Tracy Switchyard

Tracy Switchyard is the nearest existing Bureau terminal. It is about 62 miles (99.8 km) west of the New Melones Powerplant. A preliminary route is shown on plate 29. Prime light industrial, light commercial, or farmlands would be crossed. The population density is generally greater than in the proposed route.

The primary load of six pump motors at Tracy is adequately supplied by four 230-kV Bureau lines from the north. The outlet south is to the PG&E Company Tesla Substation. These lines are often heavily loaded. The introduction of New Melones power would cause the lines to overload.

(2) San Luis Switchyard

The San Luis Switchyard is about 70 airline miles (117 km) from New Melones. A 424-MW pumping-generating plant owned jointly with the State of California is located there. Their system would be able to absorb the power at that location. The primary


TRACY-SHASTA 230 KV
ELVERTA-TRACY 230 KV
STOCKTON
ALTERNATIVE ROUTE
NEW MELONES SWITCHYARD
TRACY SWITCHYARD
PROPOSED ROUTE
WARNERVILLE SUBSTATION
MODESTO
Manteca
Tracy
Oakdale
Riverbank
Turlock
Empire
Waterford
Ceres
Keyes
Hughson
UNION ISLAND
ROBERTS ISLAND
Victoria Island
Farmington
Don Pedro Reservoir
Modesto Reservoir
Turlock Lake
Lake McClure
Tuolumne River
San Joaquin R
Stanislaus R
CORRAL HOLLOW
MILES
KILOMETERS
NOVEMBER 1976
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT
EAST SIDE DIV. - NEW MELONES UNIT - CALIF.
TRACY SWITCHYARD ALTERNATIVE
881-208-166

objection is the distance involved, and the line would have to cross more of the fertile San Joaquin Valley farmland than the proposed route.

(3) Melones 115-kV Substation

The Melones 115-kV Substation is located at the existing PG&E Melones Powerplant adjacent to the New Melones Powerplant. The station is grossly undersized to receive full plant output. No acceptable method of upgrading these facilities to accomodate the New Melones power was found.

(4) Bellota 230-kV Substation

The PG&E Company 230-kV Bellota Substation receives a surplus of power from their Tuolumne and Feather River plants and the Sacramento Municipal Utility District Rancho Seco Nuclear Powerplant. Additional power is not needed there.

(5) Warnerville Substation

The city and county of San Francisco 230-kV Warnerville Substation receives power from the Hetch Hetchy project plants. The Warnerville Substation ties to a PG&E Company Bellota-Herndon 230-kV line and to loads in the Modesto/Oakdale area.

Terminals at the Warnerville Substation would cause extra construction not needed by the proposed facilities.

(6) Parker Substation

The Parker 230-kV Substation being constructed by the Modesto Irrigation District and associated lines should be capable of receiving plant output.

The Bureau has wheeling rights from the Parker Substation to the PG&E 230-kV system near Westley. About 11 miles (17.7 km) of additional line construction would be required through an area with a higher population density than the proposed route. This plan is more expensive due to the higher cost of new construction than using existing facilities.

(7) Waterford Substation

The PG&E Company is considering constructing a major substation near Waterford Substation which would tie their future 500-kV system to the Turlock/Modesto area load. The subdivision is not presently scheduled to be completed in time to provide a terminal for the New Melones line and the location of the substation has not been firmly established.

e. Alternative Routes

Three alternative routes to the preferred route were considered, and they are: (1) Alternative Route A located in Calaveras, Tuolumne and Stanislaus Counties generally southeast of the preferred route; (2) Alternative route B located in Calaveras and Stanislaus Counties primarily northwest of the Stanislaus River; and (3) An underground route through Tuolumne and Stanislaus Counties. Table 8 is a comparison of the alternative routes with the proposed route.

(1) Alternative Route A

(a) Project Description

Alternative Route A would be about 25 miles (40.3± km) long from its origin at the proposed New Melones Switchyard to its termination point near the Warnerville Substation. This route would essentially follow the same corridor as the preferred route for the first 0.5 mile (0.8 km) to a point across the access road to the New Melones Dam. At this point the line would cross the Melones-Riverbank Junction 115-kV woodpole line and parallel it on the east side for about 2.2 miles (3.5 km) to Table Mountain. From here, the route would continue southerly through scattered trees and brush for approximately 3.4 miles (5.5 km) passing east of the Sierra Conservation Camp.

The line would take a slight turn to the west to provide a better crossing of Green Spring Run. Turning back easterly and continuing southerly through scattered trees, Alternative A would cross the new highway (State Highway 108/120) and the old highway east of Kistler Ranch. Limited screening would be obtained for the highway crossing by the scattered oaks.

From the highway crossing, the route would cross Rock River Road and roughly parallel it for about 1.4 miles (2.3 km) before crossing the Hetch-Hetchy Aqueduct. At the aqueduct crossing, the line would turn westerly and continue the rough parallel of the Rock River Road for about 0.8 mile (1.3 km) continuing on to the county line.

The line would then enter Stanislaus County approximately 1 mile (1.6 km) northwest of the city and county of San Francisco's transmission lines and head southwesterly intersecting the city of San Francisco lines after about 2 miles (3.2 km). this alternative route would parallel those lines on the south side for about 10.5 miles (16.9 km). From the intersection with the Hetch-Hetchy Aqueduct to the end of the line, the route would follow and parallel the same corridor as that described for the preferred route.

Table 8

COMPARISON OF ALTERNATIVE ROUTE WITH PROPOSED ROUTE
(Courtesy PG&E)

Environmental Considerations	Alternative Route A	Alternative Route B	Underground Alternative
Land Use	Parallels existing lines for 2 miles longer than proposed route--more land affected.	Would go through the Copper Cove subdivision, and a rural residential area and intensive agricultural lands. Near asbestos mine. Shortest route. Does not cross Table Mountain. Crosses Route 108/120 in more populated area. Near Oakdale Airport.	Disruption during construction--less impact on land use after completion.
Recreation	Same	Crosses Stanislaus River in area designated for conservation. Crosses Black Creek (Tulloch Lake) in Recreation Area.	Less impact on scenic overlooks and on other outdoor activities.
Socioeconomic	Same	Same	More costly to build and longer construction period.
Noise	Same	Same	More noise and deterioration of air quality during construction.

Table 8 (cont'd)

Environmental Considerations	Alternative Route A	Alternative Route B	Underground Alternative
Visual	More visible than proposed route at Highway 108/120 and O'Brynes Ferry Road crossing. Visible when crosses ridge southeast of Sierra Conservation Center.	Crosses near flume, visible from residences in vicinity of Knights Ferry and Tulloch Lake. Crosses 108/120 in visible area.	Less impact.
Miles traversed through each landscape zone[1]			
irrigated pastures	1.5	2.1	N/A
dry grazing lands	4.2	6.7	N/A
hummocky grasslands	4.7	0	N/A
riparian woodland	0	1.0	N/A
rolling oak woodland	10.7	9.8	N/A
dry scrub oak/digger pine slopes	3.7	1.8	N/A
Table Mountain Formation	0.2	0	N/A
	25.0	21.4	

[1] See Table 5 for comparison with the Proposed Route.

Table 8 (cont'd)

Environmental Considerations	Alternative Route A	Alternative Route B	Underground Alternative
Geology, Topography and Soils	More access roads required than on proposed route.	Does not cross Table Mountain but crosses two prominent ridges. Goes through areas in Stanislaus County designated as Class I and Class II agricultural soils. Requires more new construction of access roads in first section of the route.	Greater impact on geology, topography and soils during construction. Grade cutting and filling required around pressure correction station and transmission terminals.
Hydrology	Same	Crosses Black Creek, Littlejohns Creek (twice) and the Stanislaus River. Also crosses through irrigated lands in Stanislaus County.	Greater impact on sedimentation during construction but less impact after completion.
Vegetation	Does not go through Table Mountain Natural Area.	Extensive cutting of brush and trees from switchyard to Stanislaus County line. Does not go through Natural Area.	Extensive clearing during construction. Permanent removal of vegetation within fenced areas around pressure correction station and transmission terminals.
Wildlife	Same	Same	Less impact on birds or wildlife from loss of habitat. No opportunity to create raptor perches.
Archeological and Historical	None	None	None

(b) Construction Criteria

1 Access

The access conditions for Alternative Route A would be similar to those of the preferred route. From the New Melones Powerplant to State Highway 108/120, the two routes are relatively close and, therefore, access conditions would be nearly the same.

From State Highway 108/120 to where the line would parallel the existing city of San Francisco transmission lines, the terrain becomes gentler than in the first section. Access would be developed to each of the structure locations; existing access would be used wherever possible. New access would be kept to the alinement or as close as is practical. Existing access would be used along the section paralleling the city of San Francisco transmission line.

2 Clearing

From the New Melones Powerplant to the Tuolumne County line vegetation is similar to that found along the preferred route, and thus clearing would be similar. From the Tuolumne County line to the tie point with the Bellota-Herndon line the area is grass and pastureland, and it appears that no trees would have to be removed.

3 Structure Installation

The same methods would be used on this alinement as those used on the preferred route.

4 Conductor Installation

Due to the similarity of the terrain and vegetation between the preferred route and Alternative Route A, the installation of conductors would be done in a manner similar to the preferred route.

5 Cleanup

This operation would be carried out in the same manner as along the preferred alinement.

(c) Reason for Rejection

This alternative is 1.6 miles (2.6 km) longer than the proposed route and would impact an additional 12 acres (5 ha). In addition, the towers would be more prominent at the higher elevation where they would skirt Rushing Mountain. More access road would be required.

(2) Alternative Route B

(a) Project Description

The length of Alternative Route B is about 21.4 miles (34.5 km), the shortest of three overland routes. This alternative would also originate at the proposed New Melones Switchyard, and head west for about 0.3 mile (0.5 km) to the Melones Tap No. 1 and 2 Transmission Lines at the fringe of the asbestos plant property. The line would parallel the south side of the Melones Tap for about 0.8 mile (1.3 km) across French Creek. At this point, it would turn slightly to the south, and continue westerly across Bowie Flat for approximately 2.8 miles (4.5 km).

The line would then turn south and cross the westerly end of the Black Creek arm of Tullock Lake (FPC Project 2067). Continuing southwesterly for about 1.9 miles (3.1 km), it would enter Rancheria Del Rio Estanislao, southwest of the Copper Cove Subdivision. From there, it would continue southwesterly for about 4.4 miles (7.1 km) to the Calaveras County line, crossing Littlejohns Creek, Smith Falt, Peachys Creek, and the Melones Riverbank Junction 115-kV powerline.

Entering Stanislaus County, this route would continue southwesterly for 2.5 miles (4.0 km), crossing Church Spring Road and then paralleling it for about 0.5 mile (0.8 km). Turning slightly to the east, the line would continue southwesterly, crossing South San Joaquin Main Canal just west of the flume, about 3.2 miles (5.2 km) west of Knights Ferry.

The line would then cross the easterly end of Cape Horn Tunnel and continue southwesterly about 2.5 miles (4.0 km) to the north bank of the Stanislaus River. The river crossing would be made just east of the Orange Blossom Road Bridge. Entering agricultural land, the line would cross Lancaster Road, State Highway 108/120, the Sierra Railroad, Wamble Road, and the Oakdale South Main Canal before intersecting the city and county of San Francisco's transmission lines. From this point, the route would be the same as the preferred route discussed earlier.

(b) Construction Criteria

1 Access

Access from the New Melones Powerplant to State Highway 108/120 would need to be developed to each structure location. This area does not provide readily available access from trails or roadways.

The area between State Highway 108/120 to the tie point is basically grass and pastureland and access would need to be developed along the alinement.

2 Clearing

From the New Melones Powerplant to approximately the county line, conductor stringing trails would be cut through brush and trees. An area would also have to be cleared for the installation of each structure.

3 Structure Installation

The installation would be done in a manner similar to the preferred route.

4 Conductor Installation

Conductor would be installed using similar methods to those used on the preferred alinement.

5 Clean-Up

This phase would be carried out in a manner similar to the other alternatives.

(c) Reason for Rejection

Land use considerations were responsible for the rejection of this alternative. The route crosses suburban and rural subdivisions, prime agricultural soils, conservation zones near the Stanislaus River and is near the asbestos mine. It would be visible at the State Highway 108/120 crossing. More vegetation would be cleared. It would not parallel existing lines for any significant distance.

(3) Alternative Route C

(a) Project Description

Alternative Route C is similar to the proposed route except in the area between the Tuolumne-Stanislaus County line to the Warnerville Switchyard.

(b) Construction Criteria

Construction criteria are similar to the proposed route.

(c) Reason for Rejection

The line impinged on the Willms Ranch historical site.

(4) Underground Alternatives

(a) Project Description

The construction of a double-circuit underground transmission line was explored as an alternative to the proposed overhead transmission line.

Due to the geological makeup of the Table Mountain-Green Spring Run area, the steep terrain and the limitations of construction equipment, it was determined that an underground line would not be suitable for the first 5.7 miles (9.2 km), even though the area is recognized as one with numerous environmental constraints. Therefore, at a point approximately 5.7 miles (9.2 km) south of the New Melones Powerhouse on the proposed alinement, an overhead-to-underground transition terminal would be installed. The route would then continue underground southwesterly about 1.9 miles (3.1 km) across open country to State Highway 108/120. The underground route would continue south, parallel to an unimproved road and traverse open country for about 3.0 miles (4.8 km) to the Hetch-Hetchy Aqueduct. The route would then follow the aqueduct for about 12.9 miles (20.8 km) to the Warnerville Substation area where it would conect into the Bellota-Herndon 230-kV tower line at a transition station. The underground portion of the route is 17.8 miles (28.7 km) long.

(b) Construction Criteria

1 Type of Installation

The double-circuit underground transmission line would consist of two high-pressure, oil-filled, pipe-type 230-kV cable installations. Each circuit, consisting of three cables, would be encased in a 10-inch (25.4 cm) O.D. (outer diameter) oil-filled steel pipe. Oil impregnated paper wrapped around each conductor would be the primary electrical insulation between the conductors and the pipe. To preserve the insulation qualities of this paper, the heat generated by the electric current in the conductors would need to be dissipated to the surrounding soil. The two pipes would be buried in a common trench. A special thermal backfill material would be placed in the trench around each pipe to disperse heat more efficiently than native soils. A manhole would be installed every 1,500 to 2,500 feet (457.2 to 762 m) along the route to be used for cable installation and maintenance of the line. Transition terminals would be constructed, one at each end of the underground line. Each terminal would contain transition structures, lightning arresters, potheads, and oil-pumping facilities to maintain the high oil pressure required in the underground pipes. At roughly the midpoint of the line, a pressure correction station would need to be installed to prevent excessive oil pressure at potheads on the Warnerville end due to a difference of elevation in the line.

2 Circuit Installation

A trench approximately 4 feet (1.2 m) wide and averaging 6 feet (1.8 m) in depth would be dug along the alinement. Some blasting might be required along the route for rock removal. Forty-foot (12.2 m) sections of steel pipe would be welded end to end and lowered into the trench. As the pipes are welded together, each joint would be pressurized to check for leaks. Special thermal backfill material would be poured around the pipes to within approximately 3 feet (0.9 m) of the earth surface and ordinary backfill material would be used to fill the remainder of the trench. During the pipe installation, manholes would be placed strategically along the route every 1,500 to 2,500 feet (457.2 to 762 m). Each section of pipe between manholes would be pressurized and held for a period of time so that it could be monitored for leaks. The underground cables would then be pulled into the pipes between manholes and spliced together at each manhole to form a continuous length of cable. The sealed pipes would be filled with a special high-grade oil and pressurized to 220 lb/in^2g (1 519.6 kPag). If the pressure should fall significantly below this value, the line would be tken out of service to prevent damage to the cables or pipes. After locating and correcting the problem, the line would be returned to service.

3 Cleanup

Cleanup procedures would be similar for the entire line. All excess dirt and shipping materials would be disposed of in approved dump sites. Construction hardware and equipment would be removed and disturbed soils and shallow-rooted vegetation would be restored where possible.

(c) General Specifications

General Specifications of the Alternative Underground Transmission Line

1. Line Length	
Underground Portion	Approximately 17.8 miles (28.7 km)
Overhead Portion	Approximately 5.7 miles (9.2 km)
2. Right-of-Way Width	30 feet (9.1 m)

3.	Type of Conductor	3,000,000 circular mil (3 000 kcmil) (1 876 011 mm^2), aluminum compact segmental, 760 mil insulation, 0.760 inch (1.9 cm), 3.75-inch (9.5 cm) outside diameter
4.	Single Circuit Capacity	344 MVA normal thermal rating @ 100% load factor
5.	Type of Installation	High-pressure, oil-filled, pipe-type cable
6.	Pipe Type	10-inch (25.4 cm) outside diameter steel pipe
7.	Trench Dimensions	4 feet wide (1.2 m), 4 to 12 feet (1.2 to 3.7 m) deep
8.	Location of Manholes	Every 1,500 to 2,500 feet (457.2 to 762 m)
9.	Type of Manholes	Reinforced concrete, approximately 3 feet high (0.9 m), 12 feet (3.7 m) wide, 22 feet (6.7 m) long
10.	Type of Construction	Open trench

(d) Comparison of Materials

	Overhead	Underground
Aluminum, lbs (kg)	837,000 (376 700)	1,766,800 (795 060)
Steel, lbs (kg)	1,840,000 (828 000)	5,712,200 (2 570 490)
Insulating Paper, lbs (kg)	0	3,719,000 (1 673 550)
Insulating Porcelain, lbs (kg)	122,800 (55 260)	49,100 (22 095)
Oil, gals (kg)	0	388,500 (174 825)

(e) Effects of Undergrounding

The environmental effects of an underground alternative would be confined mainly to the construction period. The few residences that exist near the proposed alinement might experience some increases in noise and dust, caused by men and equipment working in the area. The presence of large quantities of rock in the area indicates that blasting may be required. Some temporary traffic interruptions would result at road crossings. In locations where dust would be excessive the construction area would be wetted down to decrease the dust. Flagmen and road signs would be used to aid in traffic control. An all-weather access road capable of handling 20- to 30-ton (18 to 27 t) payloads would be required along the route as part of the 30-foot-wide (9.1-meter-wide) right-of-way necessary for construction and operation of the line. The construction area would have to be cleared of any vegetation, but shallow-rooted plants would be allowed to grow after construction was completed. Long-term operational effects would include permanent removal of all vegetation within the fenced areas of the pressure correction station and transition terminals. Since these sites would require a level area of approximately 150 feet by 200 feet (45.7 by 61 m), grade cutting and filling might be necessary to obtain these leveled areas.

(f) Reasons for Rejection

Although the installation of a double-circuit underground transmission line is technically and physically possible, the environmental benefits gained by eliminating the overhead line are outweighed by the increased use of natural resources and additional cost. A cable trench would disturb more vegetation and would cost more than ten times as much as the cost of the proposed overhead transmission line. Therefore, undergrounding was not chosen as the preferred method for the proposed action.

3. "No Project" Alternatives

If no action were taken, it would be impossible to deliver the plant output to our preference customers and project loads. An alternative power source would be required. An alternative power source would likely involve the use of nuclear or fossil fuels which are nonrenewable resources and in a limited supply as opposed to the use of hydropower which utilizes a renewable "clean" energy source. In addition, the water conserved by the New Melones Reservoir could not be used to generate power. This alternative would not be in conformity with the congressional authorization (P.L. 87-874).

The landscape would not be subjected to the overhead lines and the environmental impacts of the line as discussed in other parts of this statement would not occur. Present land use practices (primarily dryland cattle grazing over most of the alinement) would be expected to continue with only minor changes.

I. CONSULTATION AND COORDINATION

1. Development of the Proposal and Preparation of the Draft Environmental Statement

The individuals and agencies contacted by the Bureau of Reclamation are given in Appendix G and those by the PG&E Company in Appendix F. Copies of correspondence from the State Office of Historic Preservation to the PG&E Company are also presented in Appendix F. Agencies with jurisdiction over the project are given in Appendix I.

2. Glossary, References, and Metric Conversion

Appendix A contains a glossary of terms used within this statement. Appendix H contains a list of many of the references utilized in the preparation of the statement. Appendix K contains a listing of several of the most useful conversion factors for converting values from the English to the metric system.

3. Review of Draft Environmental Statement

Comments on the October 3, 1977, draft environmental statement were received from 19 entities. Copies of the comments received are presented in Appendix L of this statement. The comments related to fauna, dismantling at the end of service, herbicides, preservation of artifacts, centralized electric power, justifying reservoir filling by the transmission line, oppositon to alternative B, and cost of alternatives. The Public Utilities Commission of California indicated that they will have to have costs from PG&E showing that the ratepayers will be protected.

A formal public hearing on the draft environmental statement was held in the Oakdale Community Center on November 30, 1977, at 7:30 p.m. There were no formal requests to speak. However, two people did make comments during the hearing. Mr. Leo H. Moir of the California Public Utilities Commission (PUC) stated that the PUC was a part of the hearing and requested a document entitled, "Public Agency Comments Supplementing the Draft Environmental Impact Report--November 1977" be made a part of the transcript of the hearing. The comments were on the PUC Draft EIR. Additionally, Mr. Thorn Gray of the Modesto Bee asked that cost-benefit analyses of all alternatives be included in the final EIS.

A summary of the comments received is given in the following paragraphs together with a description of the place and manner in which comments are treated in this final statement. The number in parenthesis following the agency or organization refers to the page number in Appendix L. In some instances where concerns were not fully covered in the final text or where special emphasis was indicated, further response follows the general statement regarding coverage.

The Oakdale Irigation District (L-1) found no adverse impacts on their operations or the environment in general.

The State of California Public Utilities Commission (L-2) found no significant inconsistencies between the PUC Draft EIR and our Draft EIS. They did consider that the visual impact of the line would be significant.

The United States Department of the Interior Bureau of Indian Affairs (L-4) found that no Indian lands under their jurisdiction were involved.

The United States Department of Health, Education, and Welfare Office of Environmental Affairs (L-5) offered no comments.

The United States Department of the Interior Geological Survey (L-6) was concerned with the frequency of herbicide application and that the concentration of herbicides might leach into the shallow ground-water reservoirs or migrate to surface-water (page 51).

The United States Department of the Interior Bureau of Mines (L-7) suggested an improvement about mineral deposits (page 8).

The United States Department of the Interior Bureau of Outdoor Recreation (L-8) found that recreation was adequately addressed for the preferred route.

The United States Department of the Army Corps of Engineers (L-9) furnished minor revisions (pages 6, 11, and 22, and plate 13).

The United States Department of the Interior Fish and Wildlife Service (L-10) agreed with the alternative selected.

The Modesto Irrigation District (L-11) were concerned about the economics of alternatives to the Warnerville connection.

The purpose of an EIS is to alert the President, CEQ, the public, and Congress to the environmental consequences of the proposed agency action. See E.D.F. vs. Armstrong 352 F. Supp. 50 (4 ERC 1760) affirmed 487 Fed. 814 (6 ERC 1068) 9th circuit involving the New Melones EIS. Also Trout Unlimited et. al. vs. Morton 509 Fed. 1276 (9th circuit).

The United States Department of the Interior Bureau of Land Management (L-12) suggested that Federal lands be broken down by agencies (pages 24 and 25), the length and acreage of access roads be added (pages 41 and 53), and the number of live streams be specified (pages 40, 45, and 62). Plate 18A was added to show ground slopes along the line (page 40). Table 8 was revised to show impacts on archeological and historical values (page 75).

Additional concerns not fully covered by the text for various reasons are responded to below:

Concern: The historical and archeological sites be shown on a plate.

Response: We prefer not to distribute detailed information to the general public with the location of historical and archeological sites lest the sites be destroyed by unskilled collectors. Detailed archeological survey reports have been submitted to the State Historic Preservation Office.

The State of California--Office of Planning and Research (L-14) verified that this statement is in compliance with those aspects of the National Environment Policy Act that are implemented by the Office of Management and Budget Circular A-95.

The City of Oakdale (L-15) were opposed to alternative B because it would interfere with their future airport expansion. The Department does not consider alternative B to be a viable alternative.

The Federal Energy Regulatory Commission (L-16) noted that they are no longer the Federal Power Commission (pages iii, iv, 2, 11, and 41).

Additional concerns not fully covered by the text for various reasons are responded to below:

Concern: The possible loss of line performance due to the lack of static shield conductors over the full length of the line.

Response: The low isokeraunic level of 10 or less doesn't merit the added facilities. Isokeraunic level is the expected lightning storm days a year.

The United States Department of the Interior National Park Service (L-18) concerns not fully covered by the text for various reasons are responded to below:

Concern: The Service recommended that the identified archeological resources which meet the criteria for the National Register of Historic Places.

Response: The Pacific Gas and Electric Company has supplied the appropriate information to the State Historic Preservation Officer. A copy of your letter has been forwarded to them.

The United States Department of the Interior National Park Service (L-18). The Service recommended that identified archeological resources be evaluated for their National Register of Historic Places significance in consultation with the State Historic Preservation Officer, and results of that consultation be documented in the final statement.

The Pacific Gas and Electric Company has supplied the appropriate information to the State Historic Preservation Officer (page 41).

The Pacific Gas and Electric Company (L-19) offered an editorial change which has been made (page 11).

The Friends of the Earth (L-20) was concerned about the possible impacts of construction on major migratory routes of major mammals such as deer, that reside in the area (page 41a).

Additional concerns not covered fully by the text for various reasons are responded to below:

Concern: It was noted that decommissioning procedures and costs to dismantle the proposed project after it is no longer needed were not covered.

Response: The 50-year period refers to the initial service contract with PG&E. The actual life of hydroprojects and the powerline may extend beyond 100 years with proper maintenance. We anticipate renewing the contract after 50 years. Therefore, decommissioning is not anticipated. If or when the line is no longer needed, it would be removed by PG&E at their expense. The towers would be disassembled, and the conductors would be placed on reels for possible reuse or salvage.

This environmental statement is for the electric transmission line. The New Melones Lake Final Environmental Impact Statement, which was filed with CEQ by the U.S. Army Engineers in May 1972 (revised June 21, 1972), covered the dam and powerhouse. The Bureau of Reclamation filed an Environmental Impact Statement on New Melones Lake Supplemental Data on Use of Conservation Yield with CEQ on January 23, 1973.

Concern: They were concerned about pollution caused by herbicides and its treatment in the draft. Labor intensive methods of vegetation removal was suggested. The potential benefits were employment, conservation of fossil fuels, and possible contamination.

Response: Although herbicides may be used, the use of manual tree trimming is not precluded. Only about 11 miles of the line is on tree and brush-covered foothills. The brush and trees are sparse on much of this land. Trees would generally be trimmed rather than removed. The herbicides covered in the report would not be used in large quantities. There would not be sufficient trimming required on the proposed line to hire individuals for that specific purpose.

Substantial savings in fossil fuel by labor intensive methods is questionable when the total operation is considered.

Concern: An outline of the special construction techniques to be used if archeological artifacts were uncovered during construction was requested.

Response: An archeological survey has been made and sites were identified. The towers have been located to avoid these locations. Construction people will be advised of the location of the sites and admonished not to disturb them. An professional archeologist will be present when construction is done in the site areas. Should any sites be discovered during excavation for footings, they will be studied before construction continues. The techniques used will be dependant upon the nature of the resource discovered. Coordination with the State Historic Preservation Officer will insure that the techniques utilized will be appropriate for the nature of the resource.

Concern: The concept of centrally produced electricity was questioned.

Response: Studies by the Western Systems Coordinating Council, the State of California Energy Commission, the Federal Energy Regulatory Commission, and various electrical utilities show a deficiency in future domestic energy supplies. The Department of Energy is keenly interested in meeting the present energy needs of the United States. Energy self-sufficiency is not at hand, and the development of all economical means of supplying energy is being considered. The use of hydroelectric energy conserves fossil or nuclear fuel and is environmentally advantageous.

Concern: A concern that the line would be used as a justification for filling the New Melones Reservoir was expressed.

Response: The filling of the New Melones Reservoir will depend on the outcome of the U.S. Supreme Court deliberations concerning the State Water Resources Control Board Decision 1422. Since the proposed line would be required for the project under Decision 1422, construction of the line is not dependent on the outcome of the court decision. Even if the U.S. Supreme Court rules in favor of the State of California in this matter, the proposed line is still needed. Studies show that the full capacity of this line will be needed to deliver the power generated at New Melones during an average of about 4 months each year because the storage limits imposed by Decision 1422 require that all normal reservoir inflow be released (through the powerplant or spilled) after reservoir storage reaches 650,000 acre-feet. The average annual inflow to New Melones Reservoir is in excess of 1 million acre-feet. It is anticipated that under normal conditions most releases would be made through the powerplant.

Further, it was recognized by the State of California Water Resources Control Board that the storage limitations set by Decision 1422 were interim in nature and could be modified at any time based on a demonstration of beneficial uses of the water supply. Therefore, it is reasonable and prudent to construct a transmission system capable of carrying the plant's full output at this time. The cost of the line is about 5 percent of the total project cost.

The Modesto Bee (L-23) was concerned about the financial analysis of the alternatives. This has been covered in this appendix under Modesto Irrigation District which has a mutual concern.

The Friends of the River (L-24) objected to the construction of the transmission line based on the need for the line if the Water Resources Control Board Decision 1422 was upheld by the U.S. Supreme Court. This concern is similar to that of the Friends of the Earth and is covered in that response (page 87).

The United States Department of Agriculture (L-25) had no comments.

The United States Environmental Protection Agency (L-26) was concerned about air quality as discussed below.

These are EPA comments – helpful but overall there is a guide slight

Data relating to existing pollutant levels and air quality is needed. Paragraph B.1.a on page 14 was revised and appendices M and N were added to provide data on existing air quality.

Additional concerns not fully covered by the text for various reasons are responded to below:

Concern: A discussion of local impacts resulting from construction or emissions indirectly associated with the project.

Response: The impacts during construction would be short in duration and would not significantly affect the environment. Construction related impacts are discussed on pages 36 through 45.

Other minor emissions assocated with the project would be those generated by the fabrication and transportation of the line materials and equipment. Although these emissions would contribute to the total pollutants, they are not considered to be a significant portion.

Concern: Air Quality impacts associated with each alternative wasn't included.

Response: The impacts on air quality of the overhead lines would relate to the line length. The proposed line length is only slightly longer than the shortest route considered. The underground alternative would require considerable excavation and possibly some blasting. Only a very minor difference in air pollution would occur due to difference in access distances.

Concern: Comments on Air Quality are scattered and effort should be made to organize them in the final statement.

Response: This has been done for the existing environment on page 14. Similar changes in the sections on impacts and mitigation would improve the format of this report. However, because of time constraints and the expense involved, we have chosen not to make the suggested changes. Although the suggested changes would, as previously stated, improve the report's format, they would not add any additional data on environmental impacts.

Concern: A discussion on fugitive dust and slash burning, and procedures followed to abate dust is needed.

Response: Regulations covering fugitive dust and slash burning are found in the State of California Health and

Safety Code and are enforced by the counties involved. Part 4 covers fugitive dust mainly as a nuisance and slash burning as open burning of wood wastes on property where grown. Burning is allowed on permissive days. The line construction will conform to the above regulations. The contributions to air quality deterioration are not considered to be significant.

Small amounts of particulate matter are likely to be produced locally from tower construction, road improvements, and vehicular traffic. The effect during construction would be localized.

Dust abatement would be provided by water sprinkling if it becomes a nuisance. Some dispersion would occur from the wind.

Concern: Air pollution might occur from blasting deposits of asbestos into the air and health problems might result.

Response: Asbestos deposits generally occur in pockets in this area. No known deposits are within the proposed transmission line easement. The blasting charges used to excavate tower footing, if any, would be small and any asbestos dust blown into the air would be local and in limited amounts. The possible blasting would occur in the rock-bound areas of Tuolumne County.

The duration and quantities of any possible discharge of asbestos in the air are small. The asbestos along with any dust would soon settle or be blown away.

APPENDIX A

Glossary

ANDESITIC	Composed primarily of fragments of andesite, a lava intermediate in composition between a rhyolite and a basalt.
ACCESS ROAD	Any road to reach the work sites.
ACRE-FOOT	The volume (as in irrigation water) that would cover one acre (43,560 square feet or (4 050 m^2) to a depth of 1 foot (.0305 m).
ACSR	Aluminum Conductor-Steel Reinforced, a type of electrical conductor.
ALLUVIAL	A general term for clay, silt, and gravel, or similar unconsolidated material deposited during recent geologic time by a body of running water.
ALLUVIAL PLAIN	A level or gently sloping land surface produced by extensive deposition of clay, silt, sand, or gravel through the action of running water.
AMBIENT NOISE LEVEL	That level of noise (normally measured in decibels) existing in an environment under normal conditions.
ANTICLINE	The upward geological fold, convex upward in rocks which contains the stratigraphically older rocks that may hold accumulations of gas or oil. (Also called a dome.)
ARCHEOLOGICAL SITE	A site lending itself to the scientific study of extinct peoples or of past phases of the culture of historic peoples through skeletal remains, fossils and objects of human workmanship found in the earth.

ATTENUATION	A general term used to denote a decrease in magnitude in transmission of electrical energy from one point to another.
AUGER	Large spiral bit used for boring in soil or rock.
AWG	American Wire Gage is a wire size standard.
BATHOLITH	A great mass of intruded igneous rock that for the most part stopped in its rise a considerable distance below the surface.
BREAKDOWN GRADIENT	That value of electrical stress which when applied to the surrounding atmosphere causes a flashover.
CENOZOIC	A geological time era. See figure 6.
CHANNEL FILL	An alluvial deposit in a stream channel or in an abandoned cutoff channel.
CIRCUIT	A system of conductors through which three-phase electric currents are intended to flow. In the case of transmission and distribution lines, each circuit will consist of three conductors.
CIRCULAR MIL	A unit of area equal to 0.7854 square mil (5.1×10^{-4} mm^2). A mil is one thousandth part of an inch. A one-inch diameter circle contains one million circular mils.
CONDUCTOR	A wire, or combination of wires not insulated from each other, suitable for carrying an electric current.
CONSOLIDATE	The gradual or slow reduction in volume and increase in density of a material in response to increased load or compressive stress.
CONTACT	A plane or irregular surface between two different types or ages of rocks.
CONTAMINATION (INSULATOR)	The formation of soil and residue on an insulator ultimately resulting in an insulation breakdown.

CROSSTIE	Section of pipe used to connect two parallel pipelines.
CRYSTALLINE	A rock consisting wholly of crystals or fragments of crystals.
CUESTA	A hill or ridge with a gentle slope on one side and a steep slope on the other.
CULVERT	A transverse drain.
CURRENT, STEADY-STATE	The value of a current after all transients have decayed to a negligible value.
DECIBLES A-WEIGHTED (dBA)	Sound pressure levels weighted in accordance with A scale. A-weighted scaled similar in response to that of human ear for normally encountered sounds. One dBA represents the faintest audible sound. 50 to 60 dBA represents normal conversation at 3 to 5 feet (0.9 m to 1.5 m).
DEFORMATION	A general term for the process of folding, faulting, shearing, compression, or extension of the rocks as a result of various earth forces.
DEMOGRAPHY	The statistical study of human populations especially with respect to size and density, distribution, and vital statistics.
DENSITY	The quantity per unit volume, unit area or unit length.
DIP	The angle that a structural surface, e.g., a bedding or fault plane, makes with the horizontal, measured perpendicular to the strike of the structure.
DISPLACEMENT	The relative movement of the two sides of a fault, measured in any chosen direction.
DISSECTED HILL TOPOGRAPHY	A cut into an eroded surface of considerable area and slight relief.
EASEMENT	The right held by one person to make use of the land of another for a limited purpose.

ECOSYSTEM	A community and its (living and non-living) environment considered collectively; the fundamental unit in ecology. May be quite small, as the ecosystem of one-celled plants, in a drop of water, or indefinitely large, as in the grassland ecosystem.
EDAPHIC	Of or relating to the soil.
ELECTRIC FIELD	A state of a medium characterized by spatial voltage gradients caused by conductors at different voltages.
ELECTROMAGNETIC INDUCTION	The production of an electromotive force in a circuit by a change in the magnetic flux linking with that circuit.
EMPLACEMENT	Set into place by various geologic processes.
FAULT (ELECTRICAL)	The unintentional contact of conductors in an electrical network to each other or to ground which cause short circuit currents to flow. Faults may be caused by many physical events including structure failure, insulator flashovers and contact by foreign conducting materials.
FAULT (GEOLOGIC)	Break in the earth's crust along which parallel slippage of adjacent earth material has occurred at some point in the past.
FAULT SYSTEM (GEOLOGIC)	Two or more regional faults or fault zones which are related but usually not interconnected.
FAULT ZONE (GEOLOGIC)	One or more faults and the adjacent fractured and sheared rocks; may be a few feet to a few miles in width.
FAUNA	The animals or animal life developed or adapted for living in a specified environment.
FEDERAL POWER COMMISSION	A regulatory commission created to regulate and oversee certain activities of governmental and private utility interests.

FLORA	Plants; organisms of the plant kingdom specifically, the plants growing in a geographic area, as the Flora of Illinois.
FOLD	A curve or bend of a planar structure such as rock strata, bedding planes, foliation, or cleavage.
FORMATION	A persistent body of igneous, sedimentary, or metamorphic rocks, having easily recognizable upper and lower boundaries that can be traced in the field and large enough to be represented on a geologic map as a convenient unit for mapping and description.
GABBRO	A group of dark-colored, iron and magnesium rich, coarse grained intrusive igneous rocks which are the intrusive equivalent of basalt.
GIN POLE	A single pole held in a nearly vertical position by guys that support a block and tackle used for lifting loads.
GRADER	Machine used to move earth for trimming land or roadways or to make ground conform to a desired contour.
GREENSTONES	Metamorphosed volcanic rocks rich in the green colored minerals epidote and chlorite.
GROUP	A major rock-stratigraphic unit consisting of two or more formations having significant lithologic features in common.
HABITAT	The place or type of site where a plant or animal naturally or commonly is found.
HISTORICAL SITE	Any site which by virtue of historical events (i.e. within the time frame of recorded history) taking place thereon is shown to be of culturally redeeming value.
ID	Inside diameter.

IGNEOUS	One of the three major classes of rock; formed by cooling and solidification of molten material (magma).
IN SITU	Having to do with in place original characteristics.
INSULATION	Material having a high resistance to the flow of electric current, to present leakage of current from a conductor.
INTRUSION (IGNEOUS)	The process of emplacement of magma or molten rock into preexisting rock.
IONIZED	The state of matter having a net positive or negative electrical charge.
JURASSIC	The second period of the Mesozoic era (after the Triassic and before the Cretaceous) thought to have covered the span of time between 195-190 and 136 million years ago.
kcmil	Thousand circular mils (0.63 mm^2) - a unit describing conductor size in terms of its cross-sectional area.
kV	Kilovolt; unit equal to one thousand volts.
kWh	Kilowatthour; a unit of electrical energy.
LATERAL	A side ditch or conduit (as in a water system).
LAVA	A molten rock that has flowed upon the earth's surface and solidified.
LEAD LINE	A fibre rope or small steel cable used to pull in a "sock line".
LOAD CENTER	The geographical center of electric demand.
MAINTENANCE ROAD	Any road constructed and used for performing routine maintenance and repair on a facility.

MANHOLE	A subsurface structure, large enough for a man to enter. Manholes are spaced along the cable route at intervals depending on the type and design of the cable system. Manholes provide an underground location for cable installation and for joining cables.
MESA	A very broad, flat-topped, usually isolated hill or mountain bounded on at least one side by a steep cliff or slope.
MESOZOIC	A geologic era from 230,000,000 to 63,000,000 years before present.
METAMORPHIC	One of the 3 major classes of rock; the rock resulting from preexisting rocks which have been changed (metamorphosed) by heat, pressure and/or mineralizing solutions or combinations of the above.
METASEDIMENTARY	A metamorphosed sedimentary rock which retains most of its original sedimentary characteristics.
MILLIAMPERE	1/1000th of one ampere (the basic unit for measurement of current).
mm	1/1000th of one meter (.04 inch).
MUDFLOW (VOLCANIC)	A deposit composed chiefly of fragments of volcanic materials transported and deposited as a water saturated mass.
MVA	Megavolt-amperes, apparent power unit of one million volt-amperes.
MW	Unit of power; Megawatt; one million watts; 1,000 kilowatts.
OD	Outside diameter of pipe size or conductor.
OVERHEAD GROUND WIRE	Multiple grounded wire or wires placed above phase conductors for the purpose of intercepting direct lightning strikes in order to protect the phase conductors.

PALEOZOIC	The geologic era thought to have covered the span of time between 570 and 230 million years ago.
PAYLOAD	The useful load that a vehicle of transport can carry.
PHASE SPACING	The distance between the phase conductors.
PHOTOCHEMICAL PROCESS	Chemical changes brought about by the radiant energy of the sun acting upon various polluting substances; result is photochemical smog.
PLATE TECTONICS	A theoretical global model in which the earth's crust is subdivided into 10 to 25 large plates, each of which "floats" on a viscous layer within the mantle. The plates are propelled by an upward and outward movement of submarine basalts, called sea floor spreading, from oceanic ridges.
PHYSIOGRAPHIC PROVINCE	A region all parts of which are similar in geologic structure, landforms, and climate.
PLEISTOCENE	The geologic epoch thought to have covered the span of time between 2-3 million years ago and 10,000 years ago.
PLIOCENE	The geologic epoch thought to have covered the span of time between 12 and 2-3 million years ago.
PRESSURE LIMITING STATION	Equipment that prevents pressure in a pipeline from exceeding the maximum allowable operating pressure by controlling the flow of gas.
PSIG	Pounds per square inch gauge (i.e. above atmospheric pressure).
PULL SITE	Where a puller and related equipment are set up for pulling conductor.
QUARTZ PORPHYRY	An igneous rock in which quartz crystals are significantly larger than other minerals and plainly visible to the unaided eye.

REVEGETATION	The restoration of the plant life or total plant cover subsequent to certain construction activities.
REWORKED	A sediment, fossil, rock fragment, or other geologic material that has been removed or displaced by natural agents from its place of origin and incorporated in a younger formation.
RIGHT-OF-WAY	Strip or corridor of land, which is acquired (as an easement or outright ownership) for the construction and operation of a pipeline or electric overhead line.
RIPARIAN	Pertaining to areas adjacent to a stream or other body of water.
SERAL (STAGES)	Developmental temporary communities in a sere; not fixed.
SEDIMENTARY	One of the 3 major classes of rock. A rock resulting from the consolidation of various size fragments derived from weathering of older rocks and transported by and/or deposited by water, air or ice.
SEISMICITY	The activity of an area regarding earthquake or earth vibration.
SERPENTINITE	A metamorphic rock formed from ultra basic rocks by hydrothermal alteration of magnesium-rich silicate minerals to form various minerals of the serpentine group.
SHEARED (SHEAR ZONE)	A tabular zone of rock that has been crushed and broken by many parallel fractures due to shear strain.
SHEAVES	A grooved wheel, placed on structures during the conductor stringing operation.
SLASH	Tree limbs or brush cut down during the clearing of the right-of-way.
SLATE	A compact, fine-grained, metamorphic rock formed from rocks like shale which can be parted into slabs of varying thickness.

SLOPEWASH	Soil and rock material that is or has been transported down a slope by mass-wasting assisted by running water not confined to channels.
SOCK LINE	Steel cable used to pull in conductor under tension.
SPAN LENGTH	Horizontal distance separating two successive supporting structures of a transmission line.
STRIKE	The direction or trend that a structural surface, e.g., a bedding or fault plane, takes as it intersects the horizontal.
STRINGING	Payout and sagging of electrical transmission lines.
SUBCLIMAX	A stage in a community's development, i.e., succession (q.v.) before its final (climax) stages; a community simulating climax because of its further development being inhibited by some disturbing factor (e.g., fire, poor soil).
SUBDUCTION ZONE	Formed when an oceanic plate (see "plate tectonics") is thrust beneath a continental plate. The underthrusting causes very complex deformation and intermixing of the rocks derived from the two adjacent plates.
SUBSTATION/SWITCHYARD	An electric power facility containing circuit switching devices (such as circuit breakers and/or air switches) and/or transformers.
SUCCESSION, SECONDARY	Refers to succession which occurs on formerly vegetated areas (i.e. having an already developed soil) after disturbance or clearing.
SUSPENSION INSULATOR	A string of suspension-type insulators assembled with the necessary attaching hardware and designed to support, in a generally vertical direction, the weight of the conductor and to afford adequate insulation from the tower.

SYMMETRICAL	The correspondence in size, form, and arrangement of parts on opposite sides of a plane, line, or point.
SYNCLINE	A fold, concave upward, the core of which contains the stratigraphically younger rocks.
TECTONIC MELANGE	A heterogeneous mixture of rocks of diverse origins and geologic ages (tectonic inclusions) enclosed in a pervasively sheared matrix. Believed to have been formed by the intense deformation of subduction zones.
TENSIONER	A machine which keeps even predetermined tension on the conductor as it is installed. This machine is used in the technique of tension stringing.
TERMINATION	Formerly called "pothead". This latter term is being dropped from usage by the latest proposed IEEE Standard. A cable termination is located at the terminal ends of an underground cable system and is usually located above ground. The termination serves to prevent entrance of the external environment into the cable and to maintain the pressure, if any, within the cable system. They also control, by design, the electrical stresses so that external overhead connections may be made to the cable system such as at substations, generating plants, etc.
TERRACE	A large bench or step-like ledge breaking the continuity of a slope.
THALWEG	Mean thread of water flow.
THERMAL SELECT BACKFILL OR THERMAL SAND	A special backfill material that is imported and placed around the cable system in order to improve the heat transfer from the cables to the earth, the purpose being to improve the power transmitting capability of the system.
THREE PHASE	Method of using three phase conductors to transmit electrical energy economically.

TOPOGRAPHY	Configuration of a land surface including its relief and position of natural and manmade features.
TOWER	The mechanical structures used to support the transmission line above ground.
TRANSITION STATION	An aboveground installation where a transition is made from an underground transmission line to an overhead transmission line or vice versa.
TRIBUTARY STREAM	A stream feeding a larger stream or lake.
TUFF	A compacted deposit of volcanic ash and dust that may contain sand or clay.
TUFFACEOUS	Said of sediments containing up to 50% volcanic ash and dust.
TUNNEL EFFECT	A linear channelizing of a view, as in a distant one point perspective.
TURBIDITY	Condition of water resulting from suspended matter; water is turbid when its load of suspended material is conspicuous.
UNCONFORMABLE	Lack of continuity of deposition between rock strata in contact corresponding to a period of nondiposition, weathering, or erosion either subaerial or subaqueous prior to the deposition of younger beds, and consequently to a gap in the stratigraphic record.
VOLCANIC ROCK	A generally finely crystalline or glassy igneous rock resulting from volcanic action at or near the earth's surface.
VOLCANIC ASH (TUFF)	Unconsolidated or consolidated fine pyroclastic material.
VOLTAGE, OPERATING	The voltage at which a transmission line operates.
WHEELING	One utility company or agency transmitting electrical power for another company or agency.

APPENDIX B

EQUIPMENT TO BE USED:

	TYPE	DURATION	PURPOSE
a.	Foundations		
2	1/2 ton pickups	5 months	Personnel transportation
3	4x4 crew cab power wagons	"	Personnel transportation and tool carriers
2	5 ton trucks	"	"
1	Truck mounted auger	"	Excavating foundations
1	250 CFM Compressor	"	For driving air tools
3	Concrete mixer trucks	"	Delivering concrete for foundations
1	20 ton trailer	"	Hauling misc. materials
1	Tiltbed trailer	"	Hauling equipment
1	Tool Van	"	Tool storage
1	Mobile Office	"	Supervision and clerical office
b.	Structure		
2	1/2 ton pickups	5 months	Personnel transportation
2	4x4 crew cab power wagons	"	Personnel transportation and tool carriers
2	10 ton trucks	"	Delivering structures
2	5 ton trucks	"	Material hauling
2	2 ton trucks	"	"
2	20 ton trailers	"	"
2	30 ton mobile cranes	"	For assembly and erection of structures
1	50 ton mobile crane	"	Erection of structures
1	Tool van	"	Tool storage
1	Mobile office	"	Supervision and clerical office

c. Conductor installation and temporary work to maintain service during the construction period.

2	Trailer mounted tensioners	5 1/2 months	Conductor installation
2	Truck mounted 3 reel take up units	"	Conductor installation and temporary work
1	Line truck	"	"
1	5 ton truck	"	"
2	Highway tractors	"	"
1	Low bed trailer	"	"
2	2 ton trucks	"	"
2	Crew cab 4x4 pickups	"	"
3	1/2 ton pickups	"	"

(COURTESY P.G.&E.)

c. Conductor installation and temporary work to maintain service during the construction period. (Cont.)

12	Conductor reel carts	5 1/2 months	Conductor installation and temporary work
2	Crawler tractors	"	"
1	Truck mounted auger	"	"
1	Puller, drum type, truck mounted	"	"
1	Tool van	"	Tool storage
1	Mobile office trailer	"	Supervision and clerical office

APPENDIX C

General Specifications of the Proposed Transmission Line

1.	Line length	Approximately 23 miles (37.0 km)
2.	Right-of-Way Width	100 feet (30.5 m) (nonparallel section); 103 feet (31.4 m) (parallel section to close right-of-way gap)
3.	Type of Conductor	61 strand aluminum
4.	Size of Conductor	1,113,000 circular mil (6 956.3 cm^2), 1.216 inch diameter
5.	Line Capacity*	Summer normal - 317.3 mva at 230 kv Summer emergency - 386.3 mva at 230 kv
6.	Type of Structures	Double circuit lattice steel structures
7.	Dimensions at Base	Suspension:** 21 x 21 ft to 35 x 35 ft (6.4 x 6.4 m to 10.7 x 10.7 m) Dead end:*** 21 x 21 ft to 35 x 35 ft (6.4 x 6.4 m to 10.7 x 10.7 m)
8.	Height of Structures	90 to 155 ft (27.4 to 47.2 m); typically 135 ft (412 m)
9.	Span Lengths	500 to 2,000 ft (152.4 to 609.6 m); generally about 1,200 feet (365.8 m)
10.	Estimated Cost (excluding right-of-way)	$4,300,000
11.	Overhead Ground Wires	Two - 7 strand #8 AWG alumoweld conductors each approximately 3/8 inch (9.5 mm) in diameter on the first 1.5-2 mi (2.4-3.2 km) from Melones Powerhouse only

* Thermal limit.
** Suspension towers used on tangents and small running angles
*** Dead end towers used on upstrain points and larger line angles

(Courtesy of PG&E)

APPENDIX D

SCIENTIFIC NAMES OF ANIMALS AND PLANTS

Common Name	Scientific Name
Mammals	
Viriginia oppossum	Didelphis marsupialis
Shrews	Sorex sp.
Black-tailed jackrabbit	Lepus californicus
Audubon cottontail	Sylvilagus audubonii
Brush rabbit	Sylvilagus bachmani
Beechy ground squirrel	Otospermophilus beecheyi
Botta pocket gopher	Thomomys bottae
Beaver	Castor canadensis
Muskrat	Ondatra zibethicus
Coyote	Canis latrans
Gray fox	Urocyon cinereoargenteus
Kit fox	Vulpes macrotis mutica
Raccoon	Procyon lotor
Mink	Mustela vison
Long-tailed weasel	Mustele frenata
Striped skunk	Mephitis mephitis
Spotted shunk	Spilogale gracilis
River otter	Lutra canadensis
Bobcat	Lynx rufus
Black-tailed deer	Odocoileus hemionus columbianus
Birds	
Southern bald eagle	Haliaetus leucocephalus leucocephalus
Anthony green heron	Butorides virescens anthonyi
Canada goose	Branta canadensis
White-fronted goose	Anser albifrons
Snow goose	Chen hyperborea

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APPENDIX D

SCIENTIFIC NAMES OF ANIMALS AND PLANTS

Common Name	Scientific Name
Birds (continued)	
Mallard	Anas platyrhynchos
Gadwall	Anas strepera
Pintail	Anas acuta
Green winged teal	Anas carolinensis
American widgeon	Mareca americana
Shoveller	Spatula clypeata
Wood duck	Aix sponsa
Canvasback duck	Aythya valisineria
Scaups	Aytha sp.
Buffle head	Bucephala albeola
Scoters	Melanitta sp.
Ruddy duck	Oxyura jamaicensis
Turkey vulture	Cathartes aura
Red-tailed hawk	Buteo jamaicensis
Swainson hawk	Buteo swainsoni
Marsh hawk	Circees cyaneus
American osprey	Pandion haliaetus carolinensis
American Peregrine falcon	Falco peregrinus anatum
California (Valley) quail	Lophortynx californica
Mountain quail	Oreotyx picta
Ring-necked pheasant	Phaisanus colchicus
Virginia rail	Rallus liniicola
Lora	Porzana carolina
Yellow rail	Coturnicops noveboracensis
Black rail	Laterallus jamaicensis
Gallinue	Gallinula chloropus

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SCIENTIFIC NAMES OF ANIMALS AND PLANTS

Common Name	Scientific Name
Birds (continued)	
Coot	*Fulica americana*
Killdeer	*Charadrius vociferus*
Band-tailed pigeon	*Columba fasciata*
Mourning dove	*Zenaidura marcoura*
Burrowing owl	*Speotyto cunicularia*
Acorn (California) woodpecker	*Melanerpes formicivorous*
Western Kingbird	*Tyrannus verticalis*
Mockingbird	*Mimus polyglottos*
Western bluebird	*Sialia mexicana*
Western meadowlark	*Sturnella neglecta*
Red-winged blackbird	*Agelaius phoeniceus*
Bullock oriole	*Icterus bullocki*
Brewers blackbird	*Euphagus cyanocephalus*
Amphibians	
Western spadefoot toad	*Scaphiopus hammondi*
California toad	*Bufo boreas halophilus*
Bullfrog	*Rana catesbeiana*
Reptiles	
Western pond turtle	*Clemmys marmorata*
Northwestern fence lizard	*Sceloporus occidentalis occidentalis*
California horned lizard	*Phrynosoma coronatum frontale*

SCIENTIFIC NAMES OF ANIMALS AND PLANTS

Common Name	Scientific Name
Reptiles (continued)	
Varigated skink	*Eumeces gilberti cancellosus*
San Joaquin whipsnake	*Masticophis flagellum ruddocki*
Pacific gopher snake	*Pituophis melanoleucas cantifer*
Valley garter snake	*Thamnophis sirtalis fitchi*
Northern Pacific rattlesnake	*Crotalis viridis oreganus*
Fish	
Threadfin shad	*Dorosoma petenense*
King salmon	*Oncorhynchus tshawytscha*
Brown trout	*Salmo trutta*
Steelhead trout	*Salmo gairdnerii gairdnerii*
Rainbow trout	*Salmo gairdnerii*
Carp	*Cyprinus carpio*
Hard head	*Mylopharodon conocephalus*
Hitch	*Lavinia exilicauda*
Sacramento squawfish	*Ptychocheilus grandis*
Thicktailed chub	*Gila crassicauda*
Catfish	*Ictalurus sp.*
Channel catfish	Ictalurus punctatus

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SCIENTIFIC NAMES OF ANIMALS AND PLANTS

Common Name	Scientific Name
Fish (continued)	
White catfish	Ictalurus catus
Striped bass	Roccus saxitilis
Small mouth black bass	Micropterus dolomieui
Largemouth black bass	Micropterus salmoides
Sunfish	Lepomis sp.
Bluegill sunfish	Lepomis macrochirus
Sacramento perch	Archoplites interruptus
Cottids	Cottus sp.
Plants	
Digger pine	Pinus sabiniana
California bay	Umbellularia californica
Black walnut	Juglans californica
Interior live oak	Quercus wislizenii
Valley oak	Quercus lobata
Blue oak	Quercus douglasii
Sycamore	Platanus racemosa
California buckeye	Aesculus californica
Fremont cottonwood	Populus fremontii
Red alder	Alnus oreganus
Bulrush or Tule	Scirpus robustus
Wild oat	Avena sp.
Common reed	Phragmites communis
Cattail	Typha sp.

SCIENTIFIC NAMES OF ANIMALS AND PLANTS

Common Name	Scientific Name
Plants (continued)	
Baltic rush	*Juncus balticus*
Dock	*Rumex sp.*
Smartweed	*Polygonum sp.*
Alkali bulrush	*Scirpus robustus*
Arrow grass	*Triglochin maritima*
Saltgrass	*Distichlis spicata*
Brass button	*Cotula coronopifolia*
Pickleweed	*Salicornia ambigua*
Pickleweed	*Salicornia subterminallis*
Sego pondweed	*Potomogeton pectinatus*
Horned pondweed	*Zannichellia palustris*
Ditch grass	*Ruppia maritima*
Sand spurry	*Spergularia sp.*
Silverweed	*Potentilla anserina*
Gum plant	*Grindelia cuneifolia*
Alkali heath	*Frankenia grandiflora*
Pigweed	*Chenopodium sp.*
Filaree	*Erodium sp.*
Filaree	*Erodium cicutarium*
Filaree	*Erodium moschatum*
Bur clover	*Medicago hispida*
Fescue	*Festuca megalura*
Foxtail chess	*Bromus rubins*
Poverty three-awn	*Aristada divaricata*
Pine bluegrass	*Poa scabrella*
Wild oat	*Avena fatua*
Six weeks fescue	*Festuca octoflora*

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SCIENTIFIC NAMES OF ANIMALS AND PLANTS

Common Name	Scientific Name
Plants (continued)	
Soft cheat	*Bromus mollis*
California needlegrass	*Stipa pulchra*
Brome grass	*Bromus sp.*
Cocklebur	*Xanthium sp.*
Spikeweed	*Hemizona sp.*
Thistle	*Cenataurea sp.*
Bindweed	*Convolvulus sp.*
Mustard	*Brassica sp.*
California poppy	*Eschscholzia californica*
Lupine	*Lupinus sp.*
Salt bush	*Atriplex sp.*
Fat-hen salt bush	*Atriplex patula* var. *hastata*
Buck brush	*Ceanothus sp.*
Red bud	*Cercis occidentalis*
Coyote bush	*Baccharis pilularis*
Sagebrush	*Artemisia californica*
Poison oak	*Rhus diversiloba*
Cascara	*Rhamnus purshiana*
Buttonbush (button willow)	*Cephalanthus occidentalis*
Willows	*Salix sp.*
Wedge leaf ceanothus	*Ceanothus cuneatus*
Yerba Santa, California	*Eriodictyon californicum*

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APPENDIX E

Inventory of Historic and Prehistoric Features

Reference: "The California History Plan",

Volume two - Inventory of Historic Features

CALAVERAS COUNTY

HISTORIC SITES	Indian Era (early) 15,000 BC - 1 AD	Indian Era (recent) 1 AD - 1848 AD	Hispanic Era (Spain) 1542 - 1822	Hispanic Era (Mexico) 1822 - 1848	American Era 1848 - 1900	American Era post 1900	Exploration/Settlement	Economic/Industrial	Military	Government	Recreation	Social/Educational	Religion	Domestic	National Landmark	National Register: Nat. Significance	National Register: State Significance	National Register: Local Significance	California Historical Landmark	Point of Historical Interest	County Inventory	City Inventory	State Park	National Survey - HABS - Hist. Sites & Bl.	Ownership: Public	Ownership: Private
Agostini Store Building San Andreas					X			X													X			X		
Altaville near Angels Camp					X		X												X							
Altaville Grammar School Altaville					X							X									X				X	
Angels Camp Angels Camp					X			X											X							
Angels Hotel Angels Camp					X									X			X		X							
Banque Store San Andreas					X			X																X		
Big Bar Site Highway 49					X		X												X							
Brownsville Mining Camp near Murphys					X		X												X							
Calaveras County Courthouse San Andreas					X					X								X			X					
Calaveritas Site					X		X												X							
Camanche Site near Clements					X		X												X							
Campo Seco Site near Valley Springs					X		X												X							
Carson Hill Site near Angels Camp					X		X												X							
Chili Gulch No. 265 near Mokelumne Hill					X			X											X							
Congregational Church Mokelumne Hill					X								X						X							
Copperopolis					X		X	X											X							
Domenghini Building Mountain Ranch					X		X														X					
Double Springs near Valley Springs					X		X												X							

CALAVERAS COUNTY	Indian Era (early) 15,000 BC - 1 AD	Indian Era (recent) 1 AD - 1848 AD	Hispanic Era (Spain) 1542 - 1822	Hispanic Era (Mexico) 1822 - 1848	American Era 1848 - 1900	American Era post 1900	Exploration/Settlement	Economic/Industrial	Military	Government	Recreation	Social/Educational	Religion	Domestic	National Landmark	National Register: Nat. Significance	National Register: State Significance	National Register: Local Significance	California Historical Landmark	Point of Historical Interest	County Inventory	City Inventory	State Park	National Survey - HABS - Hist. Sites & Bl.	Ownership: Public	Ownership: Private
Douglas Flat near Angels Camp					X			X											X							
El Dorado Mountain Ranch					X		X												X							
Emerson (Robert) Building Campo Seco					X									X										X		
Fandango (James Romagge) House near Angels Camp					X									X										X		
Fourth Crossing near San Andreas					X		X												X							
Frame Store Glenco					X		X																	X		
Friedburger Building San Andreas					X			X																X		
Glencoe (Mosquito Gulch) No. 280 Mokelumne Hill					X		X												X							
I.O.O.F. Hall Mokelumne Hill					X							X							X					X		
I.O.O.F. Hall San Andreas					X							X												X		
Jenny Lind					X		X												X					X		
Jesus Maria near Mokelumne Hill					X		X												X							
Leger Hotel Mokelumne Hill					X									X					X							
Messenger House Campo Seco					X									X										X		
Milton near Copperopolis					X		X												X							
Mine Building Salt Spring Valley					X			X																X		
Mokelumne Hill					X		X												X							
Murphys					X		X												X							

CALAVERAS COUNTY	Indian Era (early) 15,000 BC - 1 AD	Indian Era (recent) 1 AD - 1848 AD	Hispanic Era (Spain) 1542 - 1822	Hispanic Era (Mexico) 1822 - 1848	American Era 1848 - 1900	American Era post 1900	Exploration/Settlement	Economic/Industrial	Military	Government	Recreation	Social/Educational	Religion	Domestic	National Landmark	National Register: Nat. Significance	National Register: State Significance	National Register: Local Significance	California Historical Landmark	Point of Historical Interest	County Inventory	City Inventory	State Park	National Survey - HABS - Hist. Sites & Bl.	Ownership: Public	Ownership: Private
Murphys Grammar School Murphys					X							X								X						
Murphys Hotel Murphys					X									X			X		X							
Noce (John) House near Mokelumne Hill					X									X										X		
North Branch Cemetery Altaville					X								X											X	X	
O'Byrne Ferry Site near Copperopolis					X			X											X						X	
Paloma near Mokelumne Hill					X			X											X							
Pedroli Ranch House Felix					X									X										X		
Pioneer Cemetery near San Andreas					X								X						X						X	
Post Office & School near Angels Camp					X							X												X	X	
Prince-Garibardi Building Altaville					X									X					X					X		
Raggio Adobe Eldoradotown					X									X										X		
Rail Road Flat					X		X												X							
Red Brick Grammar School Altaville					X							X							X							
Reddick (John) House near San Andreas					X									X										X		
Roaring Camp near Melones					X		X																	X		
Robinson's Ferry near Angels Camp					X		X												X							
Rodesino Adobe Eldoradotown					X		X							X										X		
San Andreas					X		X												X							

CALAVERAS COUNTY	Indian Era (early) 15,000 BC - 1 AD	Indian Era (recent) 1 AD - 1848 AD	Hispanic Era (Spain) 1542 - 1822	Hispanic Era (Mexico) 1822 - 1848	American Era 1848 - 1900	American Era post 1900	Exploration/Settlement	Economic/Industrial	Military	Government	Recreation	Social/Educational	Religion	Domestic	National Landmark	National Register			California Historical Landmark	Point of Historical Interest	County Inventory	City Inventory	State Park	National Survey - HABS - Hist. Sites & Bl.	Ownership	
																Nat. Significance	State Significance	Local Significance							Public	Private
Sandy Gulch near West Point					X		X												X							
Stevenot (Archie) Birthplace Carson Hill					X									X					X							
Stone Building Site Poverty Flat					X		X																	X		
Stone Corral near Valley Springs					X		X												X							
Stone Creek Settlement Site Salt Springs Valley					X		X																	X		
Thorn House San Andreas					X									X				X			X					
Tower Ranch Barn and House					X									X										X		
Traver (Peter L.) Building Murphys					X		X												X							
Vallecito near Angels Camp					X		X												X							
Vallecito Bell Monument Vallecito					X							X							X							
Vallecito Stage Station Vallecito					X		X														X					
Valley Springs					X			X											X							
West Point				X			X												X							

CALAVERAS COUNTY PREHISTORIC SITES	Indian Era (early) 15,000 BC - 1 AD	Indian Era (recent) 1 AD - 1848 AD	Hispanic Era (Spain) 1542 - 1822	Hispanic Era (Mexico) 1822 - 1848	American Era 1848 - 1900	American Era post 1900	Exploration/Settlement	Economic/Industrial	Military	Government	Recreation	Social/Educational	Religion	Domestic	National Landmark	National Register: Nat. Significance	National Register: State Significance	National Register: Local Significance	California Historical Landmark	Point of Historical Interest	County Inventory	City Inventory	State Park	National Survey - HABS - Hist. Sites & Bl.	Ownership: Public	Ownership: Private
4-Cal-99 Mercer's Caverns		X											X													
Moaning Cave Vallecito		X											X													
4-Cal-237 Old Bridge Site		X					X																			
4-Cal-1122 Stone Creek Settlement Ruins Salt Springs Valley		X					X																			
4-Cal-143		X					X																			

STANISLAUS COUNTY

HISTORIC SITES	Indian Era (early) 15,000 BC - 1 AD	Indian Era (recent) 1 AD - 1848 AD	Hispanic Era (Spain) 1542 - 1822	Hispanic Era (Mexico) 1822 - 1848	American Era 1848 - 1900	American Era post 1900	Exploration/Settlement	Economic/Industrial	Military	Government	Recreation	Social/Educational	Religion	Domestic	National Landmark	National Register: Nat. Significance	National Register: State Significance	National Register: Local Significance	California Historical Landmark	Point of Historical Interest	County Inventory	City Inventory	State Park	National Survey - HABS - Hist. Sites & Bl.	Ownership: Public	Ownership: Private
Adamsville near Modesto					X		X														X					
Covered Bridge Knights Ferry					X			X													X			X	X	
Dent House Knights Ferry					X									X							X			X		
Empire City					X		X												X							
Fire House Knights Ferry					X							X									X			X		
Gold Dredge near La Grange						X		X										X								
Grayson					X		X														X					
Jail Knights Ferry					X					X											X			X		
Knights Ferry					X		X												X							
La Grange					X		X												X							
Miller's House Knights Ferry					X									X							X			X		
Tullock Mill Powerhouse, Warehouse Knights Ferry					X			X													X			X		
Willms Ranch near Knights Ferry					X			X											X							
PREHISTORIC SITES																										
Orestimba Indian Camp Site		X					X																			
4-Sta-44 near Copperopolis		X					X																			

TUOLUMNE COUNTY

HISTORIC SITES

HISTORIC SITES	Indian Era (early) 15,000 BC - 1 AD	Indian Era (recent) 1 AD - 1848 AD	Hispanic Era (Spain) 1542 - 1822	Hispanic Era (Mexico) 1822 - 1848	American Era 1848 - 1900	American Era post 1900	Exploration/Settlement	Economic/Industrial	Military	Government	Recreation	Social/Educational	Religion	Domestic	National Landmark	National Register: Nat. Significance	National Register: State Significance	National Register: Local Significance	California Historical Landmark	Point of Historical Interest	County Inventory	City Inventory	State Park	National Survey - HABS - Hist. Sites & Bl.	Ownership: Public	Ownership: Private
B. F. Butterfield Store Site Jamestown					x			x												x						
Big Oak Flat					x		x												x							
Brick Kilns near Springfield					x			x													x					
Burgson House Sonora					x									x							x					
Cady House Sonora					x									x										x		
Carter's near Tuolumne					x			x													x					
Chaffee-Chamberloun House Garrote					x									x										x		
Cherokee near Tuolumne City					x		x												x							
Chinatown Sonora					x		x														x					
Chinese Camp					x		x												x					x		
Chinese Camp School Chinese Camp					x							x									x					
Christian Science Church Sonora					x								x								x					
Columbia Bannister Marble Quarry					x				x													x				
Columbia Historic District Columbia					x		x								x	x			x				x		x	
Confidence Mine Confidence					x			x													x					
Cooper's Cabin Emigrant Basin					x									x							x					
Crimea House - Rock Corral near Don Pedro Reservoir					x									x							x					
Donnel's Overlook Highway 108					x				x												x					

TUOLUMNE COUNTY	Indian Era (early) 15,000 BC - 1 AD	Indian Era (recent) 1 AD - 1848 AD	Hispanic Era (Spain) 1542 - 1822	Hispanic Era (Mexico) 1822 - 1848	American Era 1848 - 1900	American Era post 1900	Exploration/Settlement	Economic/Industrial	Military	Government	Recreation	Social/Educational	Religion	Domestic	National Landmark	National Register			California Historical Landmark	Point of Historical Interest	County Inventory	City Inventory	State Park	National Survey - HABS - Hist. Sites & Bl.	Ownership	
																Nat. Significance	State Significance	Local Significance							Public	Private
Dorsey House Sonora					x									x										x		
Dr. Turner House Chinese Camp					x									x												
Emigrant Basin					x		x														x					
Emporiun, Jamestown					x									x							x					
Fandango House Chinese Camp					x									x							x					
Farm Buildings Aspen Valley Yosemite National Park					x									x							x				x	
Farmhouse near Tuttletown					x									x							x			x		
Feretti Shrine near Steven's Bar					x									x							x					
First Frame Post Office Sonora					x					x											x			x		
Gold Springs near Columbia					x		x														x					
Groveland					x														x		x					
Groveland Hotel Groveland					x			x													x					
Hotel & Store Montezuma					x			x																x		
Hydraulic Mining Remains Springfield					x			x													x					
Inch House Sonora					x									x							x					
Italia Hotel Sonora					x									x										x		
Jacksonville					x		x												x							

TUOLUMNE COUNTY	Indian Era (early) 15,000 BC - 1 AD	Indian Era (recent) 1 AD - 1848 AD	Hispanic Era (Spain) 1542 - 1822	Hispanic Era (Mexico) 1822 - 1848	American Era 1848 - 1900	American Era post 1900	Exploration/Settlement	Economic/Industrial	Military	Government	Recreation	Social/Educational	Religion	Domestic	National Landmark	National Register			California Historical Landmark	Point of Historical Interest	County Inventory	City Inventory	State Park	National Survey - HABS - Hist. Sites & Bl	Ownership	
																Nat. Significance	State Significance	Local Significance							Public	Private
Jamestown					X		X												X							
Jewish Cemetery Sonora					X								X											X		
Keystone near Don Pedro Reservoir					X		X														X					
Lime Kiln Shaw's Flat					X			X													X					
Mark Twain Cabin near Tuttletown					X									X					X					X		
Methodist Church Sonora					X								X											X		
Mississippi House and Post Office Shaw's Flat					X		X	X		X											X					
Montezuma near Chinese Camp					X		X												X							
Mother Lode Belt Mines					X			X													X					
Mountain View Cemetery Columbia					X								X											X		
Mt. Carmel Catholic Church and Cemetery					X								X								X					
Oak Tree Site Big Oak Flat					X		X														X					
Odd Fellow's Hall BigOak Flat					X							X														
Old Brewery near Springfield					X			X																X		
Old Stone Building Big Oak Flat					X									X							X					
Parrott's Ferry Site Stanislaus River					X		X												X							
Post Office Chinese Camp					X					X											X					
Priest's Grade & Station near Moccasin					X		X	X													X					

TUOLUMNE COUNTY	Indian Era (early) 15,000 BC - 1 AD	Indian Era (recent) 1 AD - 1848 AD	Hispanic Era (Spain) 1542 - 1822	Hispanic Era (Mexico) 1822 - 1848	American Era 1848 - 1900	American Era post 1900	Exploration/Settlement	Economic/Industrial	Military	Government	Recreation	Social/Educational	Religion	Domestic	National Landmark	National Register: Nat. Significance	National Register: State Significance	National Register: Local Significance	California Historical Landmark	Point of Historical Interest	County Inventory	City Inventory	State Park	National Survey - HABS - Hist. Sites & Bl.	Ownership: Public	Ownership: Private
Red & White Grocery Groveland					X									X							X					
Rosasco House Sonora					X									X							X					
Rosenblohm Store Chinese Camp					X			X													X					
Ross Green House Sonora					X									X							X					
Sawmill Flat					X		X												X							
School Springfield					X							X												X		
Second Garrote near Groveland					X		X												X							
Shawmut Mine Shawmut Grade					X			X													X					
Shaw's Flat near Sonora					X		X												X							
Shaw's Flat School Shaw's Flat					X							X														
Sierra Railroad Roundhouse Jamestown					X			X												X						
Sonora Business District Sonora					X			X																X		
Sonora Gold Camp near Sonora					X			X																X		
Sonora-Mono Road near Sonora					X		X												X							
Soulsbyville					X		X												X							
Springfield					X		X												X							
Springfield Church & School Springfield					X							X	X											X		
St. Anne's Cemetery Columbia					X								X											X		

TUOLUMNE COUNTY	Indian Era (early) 15,000 BC - 1 AD	Indian Era (recent) 1 AD - 1848 AD	Hispanic Era (Spain) 1542 - 1822	Hispanic Era (Mexico) 1822 - 1848	American Era 1848 - 1900	American Era post 1900	Exploration/Settlement	Economic/Industrial	Military	Government	Recreation	Social/Educational	Religion	Domestic	National Landmark	National Register: Nat. Significance	National Register: State Significance	National Register: Local Significance	California Historical Landmark	Point of Historical Interest	County Inventory	City Inventory	State Park	National Survey - HABS - Hist. Sites & Bl.	Ownership: Public	Ownership: Private
St. Anne's Church Columbia					X								X											X		
St. Francis Xavier Catholic Church Chinese Camp					X								X								X					
St. James Episcopal Church Sonora					X								X						X					X		
St. Patrick's Catholic Church Sonora					X								X											X		
Steven's Bar					X			X													X					
Stone Dam Sonora					X			X																X		
Street (Morgan) House Sonora					X									X							X					
Sugar Pine					X			X																		
Sugar Pine Ranch near Groveland					X			X													X					
Sugg-McDonald House Sonora					X									X										X		
Summerville near Tuolumne					X		X												X							
Swerer's Store Tuttletown					X			X																X		
Tuolumne					X		X														X					
Tuolumne County Jail Sonora					X					X											X					
Tuttletown					X		X												X							
Twain Harte						X								X							X					
Wells Fargo & Co. Building Chinese Camp					X			X											X							
Wells Fargo & Co. Building Columbia					X			X															X	X		

TUOLUMNE COUNTY	West Side Flume and Lumber Company Tuolumne	White House Sonora	Wolfe's Drug Store Sonora	Yosemite National Park
Indian Era (early) 15,000 BC - 1 AD				
Indian Era (recent) 1 AD - 1848 AD				x
Hispanic Era (Spain) 1542 - 1822				
Hispanic Era (Mexico) 1822 - 1848				
American Era 1848 - 1900	x	x	x	x
American Era post 1900				
Exploration/Settlement				x
Economic/Industrial	x		x	
Military				
Government				
Recreation				
Social/Educational				
Religion				
Domestic		x		
National Landmark				
National Register: Nat. Significance				
National Register: State Significance				
National Register: Local Significance				
California Historical Landmark				
Point of Historical Interest				
County Inventory	x	x	x	x
City Inventory				
State Park				
National Survey - HABS - Hist. Sites & Bl.				
Ownership: Public				x
Ownership: Private				

APPENDIX F

Individuals and Agencies Contacted by PG&E

Vegetation

Leslie Hood, Executive Director, California Natural Areas Coordinating Council

Joe Madeiros, Modesto Jr. College and Modesto Natural History Museum

Blaine Rogers, Vegetation Botonist, Columbia Jr. College, Columbia, California

Wildlife and Vegetation

James Maddox, State of California, The Resources Agency, Department of Fish and Game, Region 4

Jack Bernard, U.S. Army Corps of Engineers

Dennis Becker, State of California, The Resources Agency, Department of Fish and Game, Region 4

Eugene Toffoli, State of California, The Resources Agency, Department of Fish and Game, Region 4

Geology and Soils

Charles Jennings, California State Division of Mines and Geology

Woodward Clyde, Soils and Engineering Consultant

Land Use

Charles Neal, Oakdale Irrigation District

Ted Brubaker, Calaveras County, Department of Building and Planning, San Andreas, California

Phil Brady, Calaveras County, Department of Building and Planning, San Andreas, California

Jeff Mendelhall, Stanislaus County Planning Department, Modesto, California

Red Archibald, Tuolumne County Planning Department, Sonora, California

John Mills, Tuolumne County Planning Department, Sonora, California

K. V. Broadway, Office of the Assessor, Stanislaus County

George Motz, City of Oakdale, Department of Planning and Development

Historical Sites

Gene Itogawa, Office of Historic Preservation

Archaeology

Michael J. Moratto, Supervising Professional Region 4, District Clearinghouse

Recreation

Jack Bernard, U.S. Army Corps of Engineers

Robert Vercade, U.S. Army Corps of Engineers

Landscape Preservation Zone

Al Kolster, California State Department of Parks and Recreation

Others

U.S. Bureau of Reclamation, Mid-Pacific Regional Office

Federal Energy Regulatory Commissioner

Sierra Conservation Camp

ATE LIFORNIA—RESOURCES AGENCY EDMUND G. BROWN JR., Governor

OFFICE OF HISTORIC PRESERVATION
EPARTMENT OF PARKS AND RECREATION
OST OFFICE BOX 2390
CRAMENTO, CALIFORNIA 95811
16) 445-8006

July 23, 1976

Mr. N. H. Daines, Manager
Land Department
Pacific Gas & Electric Company
77 Beale Street
San Francisco, California 94106

Dear Mr. Daines:

The Office of Historic Preservation has been advised that the Pacific Gas and Electric Company has initiated an environmental study for the proposed New Melones 230 KV Transmission Line Project in the Sierra foothills east of the San Joaquin Valley.

The Office of Historic Preservation is not aware of the actual route for the proposed transmission corridor. However, as staff for the State Historic Preservation Officer, I am concerned that a portion of the transmission route may encroach upon a registered historical landmark.

As the proposed transmission line construction project may adversely affect the Willms Ranch, California State Historical Landmark No. 415, the Office of Historic Preservation recommends against any proposal to install transmission lines in close proximity to the ranch complex. The historical integrity of the entire setting should be preserved as an example of an operational ranch complex in Stanislaus County. The esthetic quality of the environment should not be compromised by the introduction of visual or atmospheric elements which are out of character with the registered property.

The Office of Historic Preservation requests that the Pacific Gas and Electric Company reconsider installation of transmission lines in the vicinity of the Willms Ranch. The environmental study should develop alternative considerations such as rerouting the transmission lines or placing the transmission lines underground.

If the Federal Power Commission provides licensing for this undertaking, compliance with the National Historic Preservation Act of 1966 and Executive Order 11593 is required. The Office of Historic Preservation further requests consultation with your office regarding proper protection of environmental concerns. Please contact Mr. Eugene Itogawa (916-445-8006), of my staff, should you require further assistance.

Sincerely,
Original Signed by
Dr. Knox Mellon

Dr. Knox Mellon
Historic Preservation Coordinator

Courtesy of PG&E

STATE OF CALIFORNIA—RESOURCES AGENCY
EDMUND G. BROWN JR., Governor

OFF OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
POST OFFICE BOX 2390
SACRAMENTO, CALIFORNIA 95811
(916) 445-8006

August 17, 1976

Mr. N. H. Daines, Manager
Land Department
Pacific Gas & Electric Company
77 Beale Street
San Francisco, California 94106

Dear Mr. Daines:

In reference to our letter of July 23, 1976 requesting your assistance in preserving the historical integrity of the Willms Ranch in Stanislaus County, I am pleased to acknowledge that Pacific Gas & Electric Company has implemented appropriate mitigative measures to protect a California State Historical Landmark by rerouting portions of the proposed New Melones 230 KV transmission lines to the south of the hills surrounding the Willms Ranch complex.

The Office of Historic Preservation appreciates the commitment of Pacific Gas & Electric Company in protecting the esthetic quality of the Willms property and further commends the dedication of Ms. Nancy Twiss of your staff in preserving the cultural heritage of our state.

Thank you for your consideration regarding this matter.

Sincerely,

Original Signed by
Dr. Knox Mellon

Dr. Knox Mellon
Historic Preservation Coordinator

G-2/394
KM:EMI

cc: Ms. Nancy Twiss
Pacific Gas & Electric Company
Room 1113, 77 Beale Street
San Francisco, CA 94106

Courtesy of PG&E

APPENDIX G

Individuals and Agencies Contacted by the Bureau of Reclamation

PG&E Company

Rodney S. Baishiki -- Electrical Engineer
Donald J. Foley -- Associate in Civil Engineering
Momcilo K. Tasich -- Electrical Engineer
Nancy W. Twiss -- Environmental Planner, Project Coordinator
James Morgan -- Electrical Engineer
Deborah Nelson -- Project Coordinator

Department of Defense -- Corps of Engineers

Fred Kindel -- Environmentalist
Jack Barnard -- Environmentalist

California Department of Fish and Game

Edward S. Smith -- Wildlife Management Supervisor, Fresno, CA
Robert Bruggermann -- Area Wildlife Manager, Fresno, CA

Tri-Dam Project

Jack Southern -- Executive Secretary and General Manager

Sierra Conservation Center

Lawrence Meeks

California Native Plant Society

Mary Major -- University of California, Davis, CA

U.S. Bureau of Sport Fisheries and Wildlife

Michael R. Miller -- Wildlife Biologist

Federal Energy Regulatory Commission, Office of Electric Power Regulation

Quentin A. Edson -- Chief, Environmental Analysis Branch

APPENDIX H

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APPENDIX I

PUBLIC AGENCIES WITH JURISDICTION BY LAW

Agencies with Jurisdiction:	Type of Permit:
Bureau of Land Management	Easement
Calaveras County	Route Approval
California Division of Highways	Encroachment Permit
California Public Utilities Commission	Certificate of Public Convenience
City of San Francisco, Dept. of Public Works. Hetch Hetchy Project	License
Federal Energy Regulatory Commission	License
Federal Aviation Administration	Determination of no hazard
Oakdale Irrigation District	Consent or License depending upon type of interest
Stanislaus County	Route Approval
State of California, Department of	Easement
Tuolumne County	Route Approval
U.S. Army Corps of Engineers	Easement
Department of Water Resources Reclamation Board (only if Alternative B is selected)	Easement

Others

Sierra Railway	Crossing Permit, License

(Courtesy of PG&E Company)

APPENDIX J

ELECTRIC EFFECTS OF THE TRANSMISSION LINE

Introduction

A characteristic of any energized conductor is that electrostatic and electromagnetic fields are created in the medium surrounding the conductors. These fields produce the electrical effects attributable to the presence and operation of an overhead 230 kV transmission line.

The effects are manifested through two processes: (1) the electric field produces a partial electrical discharge into the air, known as corona. Corona discharge may result in audible noise, radio noise, television interference, and the generation of ozone and oxides of nitrogen, (2) electric and magnetic fields induce voltages and currents on objects exposed to these fields. The induced effects may produce occasional radio and television interference due to sparking between small gaps.

Corona

When an electric field of sufficient strength stresses the air within a certain finite distance, the air is ionized and corona discharge occurs. In the case of overhead transmission lines, the maximum electric field voltage gradient occurs at the surface of the conductor and is a function of the operating voltage, the radius of the conductors, and the height of the conductors above ground. For corona discharge to occur, the maximum conductor surface gradient must exceed the dielectric breakdown voltage gradient. The conductor surface gradient at which this occurs is referred to as the critical surface gradient. For air at standard atmospheric conditions in a uniform electric field, the breakdown voltage gradient is 21.1 kV rms (root-mean-square) per centimeter. The breakdown voltage gradient for air is a function of air density and is, therefore, affected by temperature, pressure and altitude.

Transmission lines are designed to have maximum smooth conductor surface gradients ranging from 0.6 to 0.8 of the theoretical value of the critical surface gradient. This is necessary because the conductor is not a smooth surface but is stranded and may be nicked or burred during transmission line construction. Particules such as dust or insects may adhere to the conductor during fair weather and raindrops and snowflakes gather on the conductor during foul weather. These discontinuities of the conductor surface result in discrete points where the actual surface gradient is no longer less than the critical surface gradient. At these points corona discharge begins. During foul weather, corona activity and its resultant effects are more pronounced because the rain or snow creates more points on the conductor from which corona discharges can occur.

The computed maximum smooth conductor surface gradients at 242 kV for the transmission line are 14.91 kV rms/cm on the bottom phase, 15.18 kV rms/ cm on the center phase, and 14.77 kV rms/cm on the top phase.

Radio Interference

Radio interference (RI) from transmission lines is primarily caused by partial discharges of the air (corona) in the immediate vicinity of the conductor. With practical line designs, the RI resulting from corona is highly dependent upon the presence of protrusions on the conductor surface and the resulting local increases of the electrical gradient (as discussed above). As a result, RI varies considerably and generally increases by 10 to 30 dB in foul weather.

A second source of RI is from gap-type sparking. In isolated instances, the induced electric potential on an ungrounded metallic object in the electric field of the transmission line may cause sparking which produces RI. Sparks may be induced across any small gap between the charged object and another metallic part which is grounded. The conducting path of the spark does not have to be part of the transmission line structure itself. Sparking may occur in loosely connected hardware of a nearby utility line or along other conducting paths such as fences and metal junk near the edge of the right-of-way. Dirty insulators may spark in foggy weather and thus be an isolated source of RI.

The level of corona-generated RI diminishes with increasing frequency and rarely is a problem to reception at frequencies above 10 MHz. To the average person, corona-generated RI is an annoyance only in the 540 to 1,600 kilohertz (KHz) AM broadcast band. In the case of the gap-type noise measured with radio noise meters, the noise level is fairly constant with increasing frequencies to 60 MHz.

By appropriate selection of design parameters (i. e., minimum conductor surface-to-voltage gradient, conductor diameter, and line dimensions), together with routing of the line so as to avoid critical locations, corona-induced RI can be held to acceptable levels.

Gap noise can be avoided by proper design of line hardware parts, including electrical bonding where necessary, and by careful tightening of fastenings during line construction. Individual locations of arcing are readily locatable and can be corrected.

Quality of AM radio reception is a function of the signal-to-noise (S/N) ratio, which is the ratio between two variables: the broadcast station signal level (S) at the point of reception and the radio noise level (N). The signal strength at any point of reception along the transmission line depends on the radiated power, distance to the desired station, location of the point of reception, and the mode of propagation. The radio noise level for a given line varies with voltage, contamination in the air and on the conductor, and weather conditions.

An RI meter with a quasi-peak detector is used to measure radio noise. The quasi-peak detector is designed so that it measures the annoyance factor to the human ear of the measured noise.

Using this instrument to establish noise levels, listening surveys of listener annoyance have been made. The evaluation of these listening tests has produced the following categories of quality of reception.

Class of Reception		Signal/Noise Peak Ratio (dB
A5	Entirely Satisfactory	31
B4	Very Good, Background Unobtrusive	28
C3	Fairly Satisfactory, Background Plainly Evident	22
D2	Background Very Evident, But Speech Easily Understood	16
E1	Speech Understandable With Severe Concentration	6
F0	Speech Unintelligible	-

The Federal Communications Commission (FCC) has defined "satisfactory service" on the basis of a 24 dB S/N ratio when measured with a meter meeting American National Standards Institute (ANSI) standards.

As previously explained, both signal strength and noise vary widely from time to time at any given location depending on many factors. The FCC defines three categories of broadcast service areas: (1) primary service - an area in which the groundwave is not subject to objectionable interference or fading, (2) secondary service - an area served by the skywave which is not subject to objectionable variations in intensity, (3) intermittent service - an area served by the groundwave, beyond the primary service area and subject to some interference and fading. Reception of AM broadcast signals may normally vary greatly in the secondary and intermittent service areas. Therefore, to accurately assess the impact of transmission line RI, only signal strengths of stations in their primary coverage areas are considered. For reliable service in a rural primary coverage area, signal strengths of 40-54 dB above 1 microvolt/meter are required. Much greater signal strengths are required to achieve reliable service in the primary coverage areas of city residential and business areas.

For lateral distance of up to 200 feet from the outermost conductor of a transmission line, the reduction of RI levels follows an inverse square law (i.e., for every doubling of distance from the conductor, the RI level decreases by 12 dB). At lateral distances beyond 200 feet, the reduction attains an approximately linear relationship (a decrease of 6 dB for each doubling of distance).

Television Interference

Power transmission line-related sources of television interference (TVI) are sparking and corona discharge from the conductor. The influence of the interference on the quality of television reception will vary, depending both on the strength of the received television signal and on the particular characteristics of the interference electrical noise.

Sparking is the most common power line-related source of TVI. Although more often experienced on Very High Frequency (VHF) channels, in some rare cases sparking interference to Ultra High Frequency (UHF) has been observed. Lightly loaded insulators and loose suspension hardware can spark due to uplift forces on the conductor or due to wind-induced movement of the conductor. Dirty insulators may spark in foggy weather. Also gap-type sparking can take place between ungrounded and grounded metal objects in the electric field of the transmission line. The electric field induces an electric potential on the ungrounded metal. If the air gap distance between the ungrounded and grounded metal is small, the dielectric strength of the gap is inadequate to withstand the induced electric potential and sparking takes place.

Sparking in power line components results in interference over a broad frequency spectrum. The interference noise level, as measured by radio noise meters, does not decay significantly with increasing frequency through the low band VHR television channels.

Sparking can be avoided by proper design and maintenance of transmission lines. Since the sources of sparking TVI occur at discrete locations, the sources can be readily detected and the TVI eliminated.

Corona discharge from the transmission line conductors may be a second source of TVI. With 230 kV transmission lines, the generated interference is highly dependent upon the presence of protrusions on the conductor surface. TVI noise will increase 10 to 30 dB in foul weather when water droplets are on the conductor surface. Unlike sparking noise, the level of noise resulting from corona discharge (as measured by a radio noise meter) decays at the rate of approximately 20 dB for each tenfold increase in frequency. For these reasons, TVI caused by corona discharge will be observed on the VHF channels only under adverse conditions of foul weather, low signal strength, and unfavorable antenna placement.

Specifying the quality of television reception in terms of signal/to/noise (S/N) ratio is more difficult than for AM broadcast band radio reception. A correction must be made to adjust for the difference in bandwidth of the noise measuring instrument and the 3 MHz bandwidth of a television receiver. The much wider bandwidth of the television receiver admits greater noise. Furthermore, corrections are required for the type of detector used in the noise measuring instrument and for the type of noise measured (i. e., gap type, positive corona, negative corona). The bandwidth correction factor for random noise is proportional to the square root of the ratio of the bandwidths; for impulse noise the bandwidth correction is proportional to the ratio of bandwidths. Corona noise approximates random noise.

The quality of television picture reception versus S/N for corona noise measured with a peak detector instrument and standardized for a 3 MHz bandwidth has been defined as follows:

Quality of Reception		S/N Ratio Peak
A5	Threshold of Visibility, Excellent Reception	37 dB
B4	Very Little Interference, Reception Very Good	27
C3	Interference Plainly Evident, Reception Tolerable	17
D2	Interference Very Evident and Annoying	4
E1	Intense Interference, Extremely Annoying	-11
F0	Intolerable Interference, Reception Unacceptable	-

As an example, the S/N for a received signal of 74 dB in a corona noise field of 44 dB would be 30 dB and the quality of reception would be very good.

For lateral distances of up to 200 feet from the outer conductor of the transmission line, foul weather corona-generated TVI will be reduced according to an inverse square law (there will be a decrease of 12 dB for each doubling of distance).

An analysis of electrical effects was conducted in the study area. The locations of the test sites for noise, radio and television interference are shown on Plate 30.

Radio Noise

Table 9 shows the AM radio stations with "satisfactory" or better reception within the project study area. Table 10 shows the signal strength for these AM broadcast stations at six test locations along the transmission line route.

For lateral distance of up to 200 feet from the outermost conductor of a transmission line, the reduction of RI levels follows an inverse square law (i.e., for every doubling of distance from the conductor, the RI level decreases by 12 dB). At lateral distances beyond 200 feet, the reduction attains an approximately linear relationship (a decrease of 6 dB for each doubling of distance).

Table 11 below shows the estimated radio interference level for the transmission line. Using this level (with corrections for frequency and the measured field strength of the AM stations) the effect of the transmission line on the quality of reception, at various distances from the tower center line is shown on Plate 31.

LEGEND TO MAP

● NEW MELONES 230 kV T/L TEST SITES

SITE 1: In main parking lot of Sierra Correctional Facilities
N 37° 53' 45", W 120° 32' 15"

SITE 2: .15 miles east of Kistler Ranch on old Hwy. 120
N 37° 50' 45", W 120° 32' 40"

SITE 3: 2.9 miles west of Kistler Ranch on new construction (eventual west-bound of Hwy 120)
N 37° 51' 5", W 120° 35' 45"

SITE 4: 1.8 miles east of Hwy. 120 on Willms Rd.
N 37° 47' 55", W 120° 38' 15"

SITE 5: 80 ft. east-northeast of pole on northeast corner of Lancaster and Orange Blossom
N 37° 47', W 120° 45' 55"

SITE 6: Quail Hill Rd., southeast of Charmstone Way, approximately 100 ft.
N 37° 55' 20", W 120° 37' 20"

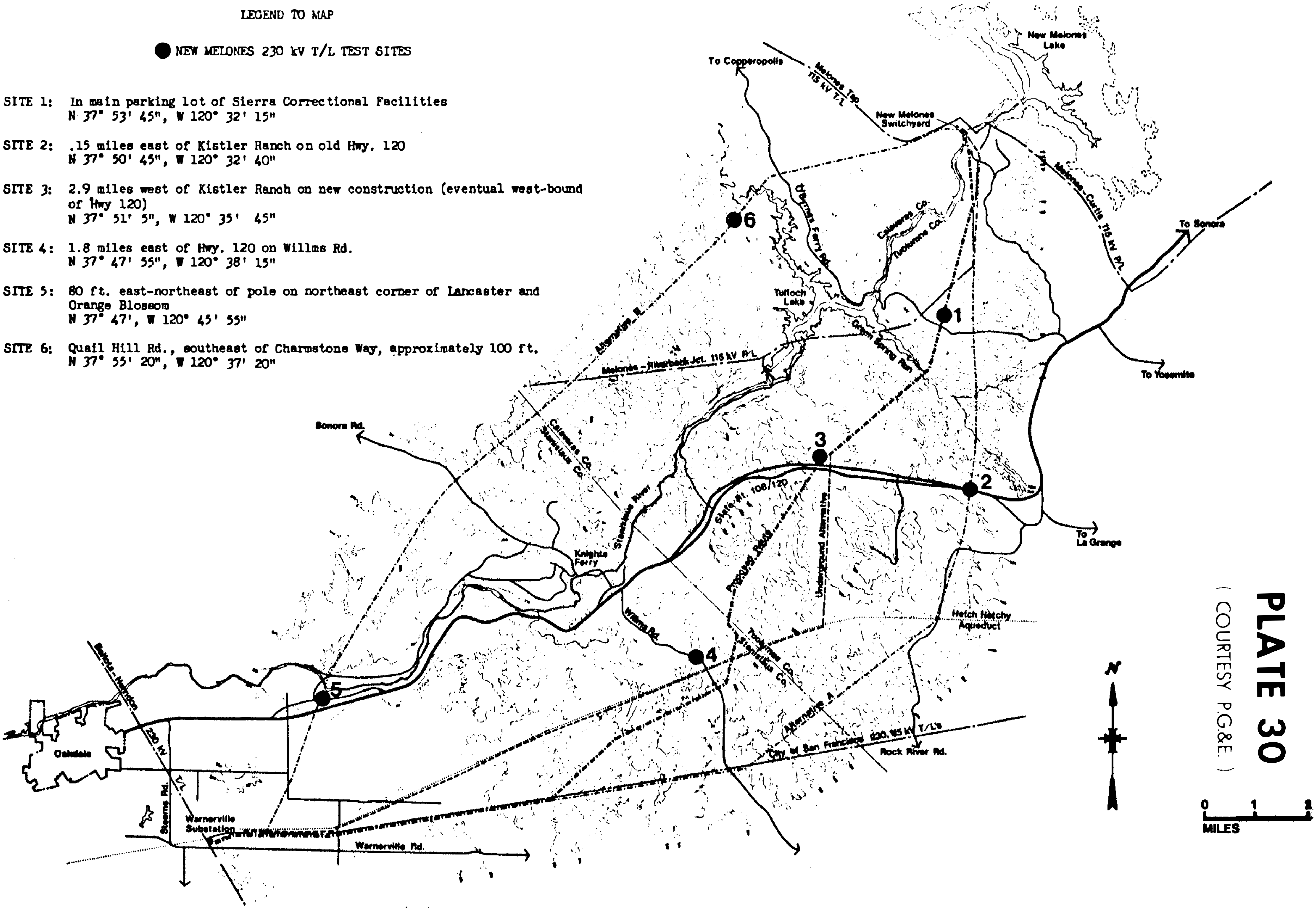


PLATE 30
(COURTESY P.G.&E.)

Table 9

AM RADIO STATIONS WITH SATISFACTORY OR BETTER RECEPTION

Radio Station	Frequency	Transmitting Power Day	Transmitting Power Night	Location
KMJ	0.580 MHz	5 kW	5 kW	Fresno
KCBS	0.740 MHz	50 kW	50 kW	San Francis
KTRB	0.860 MHz	10 kW	1 kW	Modesto
KFRE	0.940 MHz	50 kW	50 kW	Fresno
KBEE	0.970 MHz	1 kW	1 kW	Modesto
KKIS	0.990 MHz	5 kW	5 kW	Pittsburg
KRAK	1.14 MHz	50 kW	50 kW	Sacramento
KWG	1.23 MHz	1 kW	0.25 kW	Stockton
KROY	1.24 MHz	1 kW	0.25 kW	Sacramento
KJOY	1.28 MHz	1 kW	1 kW	Stockton
KYNO	1.30 MHz	5 kW	1 kW	Fresno
KCRA	1.32 MHz	5 kW	1 kW	Sacramento
KFN	1.36 MHz	5 kW	1 kW	Modesto
KCEY	1.39 MHz	5 kW	5 kW	Turlock
KSTN	1.42 MHz	5 kW	1 kW	Stockton
KVML	1.45 MHz	1 kW	0.25 kW	Sonora
KYOS	1.48 MHz	5 kW	5 kW	Merced
KCVR	1.57 MHz	5 kW	5 kW	Lodi
KWIP	1.58 MHz	1 kW	1 kW	Merced
KGST	1.60 MHz	1 kW	1 kW	Fresno

Table 10

AM RADIO STATION FIELD STRENGTHS

(Day Measurements)

Station	Frequency (in MHz)	Location */					
AM Radio Station		1	2	3	4	5	6
KMJ	0.58	70	71.5	71	71.5	71.0	68.5
KCBS	0.740	72.7	74.2	75.7	79.7	77.7	77.7
KTRB	0.860	74	78.5	83.5	86.9	87.9	81.0
KFRE	0.940	59.4	60.4	61.4	66.4	65.9	57.4
KBEE	0.970	67.4	67.9	70.9	78.4	85.4	75.4
KKIS	0.990	57.9	58.4	57.9	63.4	57.4	63.4
KRAK	1.14	42.4	40.9	46.9	59.4	66.9	46.4
KWG	1.23	58.7	62.6	64.9	68.7	64.1	65.6
KROY	1.24	44.6	33.1	42.6	50.6	50.1	44.1
KJOY	1.28	62.0	64.1	60.6	70.6	69.1	46.1
KYNO	1.30	47.5	49.0	49.5	53.1	43.0	46.0
KCRA	1.32	51.5	49.5	50.5	57.0	56.0	53.0
KFN	1.36	67	76	79.0	85.0	85.5	74.0
KCEY	1.39	64.4	72.9	71.9	77.4	75.4	65.9
KSTN	1.42	63.4	64.4	68.4	69.4	69.9	66.9
KVML	1.45	61.8	65.3	64.8	62.8	53.3	64.3
KYOS	1.48	54.8	62.8	60.8	66.4	63.8	58.3
KCVR	1.57	44.2	49.2	47.2	53.8	53.7	53.7
KWIP	1.58	50.2	56.7	56.2	62.2	56.2	54.2
KGST	1.60	42.2	42.7	45.7	48.2	43.2	44.2

Readings are in dB above 1 microvolt per meter.

*/ Locations are shown on Plate 30.

Table 11

ESTIMATED RADIO INTERFERENCE LEVEL

Distance from Center of Tower Line, Feet:	50 (edge of R/W)	100	200
Foul Weather, dB	59	51	42.4
Fair Weather, dB	43	35	26.4

Calculated at Frequency Equal to 1 Megahertz.

Based on the anticipated radio noise levels produced by the transmission line and measured signal strengths of the AM radio stations, the AM frequency reception will generally be within acceptable levels. The quality of reception during rainy weather and the quality of reception during fair weather of some AM radio broadcast stations with weak signals may be reduced in locations close to the right-of-way. AM radio interference should not be experienced in fair weather at lateral distances greater than 200 feet from the outer conductor. There should be no effect on FM radio reception.

3. Television Interference

The area along the transmission line route is served by Very High Frequency (VHF) and Ultra High Frequency (UHF) television stations.

Table 12 lists the television stations monitored. Tables 13 and 14 show the existing signal strengths, ambient noise level, and quality of television reception. The estimated transmission line noise level at 200 feet is significantly below the ambient noise level and, therefore, the transmission line noise will have a negligible effect.

Table 12

TELEVISION STATIONS MONITORED

TV Station	Channel	Location	Power	Frequency
KTUV	2	San Francisco	100 kW	55 MHz
KCRA	3	Sacramento	100 kW	61 MHz
KROM	4	San Francisco	100 kW	67 MHz
KPIX	5	San Francisco	100 kW	77 MHz
KVIE	6	Sacramento	55 kW	83 MHz
KGO	7	San Francisco	316 kW	175 MHz
KSBW	8	Salinas	234 kW	181 MHz
KQED	9	San Francisco	316 kW	187 MHz
KXTV	10	Sacramento	304 kW	193 MHz
KQVR	13	Sac. -Stock.	281 kW	211 MHz
KLOC	19	Modesto	105 kW	501 MHz
KMUV	31	Sacramento	537 kW	573 MHz
KTXL	40	Sacramento	1738 kW	627 MHz

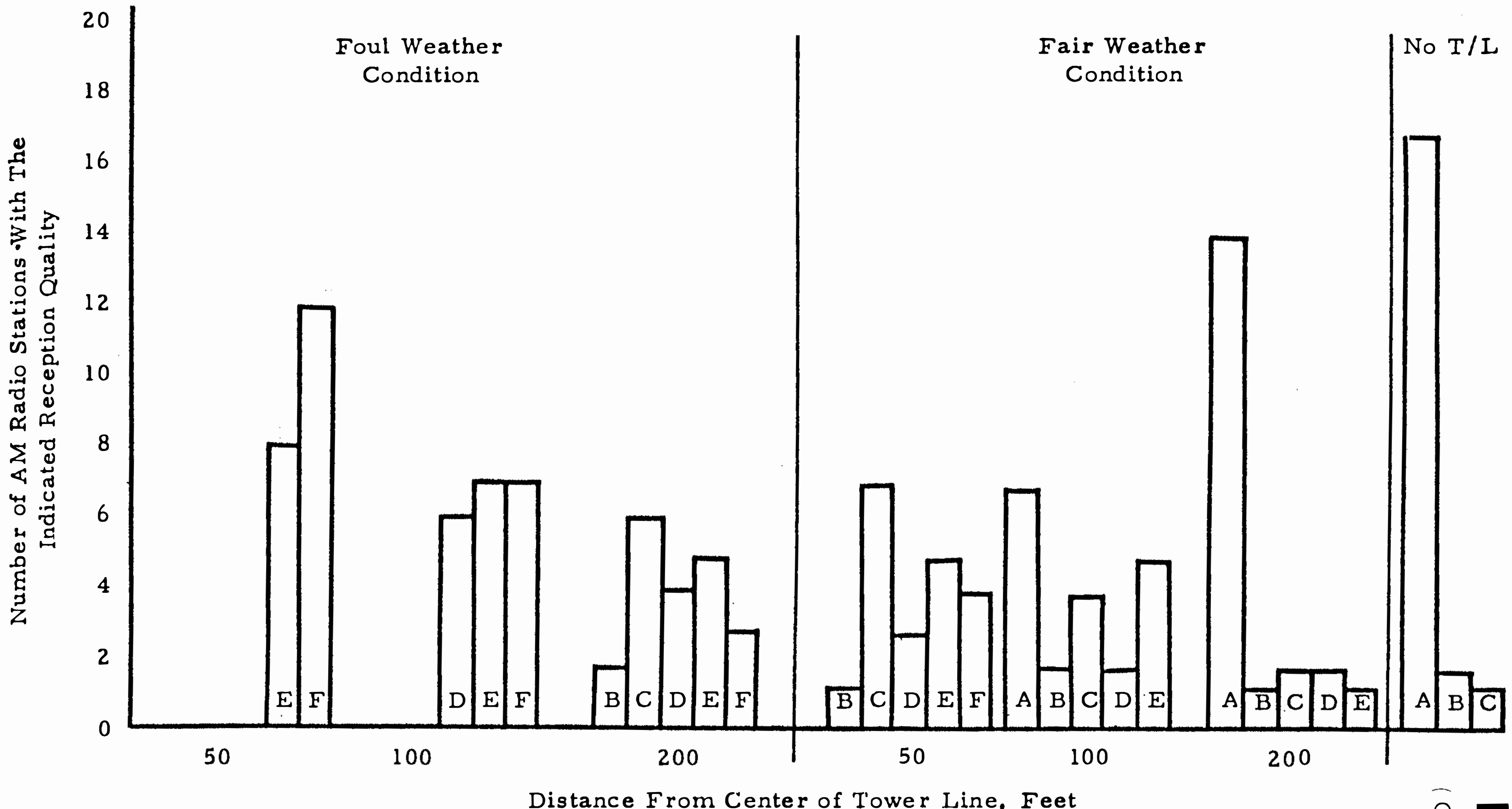


PLATE 31
(COURTESY P.G.&E.)

AM Reception Quality for Site 1

A - Entirely Satisfactory
B - Very Good, Background Unobtrusive
C - Fairly Satisfactory, Background Plainly Evident
D - Background Very Evident, But Speech Easily Understood
E - Speech Understandable With Severe Concentration
F - Speech Unintelligible

Table 13

VHF TELEVISION SIGNAL STRENGTH, AMBIENT NOISE AND SUBJECTIVE RECEPTION QUALITY

Station	Channel	Locations 1.	2	3	4	5	6
KTVU	2						
Video Signal dB-μV/m		39.4	34.4	47.9	34.4	47.4	41.1
Ambient Noise dB-μV/m		52.2	38.7	35.7	43.7	56.7	40.7
Reception Quality 1/		F0	E1	D2	E1	E1	E1
KCRA	3						
Video Signal dB-μV/m		58.8	56.3	61.3	53.8	62.3	68.1
Ambient Noise dB-μV/m		58.5	30.5	32.5	32.5	52.5	37.0
Reception Quality		E1	C3	B4	C3	D2	B4
KROM	4						
Video Signal dB-μV/m		34.5	38.5	48.5	36.5	44.5	40.0
Ambient Noise dB-μV/m		58.8	26.8	31.8	40.8	53.8	39.3
Reception Quality		F0	D2	D2	E1	E1	E1
KPIX	5						
Video Signal dB-μV/m		30.0	34.5	45.5	38.5	36.5	41.5
Ambient Noise dB-μV/m		24.8	28.8	34.8	52.8	39.8	43.3
Reception Quality		D2	D2	D2	F0	E1	E1

Table 13 (cont'd)

Station	Channel	Locations					
KVIE	6	1	2	3	4	5	6
Video Signal dB-μV/m		NS	52.9	61.9	NS	NS	NS
Ambient Noise dB-μV/m		-	32.5	31.5	-	-	-
Reception Quality		-	C3	B4	-		-
KGO	7						
Video Signal dB-μV/m		32.4	46.3	55.8	41.3	51.3	43.8
Ambient Noise dB-μV/m		-	43.1	45.1	44.1	45.1	46.1
Reception Quality		-	E1	D2	E1	D2	E1
SBW	8						
Video Signal dB-μV/m		47.4	45.4	51.9	49.4	39.4	54.4
Ambient Noise dB-μV/m		51.2	41.2	42.2	42.2	51.2	41.2
Reception Quality		E1	D2	D2	D2	F0	D2
KQED	9						
Video Signal dB-μV/m		NS	43.1	51.1	NS	49.6	NS
Ambient Noise dB-μV/m		-	41	42.0	-	49	-
Reception Quality		-	E1	C3	-	E1	-

Table 13 (cont'd)

Station	Channel	Locations					
		1	2	3	4	5	6
KXTV	10						
Video Signal dB-μV/m		65.9	71.9	72.4	70.0	64.9	74.9
Ambient Noise dB-μV/m		56.8	48.8	45.8	53.8	45.8	41.8
Reception Quality		D2	C3	C3	D2	C3	B4
KOVR	13						
Video Signal dB-μV/m		62.0	70.0	70.0	70.5	68.5	82.5
Ambient Noise dB-μV/m		55.9	51.4	45.4	48.4	51.4	52.9
Reception Quality		D2	C3	C3	C3	C3	B4

1/ Based on signal to ambient noise ratio

A5 Threshold of visibility, excellent reception

B4 Very little interference, reception very good

C3 Interference plainly evident, reception tolerable

D2 Interference very evident and annoying

E1 Intense interference, extremely annoying

F0 Intolerable interference, reception unacceptable

NS No Signal Observed

Table 14

UHF TELEVISION SIGNAL STRENGTH, AMBIENT NOISE AND SUBJECTIVE RECEPTION QUALITY

Station	Channel	Location 1	2	3	4	5	6
KLOC	19						
Video Signal dB - $\mu V/m$		NS	NS	68.4	NS	65.4	NS
Ambient Noise dB - $\mu V/m$		--	--	39.8	--	43.8	--
Reception Quality 1/		--	--	B4	--	C3	--
KMUV	31						
Video Signal dB - $\mu V/m$		NS	NS	51.9	NS	NS	NS
Ambient Noise dB - $\mu V/m$		--	--	41.3	--	--	--
Reception Quality		--	--	D2	--	--	--
KTXL	40						
Video Signal dB - $\mu V/m$		NS	NS	NS	NS	NS	56.5
Ambient Noise dB - $\mu V/m$		--	--	--	--	--	42.4
Reception Quality		--	--	--	--	--	D2

1/ Based on signal to noise ratio

A5 Threshold of visibility, excellent reception.
B4 Very little interference, reception very good.
C3 Interference plainly evident, reception tolerable.
D2 Interference very evident and annoying.
E1 Intense interference, extremely annoying.
F0 Intolerable interference, reception unacceptable.
NS No signal observed.

For lateral distances of up to 200 feet from the outer conductor of the transmission line, foul weather corona-generated TVI will be reduced according to an inverse square law (there will be a decrease of 12 dB for each doubling of distance).

Table 15 presents the estimated noise levels of foul and fair weather television interference resulting from transmission lines of this design. Using this level and site 3 as representative, Plate 32 gives the number of television stations that may be affected. As shown, TV may be affected only during foul weather. During foul weather and at 200 feet or greater from the center line of the transmission line, there should be no noticeable effect. The video signal strengths measured for the project area are relatively weak, which results in an existing marginal grade of service.

4. Ozone Generation

Of the six major ambient air pollutants governed by Federal EPA and California Standards (photochemical oxidant, carbon monoxide, nitrogen dioxide, sulfur dioxide, suspended particulate matter and hydrocarbons), only very small amounts of photochemical oxidants (primarily ozone) and even smaller amounts of nitric oxide (which transforms into nitrogen dioxide) will be produced by the high voltage electric power transmission line. No lead particulates or hydrogen sulfide (also controlled by state standards) will be produced by the power line.

The formation of ozone and nitric oxide by the proposed 230 kV transmission line from New Melones to Warnerville results from the occurrence of corona discharge. Since transmission lines are designed to minimize the generation of corona, the quantities of ozone and nitric oxide produced are not expected to be detectable.

Table 15

ESTIMATED FOUL AND FAIR WEATHER TELEVISION INTERFERENCE (TVI), dB 1/

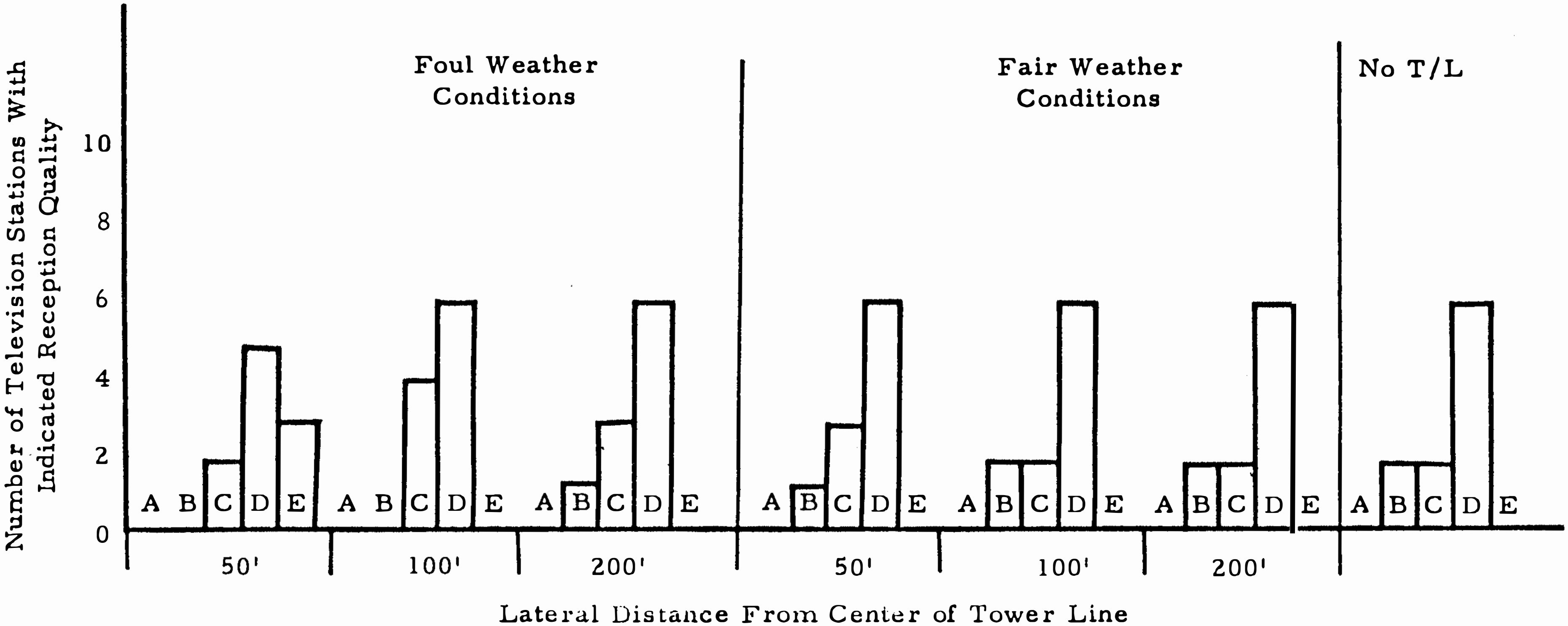
Due to the transmission line

Channel	Foul Weather: At Edge Of R/W 2/	Foul Weather: At 100 Feet From C/L 3/	Foul Weather: At 200 Feet From C/L	Fair Weather: At Edge Of R/W	Fair Weather: At 100 Feet From C/L	Fair Weather: At 200 Feet From C/L
2	51.5	43.5	34.9	35.5	27.5	18.9
3	51	43	34.4	35	27	18.4
4	50.5	42.5	33.9	34.5	26.5	17.9
5	49	41	32.4	33	25	16.4
6	48.5	40.5	31.9	32.5	24.5	15.9
7	42	34	25.4	26	18	9.4
8	42	34	25.4	26	18	9.4
9	41.5	33.5	24.9	25.5	17.5	8.9
10	41.5	33.5	24.9	25.5	17.5	8.9
13	40.5	32.5	23.9	24.5	16.5	7.9
19	33	25	16.4	17.0	9.0	0.4
31	32	24	15.4	16	8	-.6
40	31.5	23.5	14.9	15.5	7.5	-1.1

1/ decibels

2/ Right of way

3/ Center Line



Television Reception Quality for Site 3

		S/N_/ Exceeds dB Shown
A	Threshold of visibility excellent reception	37
B	Very little interference, reception very good	27
C	Interference plainly evident, reception tolerable	17
D	Interference very evident and annoying	4
E	Intense interference, extremely annoying	-11

_/ Signal to noise ratio

PLATE 32

(COURTESY P.G.&E.)

Laboratory investigations carried out by Westinghouse Electrical Corporation and the American Electric Power Service Corporation have investigated the production of ozone and other oxidants by Extra High Voltage (EHV) transmission lines. The studies conclude that the oxidant production from present EHV transmission lines (up through 765 kV) does not create an environmental problem.

5. Electrostatic and Electromagnetic Induction

It is anticipated that there will be no harmful effects to humans or animals due to electrostatic or electromagnetic induced voltages or currents from the proposed transmission line. An individual touching large ungrounded metal objects on or near the transmission line right-of-way may occasionally experience small, non-hazardous electrical sensations. The sensation experienced may range from the slightest transient electrical discharge (similar to the tingle experienced after walking on a dry carpet) to a constant electrical discharge continuing as long as the object is touched.

If induced currents approach the threshold of perception level for any long, continuous, insulated metal objects such as fences, effective mitigation measures are available and will be taken.

No physically harmful effects (due either to electrostatic or electromagnetic fields) have been experienced from PGandE's thousands of existing miles of 230 kV transmission lines.

6. Sierra Conservation Center

A special study for radio and television interference was conducted in cooperation with the Sierra Conservation Center due to its two-way radio communication and Master Antenna TV System (MATV).

The Sierra Conservation Center is located 11 miles west of Sonora, Tuolumne County. It is a medium-minimum security institution encompassing 301 acres of land and is designed to accommodate 1,200 inmates and over 400 staff. Inmates have free mobility within the institution in order that they may have the use of dayrooms, sleeping living rooms, educational classes, vocational training, recreational activities and other facilities. The physical plant is a single and double story structure of reinforced concrete construction.

Plate 33 shows the general plan layout of the existing 115 kV transmission line and the Sierra Conservation Center property along the proposed 230 kV transmission line. The proposed 230 kV transmission line will be approximately 1,100 feet from the nearest part of the main correctional facility. Therefore, radio reception, either AM broadcast or FM, should not have any impact at this distance. (See pages J8-11.)

Two-way radio communication is also a vital tool at the prison in the event of escapes, emergencies, etc. The area used for two-way communications is from the watch towers to the top of the mountain and beyond as well as in the SCC property. Previous tests conducted upon narrow band FM receivers have shown that under fair weather conditions the SCC should not experience any receiver degradation. The two-way receiver should be able to receive and transmit where they now can receive or transmit. However, under foul weather conditions the two-way radio portable receiver might range from 21 dB desensing directly under the proposed line to no degradation approximately 150 feet beyond the proposed line. (See Plate 34 for details.) Only under foul weather conditions, and when attempting to receive a message under or immediately adjacent to the proposed line, might there be an impact.

It should also be noted that PGandE operates an extensive mobile radio system throughout its operating area, which is about two-thirds of the State of

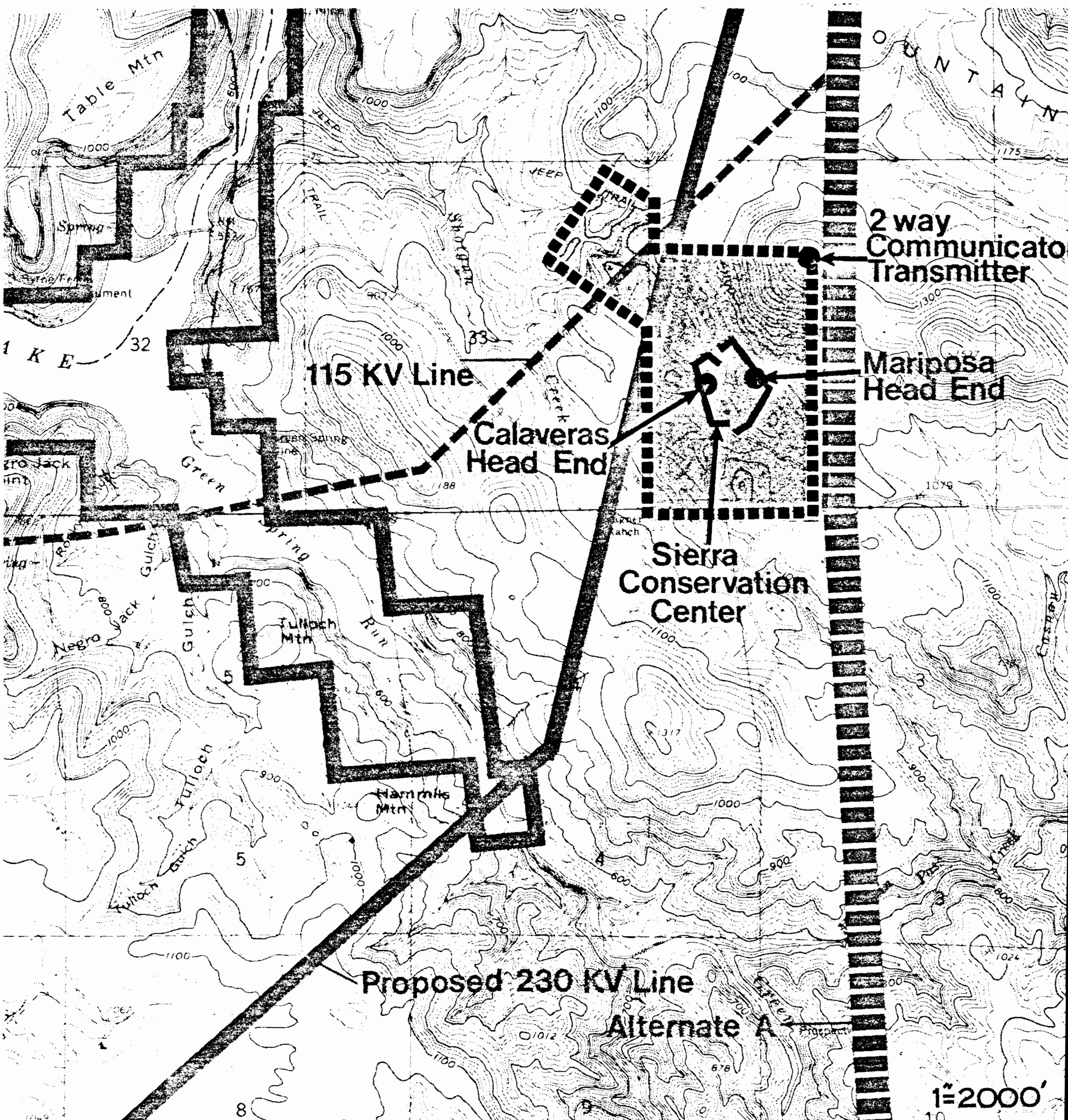


PLATE 33 : SIERRA CONSERVATION CENTER

California. The system is composed of approximately 250 base radio stations, 3,500 mobiles, and 520 pack sets operating in the 48, 150 and 450 MHz*/ bands. All of the manned transmission substations operating at voltages up to and including 500 kV are equipped with base radio stations operating in the 150 MHz band. One 500 kV substation is also equipped with a 48 MHz base. These radio systems are vital to the operation of the electrical system and are used primarily for the restoration of service in all kinds of weather. Over a period of many years, the 150 MHz radio stations operating in this severe electrical environment have not experienced any adverse effect detrimental to the operation of the station. Even the 48 MHz station, although more susceptible to electric interference, performs satisfactorily under adverse weather conditions.

With regard to television reception at the Sierra Conservation Center, it was investigated and determined that the SCC has an MATV svstem with two separate head ends and associated equipment. (See Plate 35.) From a field investigation, it appears that the system was originally designed for reception of only the Sacramento channels. In addition, the system appears to have several deficiencies. The orientation of the Calaveras Head End antenna did not appear to be optimized, which results in a reduced radio frequency (RF) level presented to the preamplifier. The distribution amplifier currently used is approximately 8 dB low in gain within the low band spectrum and also contributes a high noise figure to channel 13. The observed picture quality ranged from light to heavy electrical interference. It is felt that the heavy interference was caused by a local source due to it being cyclic in nature. A possible cause is an air conditioning unit or refrigeration equipment.

---

*/ Megahertz

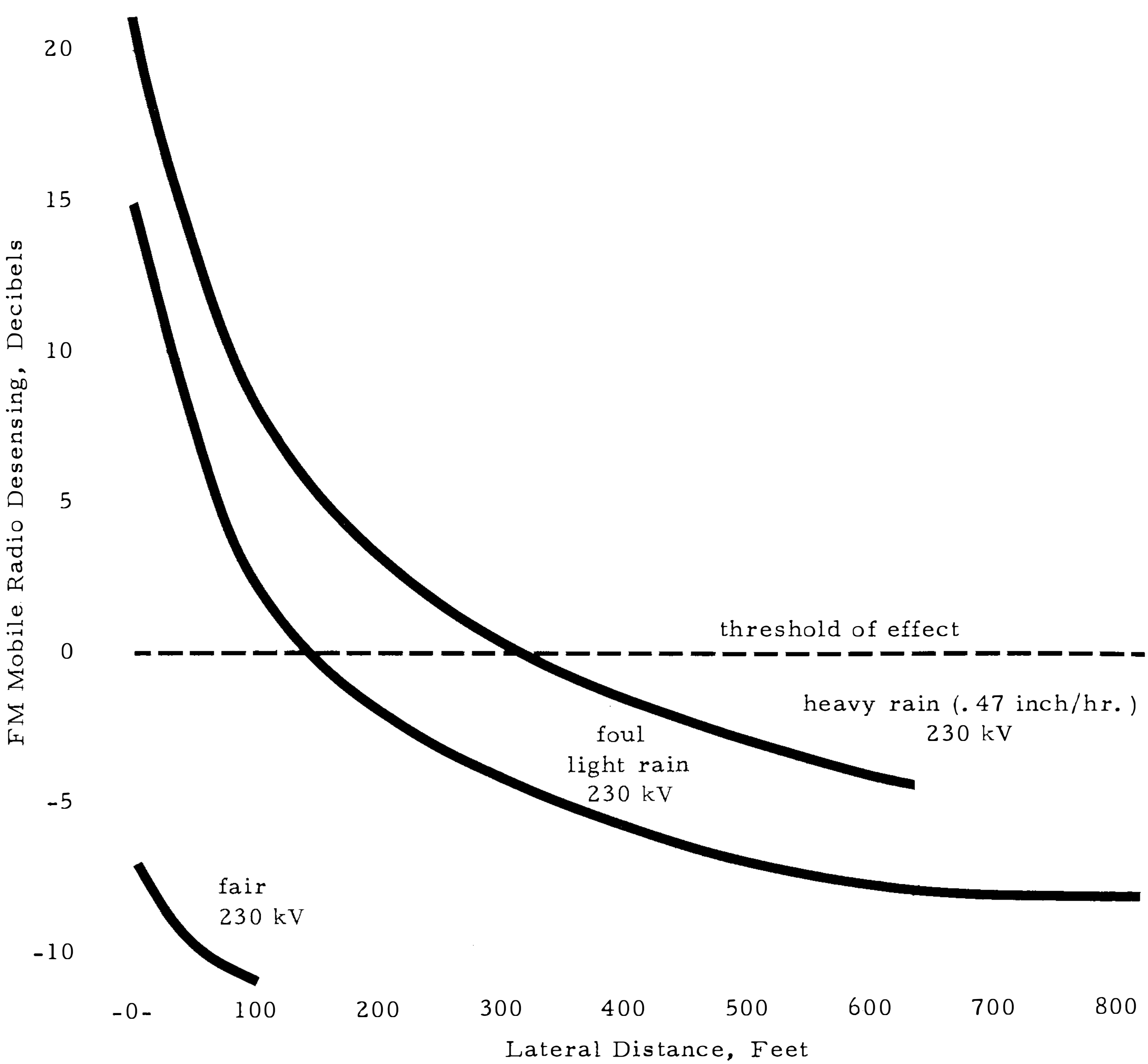
Tables 16and 17 show the data from two TV sets on the Calaveras side. From an investigation of the Mariposa facility MATV Head-End, no impulsive electrical interference was visible. However, the Winegard preamplifier may be overdriving the Jerrold amplifier. A 6 dB pad was found on the amplifier input. Another 10 dB pad was added and the gain of the amplifier was adjusted for a better picture quality. A switch on the amplifier was found in the separate mode which should have been in the combined mode.

In general, the Sierra Correctional Facility MATV system is in a location that experiences light to moderate electrical interference with respect to seasonal changes. This location also experiences a fade in the signal path during the early evening and it is further aggravated by having the existing system not optimized.

Table 18 shows the predicted power line noise field strengths expected at the existing Calaveras head end antennae. The proposed 230 kV line is approximately 1, 100 feet from the Calaveras antennae. The predicted noise field strengths at this distance for fair weather conditions are expected to be below the MATV system internal noise. However, under foul weather conditions and with the existing MATV equipment, it is possible that the low band VHF, mainly channel 3, might be slightly degraded. Table 19 illustrates that only under foul weather conditions will the proposed 230 kV transmission line introduce a noise level about equivalent to the SCC MATV internal noise, otherwise it is lower than the internal noise.

PLATE 34

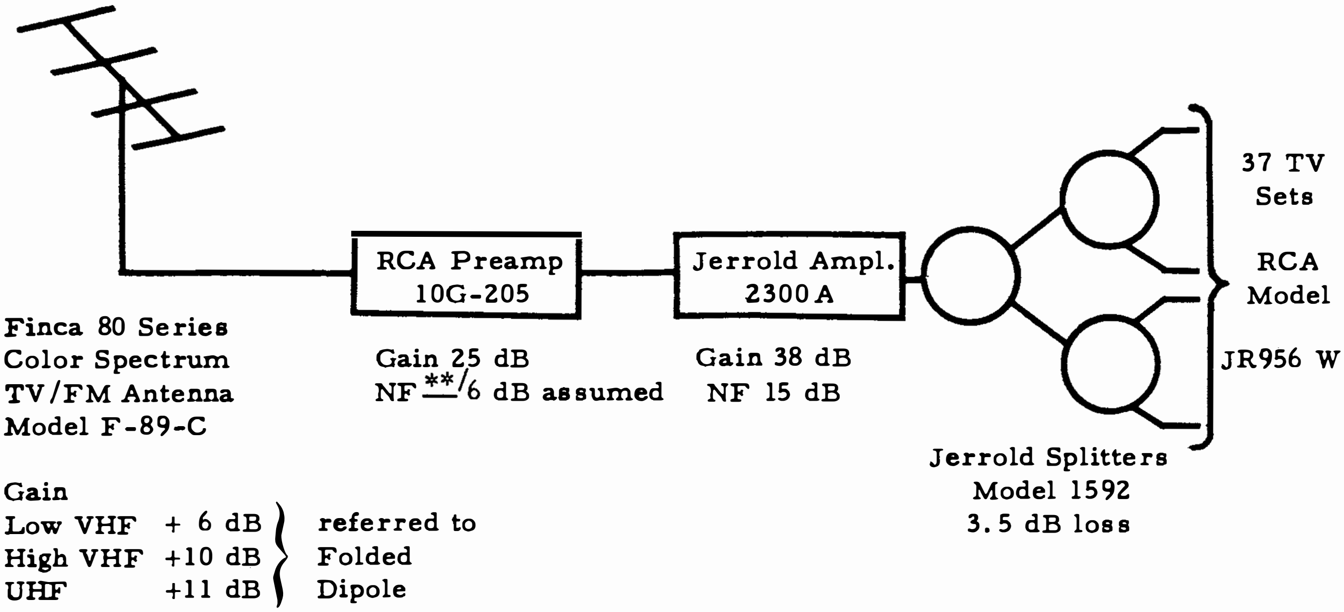
FM Mobile Radio Desensing vs Lateral Profile
for a 230 kV Transmission Line



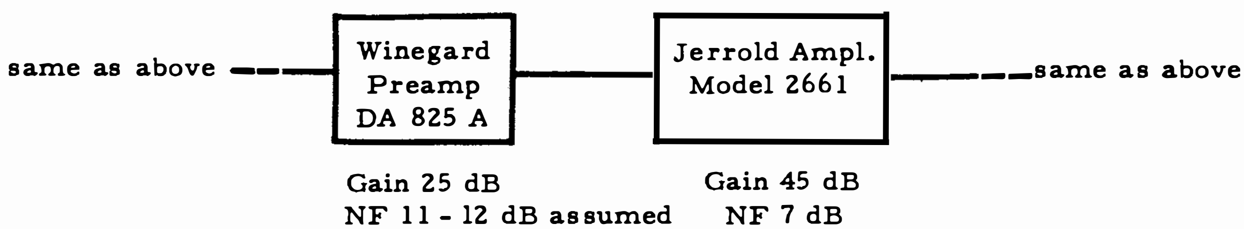
(COURTESY P.G.&E.)

PLATE 35

CALAVERAS MATV*/ SYSTEM



MARIPOSA MATV SYSTEM



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*/ Master Antenna Television System
**/ Noise Figure

SCHEMATIC

(COURTESY P.G.&E.)

TABLE 16

Calavaras MATV System, Dorm 4 TV Set

Channel	Video Carrier Level (dBmv*/)	Observed Picture Quality
3	+10	Very light to occasional moderate electrical noise, smear, ghosts. Good viewable picture, color slightly washed out, but probably due to TV set.
6	+5	Color beat, smear on edge.
10	+2	Ghosting, smear, picture noise quality not bad, good picture, except for smear. Electrical random noise, difficult to distinguish.
13	+2	Light to moderate electrical noise, smear. Noticeably noisier.

TABLE 17

Calavaras MATV System, Dorm 22 TV Set

Channel	Video Carrier Level (dBmv)	Baseband Noise (dBmv)	SN**/ dB	Observed Picture Quality
3	+18	-40	58	Slight snow and smear; impulsive electrical noise, extremely random and cyclic, 3 to 4 minute cycle, very moderate to heavy in intensity; ghosting; beat appears to be adjacent channel intermodulation product caused by set.
6	+16	<-40	>56	Good picture, minor well displaced ghost, smear, well displaced minor level negative video contrast, very moderate electrical equipment cycling through.
10	+13	<-40		Smear; extremely light, very random electrical noise.
13	+8	<-40		Smear, occasional light flashes.

*/ milivolt

**/ Signal to noise ratio

Table 18

POWERLINE NOISE FIELD STRENGTHS
EXPECTED AT THE EXISTING CALAVERAS HEAD END ANTENNAE

(Units are dB μV/m*/ for a 3 MHz**/ Bandwidth)

Channel	Fair Weather		Foul Weather	
	w/o 230 kV	w/230 kV	w/o 230 kV	w/230 kV
2	-14.33	- 9.19	1.67	6.81
3	-14.83	- 9.69	1.17	6.31
6	-17.33	-12.19	-1.33	3.81
10	-24.33	-19.19	-8.33	-3.19
13	-25.33	-20.19	-9.33	-4.19

*/ Microvolts/meter

**/ Megahertz

Table 19

CALAVERAS MATV*/ SYSTEM
POWER LINE AND MATV SYSTEM THERMAL NOISE EVALUATION

TV Channel	Power Line Noise Voltage Amplifier Output dB μV**/ Fair	Foul	Thermal Noise Voltage Amplifier Output dB μV	Resultant Noise Level dB μV Fair	Foul	TV Carrier Levels dB μV	Carrier-System Internal Noise Ratio dB	Carrier-Internal Noise + Pwr. Line Noise Ratio dB Fair	Foul
3	48.55	64.55	63.9	64	67.25	113.5	49.6	49.5	46.25
6	42.35	58.35	62.9	62.94	64.2	109.5	46.6	46.56	45.3
10	32.95	49.15	65.9	65.9	65.99	109.5	43.6	43.6	43.51
13	35.85	51.85	69.9	69.9	69.97	106.5	36.6	36.6	36.53

*/ MATV - Master Antenna Television System

**/ μV - Microvolts

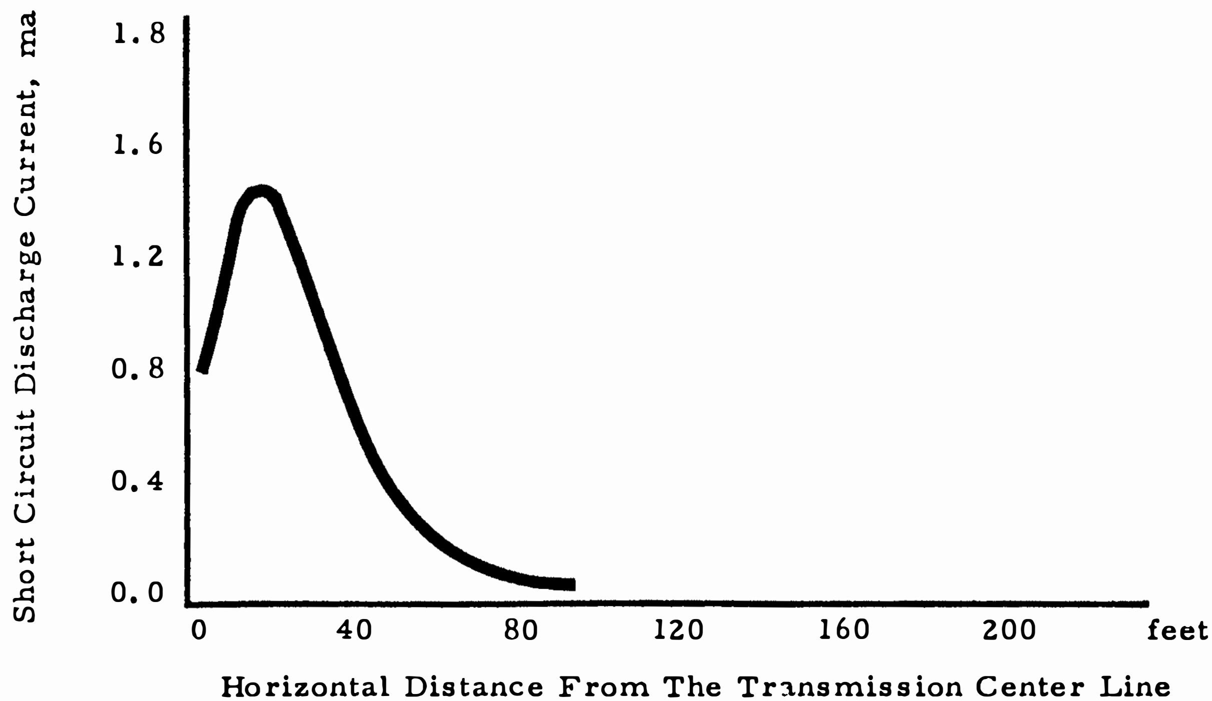
Electrostatic and Electromagnetic

Occasional, annoying, non-hazardous electrical sensations may be experienced by persons touching ungrounded metal objects on or adjacent to the edge of transmission line right-of-way. These ungrounded metal objects sometimes acquire an electrical potential by electrostatic coupling. Typical types of ungrounded objects include wire fences having dry wood posts, vehicles with rubber tires, and wooden barns with large metal roofs. The sensation experienced may range from the slightest perceptible tingle to a distinct sensation. Grounding of the fence or other metal objects will eliminate the induced electrostatic potential and any sensation that might be experienced by touching the object.

A 60 hertz current of 1 milliampere (ma) can be perceived by 50 percent of the population and this value is commonly known as the "threshold of perception level." Currents of a level (in the range of 1 to 5 ma) which may be painful, but which will not cause loss of muscular control are termed secondary shock currents. Currents greater than 5 ma are considered primary shock currents (that is, they do cause loss of muscular control).

The magnitude of the electrostatic voltage induced on ungrounded metal objects which are in the field of the 230 kV transmission line would depend on the surface area of the object, the distance of the metal surface from the transmission line conductor, and the height of the object above ground. The magnitude of the current one could experience would depend on the transmission line voltage, the size and shape of the object, and the impedance of the current's path through the person touching the object to the ground. The latter varies greatly according to the individual and the manner in which the person is grounded.

The short-circuit discharge current from an insulated fence five feet high and approximately 2,400 feet long parallel to a 230 kV transmission line at the point of maximum pickup (i.e., approximately five feet horizontal distance from the outer conductor) is 5 ma. Maximum short-circuit from an automobile on a 230 kV transmission line right-of-way is in the order of 0.4 ma and from a very large truck 12 feet by 12 feet by 50 feet long is on the order of 1.4 ma. Plate 36 shows a lateral profile of the electrostatic



Electrostatically Induced Short Circuit Discharge
Current Profile to a Large Truck for a Typical
230 kV Single Conductor Two Circuit Transmission
Line

PLATE 36
(COURTESY P.G.&E.)

discharge current from a large truck versus horizontal distance from the center line of the transmission line. The discharge current decreases rapidly as the object is moved away from the tower line.

In summary, secondary shocks may occur in rare instances when farm or construction equipment or extremely large vehicles operate on or adjacent to the right-of-way.

Electric and Magnetic Field

An overhead high voltage AC power line produces both electric and magnetic fields. To assess the effects of such fields, they must be described quantitatively in kV/m (kilovolts per meter) for the electric field and in Gauss for the magnetic field.

The electric field gradient profile for a typical double circuit, single conductor, 230 kV transmission line is illustrated in Plate 37. The maximum electric field for the five-foot height of measurement point is approximately 1.5 kV/m. Correspondingly, in Plate 38, the magnetic field profile for a typical 230 kV double circuit single conductor transmission line is illustrated for an assumed loading of 525 amperes (one-half the summer emergency rating). The maximum magnetic field at a height of five feet above ground is approximately 0.048 Gauss.

Public concern has arisen over possible biological effects of the electric fields produced by power transmission lines. The Electric Power Research Institute contracted with the IIT Research Institute to critically review the world-wide literature and on-going research and to identify areas needing additional research. The resulting report entitled "Biological Effects of High Voltage Electric Fields" (IIT Research Institute, 1975), is based on review of approximately 800 U.S. and foreign papers pertaining to biological effects of electric fields at powerline frequencies.

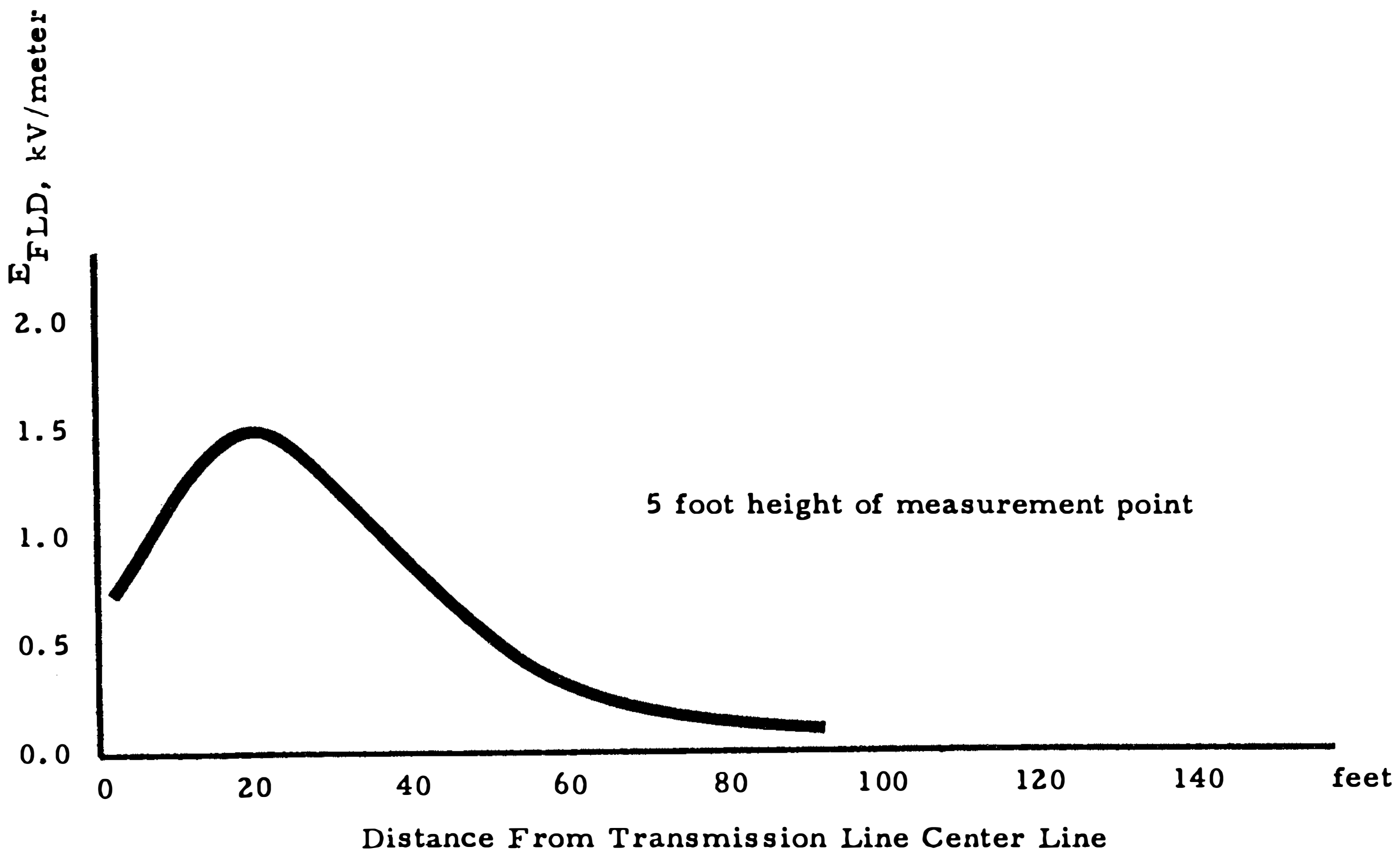
Gradients from powerlines are comparable to natural and other man-made electric fields. Beneath thunderclouds, electric fields of 3 kV/m or more have been measured. Dust storms in northern-west Africa can reverse the earth's 0.13 kV/m field (caused by the ionosphere) and produce fields up to 1.5 kV/m. Examples of man-made electric fields are those from electric blankets (0.25 kV/m), boilers (0.13 kV/m), stereos (0.09 kV/m), and electric ranges (0.004 kV/m). (Values are all at distances of about one foot.) (IIT Research Institute, 1975).

The generally accessable magnetic field produced by transmission lines is much less than the magnetic fields which now occur in homes or industrial environments due to appliances and machinery. Soldering guns and hair dryers can generate 10-25 Gauss in their vicinity and a can opener, kitchen range, and electric shaver generate 5-10 Gauss. The earth's natural magnetic field is about 0.5 Gauss. (IIT Research Institute, 1975).

A summary of the studies as reported in EPRI report on "Biological Effects of High Voltage Electric Fields" follows:

A. HVAC Field Influences on Humans

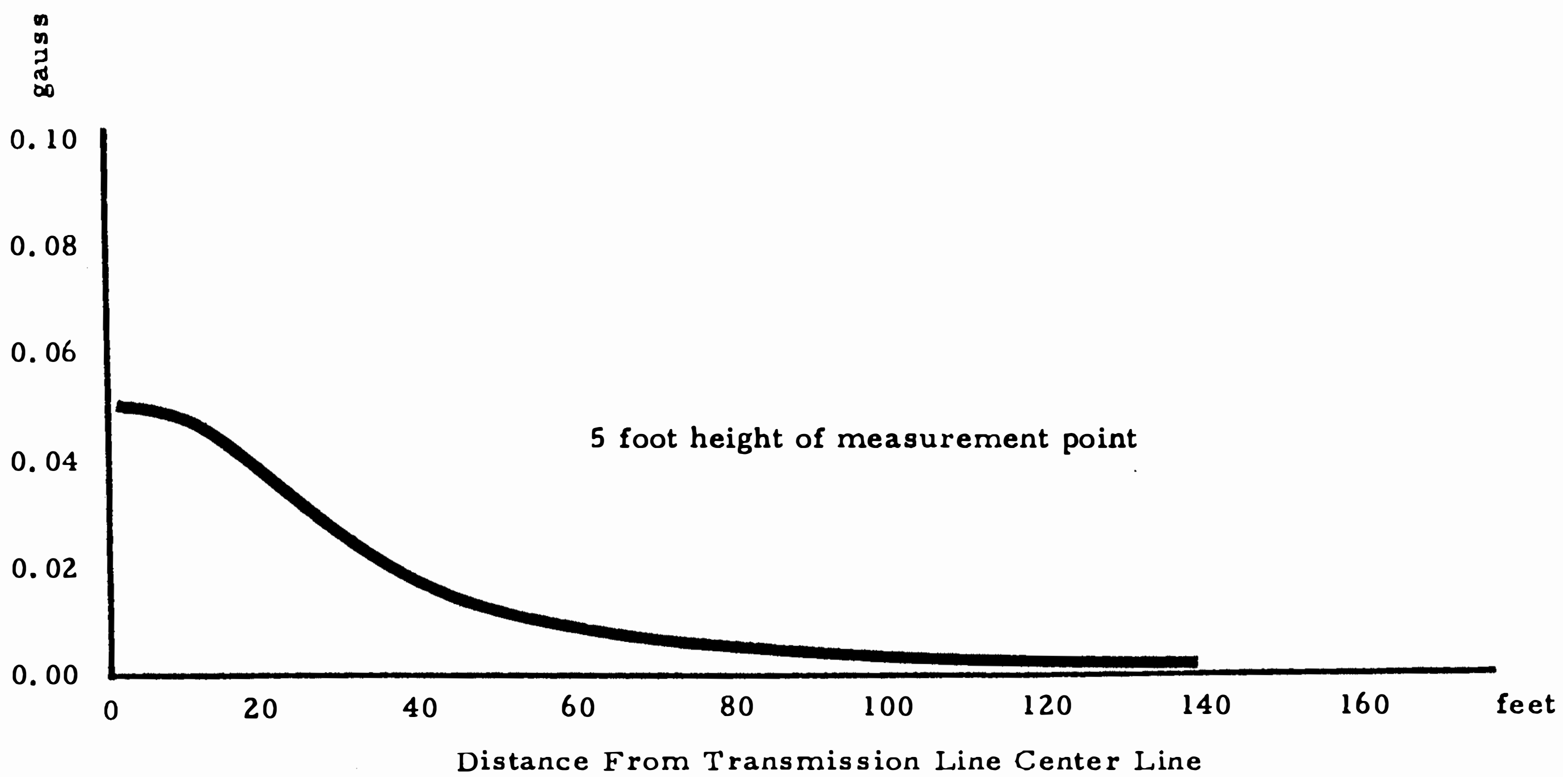
No significant differences between test subjects and test controls were observed according to seven references relevant to studies conducted in Western Europe and the United States. At the very high electric field intensities - on the order of 100 kilovolts per meter (some 50 times the normal field intensities at ground level for 230 kV transmission lines), some transition after effects have been noted.



Electric Field Gradient Profile for a Typical 230 kV Single Conductor Two Circuit Transmission Line

PLATE 37

(COURTESY P.G.&E.)



Magnetic Field Profile for a Typical 230 kV Single Conductor Two Circuit Transmission Line Carrying One-Half the Summer Emergency Rating, or 525 Amperes

PLATE 38
(COURTESY P.G.&E.)

As reported by Soviet research workers, persons occupationally exposed to high voltage electric fields in the complex environment found in switchyards have complained of a number of disorders such as headaches, fatigue and nausea. A major problem exists in interpreting these findings because of the difficulty in determining which factors in this unique environment were responsible for the observed symptoms. The Soviets report that the small arc self-discharge is another factor which might be responsible for the symptoms. Another plausible factor, unique to the switchyard environment, is the very high level 100 Hz accoustical noise arising from magnetostriction in the transformer. Such high level 100 Hz accoustical noise can cause similar symptoms.

B. HVAC Field Influences on Animals

No hazardous effects on laboratory and agricultural animals have been attributed to electric field exposures according to references from Western Europe and the United States. However, some of the results obtained are not definitive owing to possible problems with the biological protocol or dosimetry.

C. Horizontal Power Frequency Electric and Magnetic Field Effects on a Variety of Test Subjects

The horizontal portion of the electric field and the magnetic field are similar to the field which would be created by the Navy's proposed ELF (45-75 Hz) Communications System (Project Sanguine or Seafarer). No hazardous effects have yet been identified in some 45 studies conducted under Project Sanguine. The subjects of these tests included soil anthropods, earth worms, fish, marine animals, tadpoles, rodents, pigeons, monkeys, man, amoebas, and plants (including pine trees). Some alterations of orientation behavior in birds were identified, but judged to be nonhazardous influences.

D. Overall Appraisal

Some recent assessments of possible safety problems which have appeared in the recent literature are cited below. These remarks are made in the context of existing normally encountered environments, both man-made and natural.

> Reiter states: There is no proven case where high voltage lines running across closed rooms at low height have produced any significant disturbances in health. Analogously, this is true for cattle grazing within the range of such lines. The animals do not avoid them, nor was it found that milk production was reduced or the animals' health any poorer for having grazed under such high voltage lines for extended periods. In this connection, another important fact needs to be pointed out. Thus far, no reports have become known concerning disturbances, let alone injury to health, of personnel of electric railways working day in and day out in the range of strong alternating electric fields.

> Schmidt (1973) states: As members of the American community, we have been living in a sea of 60 hertz magnetic field of moderate, but ever increasing intensity for something over 50 years without any demonstrated cases of injury, disability, or even noticeable discomfort. It is, thus, very unlikely that weak magnetic fields are doing anything very importantly injurious to us individually or as a population.

Kauffman and Michaeolson (1974) present several conclusions as follows: Research to date has failed to provide any convincing evidence that human exposure to stationary or low frequency electric fields has any harmful biological effect. Until such evidence is found, the obvious dangers of electrical sparking should determine the limits of safe human exposure.

Wilson (1974) states: It seems that the physiological research on the influence of electric magnetic energy has identified few tangible effects. For the most part, the experimental effort lacks a systematic approach to the examination of the critical variables involved and parametric studies are the exception rather than the rule. Part of the difficulty probably lies in the fact that the research accomplished so far has not produced data suggesting that a profound physiological hazard might be developing. This, in turn, limits the interest in this field of study by those searching for exciting and rapid developments.

Research into biological effects of both electric and magnetic fields is being continued. Such research is difficult and must be carefully done to uncover any subtle effects. After critically reviewing the literature concerning known biological effects of power frequency electric fields on man and animals, no convincing evidence is reported that 50/60 hertz electric fields, as normally encountered, can cause a significant biological effect to humans. Where a possible effect is suggested, its cause can be attributed to factors other than electric fields - such as different environmental influences or improper biological procedures.

REFERENCES

1. Reiter, R. "Effects of Atmospheric and Extra-Terrestrial Electromagnetic and Corpuscular Radiations on Living Organisms," Sixth International Journal of Biometeorology, Vol. 17, No. 3, Pages 217-227.

2. Schmitt, O.H., and Tucker, R.D. "Human Perception of Moderate Strength Low Frequency Magnetic Fields," IEEE EMC Symposium Record, New York, Pages 65-70, June 1973.

3. Kaufman, G.E., and Michaelson, S.M. "Critical Review of the Biological Effects of Electric and Magnetic Fields," From Biologic and Clinical Effects of Low-Frequency Magnetic and Electric Fields, Llaurado and Sances, Publ. C. C. Thomas, Springfield, U.S.A., Pages 49-61, 1974.

4. Wilson, Arthur S. "Physiological Effects of Magnetic and Electric Fields," From Biologic and Clinical Effects of Low-Frequency Magnetic and Electric Fields, Llaurado and Sances, Publ. C.C. Thomas, Springfield, U.S.A., Pages 71-80, 1974.

APPENDIX K

METRIC CONVERSION

	From English	To Metric	Conversion Factor
Length	Mill	Millimetre (mm)	0.0254
	Inch (in)	Centimetre (cm)	2.54
	Foot (ft)	Metre (m)	0.305
	Yard (yd)	Metre (m)	0.914
	Mile (mi)	Kilometre (km)	1.61
Area	Kilocircular Mill (kcmill)	Square Millimetre (mm^2)	0.625
	Square Foot (ft^2)	Square Metres (m^2)	0.094
	Acre (ac)	Hectare (ha)	0.4
	Square Mile (mi^2)	Square Kilometre (km^2)	2.6
Volume	Cubic Foot (ft^3)	Cubic Metre (m^3)	0.028
	Gallon (gal)	Litre (1)	3.8
	Cubic Yard (yd^3)	Cubic Metre (m^3)	0.77
Weight	Pound (1b)	Kilogram (kg)	0.45
	Ton	Metric Ton (t)	0.9
Energy	Kilowatthour (kwh)	Tera Joule (TJ)	3.6

Appendix L

Comments on the Draft Environmental Statement

The October 3, 1977, draft environmental statement were furnished to those listed on pages iii-v for review and comment. Additional copies were furnished to outside entities who requested them. This appendix contains copies of comments received on the draft statement. Each letter of comment is numbered for ready reference to the discussion under Section I--Consultation and Coordination.

Entities from Whom Written Comments
on Draft Environmental Statement
Were Received

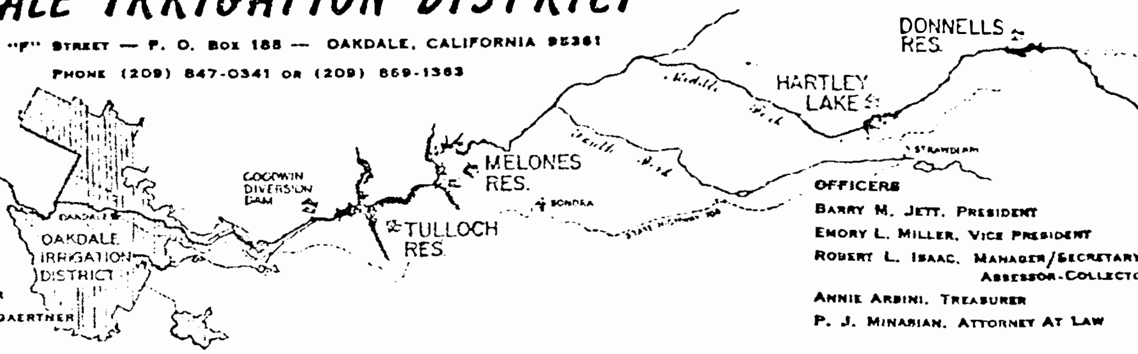
9.	Richard J. Navarre Fish and Wildlife Service U.S. Department of the Interior Sacramento, California	November 11, 1977	L-10
10.	Charles S. Viss, Chief Engineer Modesto Irrigation District Modesto, California	November 14, 1977	L-11
11.	James W. Monroe Assistant Director Bureau of Land Management U.S. Department of the Interior Washington, D.C.	November 15, 1977	L-12
12.	State of California Office of Planning and Research Sacramento, California	November 15, 1977	L-14
13.	Kirk E. Lindsey, Assistant Planner City of Oakdale, California	November 15, 1977	L-15
14.	William W. Lindsay Acting Chief, Office of Electric Power Regulation Federal Energy Regulatory Commission Washington, D.C.	November 16, 1977	L-16
15.	David J. Tobin, Jr. National Park Service U.S. Department of the Interior Washington, D.C.	November 16, 1977	L-18
16.	P. E. DeYoung, Sr., Permit Agent Pacific Gas and Electric Company San Francisco, California	November 18, 1977	L-19
17.	Michael Keesee Friends of the Earth Sacramento, California	November 20, 1977	L-20
18.	Thorne Gray, Staff Writer Modesto Bee Modesto, California	December 1, 1977	L-23
19.	Alexander Gaguine Friends of the River Sacramento, California	December 10, 1977	L-24

20.	Errett Deck Department of Agriculture Washington, D.C.	December 5, 1977	L-25
21.	Paul DeFalco, Jr. U.S. Environmental Protection Agency San Francisco, California	December 19, 1977	L-26

OAKDALE IRRIGATION DISTRICT

1205 EAST "F" STREET — P. O. BOX 188 — OAKDALE, CALIFORNIA 95361

PHONE (209) 847-0341 OR (209) 869-1363



October 11, 1977

U. S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region
2800 Cottage Way
Sacramento, California 95825

Gentlemen:

Reference is made to your letter of October 4, 1977, concerning the draft environmental statement for the proposed New Melones 230KV Electrical Transmission Line, Central Valley Project.

We have reviewed the draft environmental statement and find that the proposed transmission line would not adversely affect present or future Oakdale Irrigation District activites in the area, and would have minimal effect on the environment.

Alignment of the transmission line has been routed around the historic Wilms Ranch, and Highway 108/120 will be crossed at right angles to reduce the visible length of line. Most of the adverse effects on the environment during construction are temporary, vegetation will recolonize quickly.

Thank you for this opportunity to comment.

Very truly yours,

OAKDALE IRRIGATION DISTRICT

Kenneth G. Pinkerton

Kenneth G. Pinkerton,
Chief Engineer

KGP:se

State of California

Memorandum

65-2.

To
Governor's Office
Office of Planning and Research
State Clearinghouse
1400 10th Street, Room 121
Sacramento, Ca. 95814

Date : October 26, 1977

File No. A. 56725

Subject : SCH No. 77101164
New Melones
230K Electrical
Transmission Line

From : **Public Utilities Commission — San Francisco** - John Dutcher
Project Engineer

The subject Draft Environmental Statement prepared by the U. S. Bureau of Reclamation duplicates, in many areas, the work of the California Public Utilities Commission staff on the same project. The CPUC draft EIR on this same project was circulated under State Clearinghouse No. (SCH) 77100328.

There are apparently no significant inconsistencies between the two documents. However, the CPUC staff did conclude that the project's visual impact would be significant as indicated in the attached excerpt.

151 OCT 28 1977

Code	Action	Surname & Date
150		[illegible] CRL
150	[illegible] 10-31	
105		
DOE		[illegible] 10/31 ESTES
E/P		

Attachment

JLD:mf

cc: Mr. Malcolm Furbush
Pacific Gas and Electric
77 Beale Street
San Francisco, Ca. 94106

Ms. Debbie Nelson, Land Dept.
Pacific Gas and Electric
77 Beale Street
San Francisco, Ca. 94106

X H. E. Horton - Project Contact
U. S. Dept. of Interior
2800 Cottage Way
Sacramento, Ca. 95825

Attachment

C. Project Objective

1. Statement of Objective

The PGandE objective is as follows:

> "The proposed PGandE 230 kv transmission line will provide the New Melones Power Plant with a transmission outlet to integrate New Melones generation (through PGandE's bulk transmission) into the Bureau's Central Valley project system at the Tracy Switchyard."

2. Staff Conclusions

The staff has concluded that this project will meet PGandE's objective. Further, the project will have only one significant (i.e., substantial adverse impact) effect on the environment. This effect will be the visual effect of the transmission line from the New Melones switchyard to the point at which the transmission line begins to parallel the existing transmission lines of the City and County of San Francisco, a distance of approximately 16 miles.

IN REPLY REFER TO

Land Operations

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
Sacramento Area Office
2800 Cottage Way
Sacramento, California 95825

OCT 31 1977

R. Keith Higginson, Commissioner
Bureau of Reclamation
U. S. Department of the Interior
Washington, D. C. 20240

Dear Mr. Higginson:

We have reviewed the draft environmental statement for the New Melones 230-KV Electrical Transmission Line, Central Valley Project, California (DES 77/33), and found no Indian lands under the jurisdiction of this office are involved.

Sincerely yours,

Eddie V. Edwards

Acting Area Director

SEE REPLY DATED
Nov. 14, 1977

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

REGIONAL OFFICE

50 United Nations Plaza

SAN FRANCISCO, CALIFORNIA 94102

Office of Environmental Affairs

OFFICE OF THE REGIONAL DIRECTOR

November 7, 1977

Mr. Al R. Jonez
Assistant to the Commissioner
Ecology
U.S. Department of the Interior
Bureau of Reclamation
Washington, D.C. 20240

Dear Sir:

The Draft Environmental Statement for the New Melones 230 kV Electrical Transmission Line, Central Valley Project has been reviewed in accordance with the procedures of the Department of Health, Education and Welfare as required by Section 102(2)(c) of the National Environmental Policy Act, PL 91-190.

We take this opportunity to commend you for a well prepared Environmental Statement. The major concerns of this Department are related to possible impacts upon the health of the population, services to that population and changes in the characteristics of the population which would require a different level or extent of services. At this time we have no comments to offer.

Thank you for the opportunity to review this Statement. We would be interested in receiving a copy of the Final Statement.

Sincerely,

Evelyn Wachtel

for James B. Knochenhauer
Regional Environmental Officer

cc: CEQ
OEA

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

OFFICE OF THE DIRECTOR

In Reply Refer To:
EGS-DES-77/33
Mail Stop 760

7 NOV 1977

Memorandum

To: Assistant to the Commissioner - Ecology
Bureau of Reclamation

Through: Deputy Assistant Secretary--Energy and Minerals NOV 10 1977

From: Director, Geological Survey

Subject: Review of draft environmental statement for the New Melones 230-kV electrical transmission line, Central Valley Project, Calaveras, Tuolumne, and Stanislaus Counties, California

We have reviewed the subject draft environmental statement as requested in your memorandum of October 4.

Although the statement indicates that only minimal amounts of herbicides will be used to control vegetation within the easement (p. 50, item (3), par. 2), the frequency of herbicide application also should be considered. Too frequent use could result in significant concentrations of hazardous substances that may leach into shallow ground-water reservoirs or migrate to surface-water sources.

J. R. Balsley
Acting Director

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

OFFICE OF THE DIRECTOR

United States Department of the Interior

BUREAU OF MINES
2401 E STREET, NW.
WASHINGTON, D.C. 20241

BUREAU OF RECLAMATION
OFFICIAL FILE COPY
Rec'd NOV 15 1977

6552.
CENTRAL VALLEY PROJECT

November 9, 1977

TO	INIT.	D
150		11/15
600		11/15
615		

NOV 14 1977

Memorandum

To: Commissioner, Bureau of Reclamation

Through: Assistant Secretary--Energy and Minerals

From: Director, Bureau of Mines

Subject: Draft environmental statement, Bureau of Reclamation, New Melones electrical transmission line, Central Valley Project, California

The transmission line should not adversely affect mineral development in the project area. No mines are in the corridor, although an asbestos mine is operating near the damsite.

We suggest the addition of the following sentence at the end of the first paragraph under (3) Land Use on page 8: "Generally, mineral deposits may be located, leased, or otherwise developed within or beneath transmission line easements or rights-of-way provided such activities do not interfere with operation and maintenance of transmission towers, conductors, or cables."

Thank you for the opportunity to review this statement.

Director

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

United States Department of the Interior

BUREAU OF OUTDOOR RECREATION
WASHINGTON, D.C. 20240

IN REPLY REFER TO:

D6419-2781

NOV 11 1977

Memorandum

To: Commissioner, Bureau of Reclamation

From: Director, Bureau of Outdoor Recreation

Subject: Draft Environmental Statement for New Melones 230 KV Electrical Transmission Line, Central Valley Project, California DES 77/33

As requested in your memorandum of October 4, 1977, we have reviewed the draft environmental statement for the New Melones transmission system. We find that recreation has been adequately addressed for the preferred route, and concur that the alternative routes do not offer any significant advantages.

Chris Therral Delaporte

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
650 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

BUREAU OF RECLAMATION
OFFICIAL FILE COPY
Rec'd 1977

REPLY TO
ATTENTION OF
SPKED-D

11 November 1977

TO		
600		11/15
610		

U. S. Department of the Interior
Bureau of Reclamation
Washington, D. C. 20240

Gentlemen:

As requested in your letter, reference No. 611 652. CVP, dated 4 October 1977, the attached draft environmental statement on the New Melones 230 KV Electrical Transmission Line, Central Valley Project, has been reviewed. Comments are contained in the attached draft.

Sincerely yours,

Walter C. Day
for GEORGE C. WEDDELL
Chief, Engineering Division

1 Incl
As stated

Copy furnished: (w/o Incl)
General Counsel
Council on Environmental Quality
722 Jackson Place NW
Washington, D. C. 20006 (5 cys)

HQDA (DAEN-CWP-V)
Washington, D. C. 20314

SPD

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Area Office
2800 Cottage Way, Rm. E-2740
Sacramento, California 95825

NOV 11 1977

TO	INIT.	DATE
150		11/15
600		11/15
610		

To : Commissioner
Bureau of Reclamation
Washington, D.C. 20240

From : Area Manager, Sacramento, California (ES)

Subject: Draft Environmental Statement - New Melones 230 kV Electrical Transmission Line, Central Valley Project (ER 77-33).

We have reviewed the subject statement and believe that it adequately describes the fish and wildlife resources and satisfactorily discusses the impacts of the selected project plan of development on these resources. It is our conclusion that, from the standpoint of fish and wildlife, the correct alternative was selected as the project plan.

Richard J. Navarre

CC: Chief, Env. Coord.,Washington, D.C.
ARD-EC, Portland, Oregon
ES, Sacramento, California

FMichny/ar/11/9/77

652,

MODESTO IRRIGATION DISTRICT

1231 eleventh street • p.o. box 4060 • modesto, california 95352 • phone (209) 524-4061

November 14, 1977

United States Department of Interior
Bureau of Reclamation
2800 Cottage Way
Sacramento, California 95825

Attention: Mr. H. E. Horton, Regional Director

Re: Draft Environmental Statement - New Melones 230 KV Transmission Line (D.E.S. 77-33)

Gentlemen:

We have reviewed subject document and are pleased to respond as follows.

While the project description is adequate, the document appears to be deficient in the discussion of alternatives to the Warnerville Connection (pages 71 and 72). In particular, there is insufficient cost, economic and contractual data to fully evaluate these alternatives.

The District feels that this additional information should appear in the final Environmental Statement in order to allow a more complete appraisal by all interested parties.

Very truly yours,

MODESTO IRRIGATION DISTRICT

Charles S. Viss

CHARLES S. VISS
Chief Engineer

CSV:sr

xc: M. N. Bennett

IN REPLY REFER TO:
1793(260)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

DES-77/33

NOV 15 1977

Memorandum

To: Commissioner, Bureau of Reclamation

From: Director, Bureau of Land Management

Subject: Comments on Draft Environmental Statement, New Melones 230-kV Electrical Transmission Line, Central Valley Project, California

The proposed powerline would cross 660 feet of public land classified for disposal. No other public lands or programs administered by this Bureau will be affected by the proposed action. Although our jurisdictional involvement is minimal, we have developed the following comments which we hope will be helpful.

In the discussion of land ownership on pages 24 and 25, it would be preferable if the public lands involved were broken down by specific agencies. For example, the amount of public land administered by BLM should be noted.

On pages 27 and 28, a brief explanation of historical and archaeological values is presented. A plate showing the locations of historic sites and another plate showing the locations of known archaeological sites is desirable. The locations can be indicated by small numbers, and the numbers used in an accompanying key indicating site names (Appendix E can serve as the key for historic sites).

The first paragraph on page 57 indicates that about 20 miles of new access road will be required for the proposed action. We believe this figure, and an accompanying acreage figure, should also appear where access is discussed on page 7, page 41 (item 9), and page 53 (item 8).

On page 40 (item 6), the text indicates that five culverts will probably be utilized for stream crossings during construction, but it is not clear if more than 5 live stream crossings may be involved in the

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

proposed route. The number of live stream crossings should be clearly indicated here, and also on page 45 (last paragraph) and page 62 (fourth paragraph).

Also on page 40 (item 7), the term "steep slopes" should be defined in percentage-slope terms, and the text should quantify the amount of "steep slope" to be impacted by the proposed route using both in linear and acreage figures. It would be most desirable to develop a plate showing percentage-slope ranges for all areas as they are crossed by the proposed and alternative routes.

On pages 73 through 83, the approach to analysis of alternatives is generally sound. However, comparisons of impacts on archeological values and historical values need to be added to Table 8. We also believe comparisons for many of the categories in Table 8 are too general; a slightly more detailed identification of specific resources (e.g., one acre of black-tailed deer habitat, two acres of 15 percent slope or greater) impacted by the alternatives should be provided. Although the text under item d ("Alternatives to the Warnerville Connection ") and item e ("Alternative Routes") addresses comparative impacts in a general way, the most important specific resources impacted by each alternative should be identified.

James W. Morrow

Assistant Director

State of California

GOVERNOR'S OFFICE
OFFICE OF PLANNING AND RESEARCH
1400 TENTH STREET
SACRAMENTO 95814

EDMUND G. BROWN JR.
GOVERNOR

Code	Action	Surname & Date
150		K ett
DOE		Estes 12/5
E/P		Anderson
DT		

November 15, 1977

Mr. H. E. Horton
2800 Cottage Way
Sacramento, CA 95825

Dear Mr. Horton:

SUBJECT: SCH# 77101164 - NEW MELONES 230 - KV TRANSMISSION LINE

Clearinghouse review of your Negative Declaration is complete. We have no comments on the project.

This letter verifies your compliance with the review requirements contained in the National Environmental Policy Act as implemented by the Office of Management and Budget Circular A-95.

Sincerely,

Laurie K. Wright

Laurie K. Wright
Acting Division Chief
State Clearinghouse

CITY OF OAKDALE

November 15, 1977

Code	Action	Surname & Date
150	C.A. Long 11-18	
DOE		

Mr. H. E. Horton
Acting Regional Director
United States Department of the Interior
Bureau of Reclamation
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, California 95825

Dear Mr. Horton,

Re: MP-150
652

We are in receipt of a copy of a draft environmental statement for the proposed New Melones 230-KV Electrical Transmission Line, Central Valley Project, California. As suggested we are responding within the 45 day limit.

The City of Oakdale is opposed to Alternative "B" and its corridor (as shown on Plate No. 6) because of the close proximity to the Oakdale Airport. As the report states "it, also, has the Oakdale Airport runway jutting into it" (pg. 5).

The City of Oakdale is presently in consideration of a 900 foot extension to the east end of the airport runway. Depending upon the proximity of the transmission lines to the airport and runway, a definite hazard could be created. We strongly recommend that the lines be placed a safe distance from the airport and runway.

Thank you for the opportunity to respond to the environmental statement and please keep us informed of further developments.

Very truly yours,

Kirk E. Lindsey

KIRK E. LINDSEY
Assistant Planner

KEL:ca

280 NORTH THIRD AVENUE • P.O. BOX 305 • OAKDALE, CALIFORNIA 95361 • (209) 847-3031

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D. C. 20426

EPR-DLP
Project No. 2781
California

BUREAU OF RECLAMATION
OFFICIAL FILE COPY
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NOV 16 1977

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RECLAMATION FILES

Mr. Al N. Jonez
Assistant to the Commissioner - Ecology
Bureau of Reclamation
United States Department of the Interior
Washington, D. C. 20240

Dear Mr. Jonez:

This is in reply to your letter dated October 4, 1977, (reference 611-652. CVP) transmitting the Bureau of Reclamation's Draft Environmental Impact Statement (DEIS) for the New Melones 230-kV Electrical Transmission Line for the Central Valley Project, located in Calaveras, Tuolumne, and Stanislaus Counties, California.

The subject transmission facilities will be more than adequate to deliver the output of the New Melones project to the bulk power transmission network in California. The proposed facilities will in effect become segments of other Pacific Gas and Electric Company transmission lines, and the proposed design criteria appear to equal or exceed the standards utilized in constructing the existing facilities. The lack of a static shield conductor over the full length of the proposed line may result in increased numbers of lightning strikes. Thus, the overall performance level of the transmission line may not equal the highest level possible.

The Staff of the Federal Energy Regulatory Commission has reviewed the DEIS and concludes that it adequately addresses the environmental concerns of the Commission Staff, as they relate to Pacific Gas and Electric Company's application (FERC Project No. 2781) for a license to construct and operate the New Melones transmission line.

Final determination of the jurisdiction and possible licensing of the proposed transmission facilities by the Federal Energy Regulatory Commission is pending.

On October 1, 1977, pursuant to the provisions of the Department of Energy Organization Act (DOE Act), Public Law 95-91, 91 Stat. 565 (August 4, 1977) and Executive Order No. 12009, 42 Fed. Reg. 46267 (September 15, 1977), the Federal Power Commission ceased to exist and its functions and regulatory responsibilities were transferred to the Secretary of Energy and the Federal Energy Regulatory Commission which, as an independent commission within the Department of Energy, was activated on October 1, 1977. Therefore, certain references to the Federal Power Commission in the DEIS should be changed in the Final Environmental Impact Statement to read "The Federal Energy Regulatory Commission".

Sincerely,

William W. Lindsay
Acting Chief, Office of Electric Power Regulation

United States Department of the Interior

NATIONAL PARK SERVICE
WASHINGTON, D.C. 20240

IN REPLY REFER TO:
L7619
(WR)REQ

NOV 1 6 1977

Memorandum

To: Commissioner, Bureau of Reclamation

Through: Assistant Secretary for Fish and Wildlife and Parks

NOV 2 3 1977

From: ASSOCIATE Director

Subject: Draft Environmental Statement for the Proposed New Melones 230-kv Electrical Transmission Line, Central Valley Project, California (DES 77-33)

We have reviewed the draft environmental statement and offer the following comments for your consideration.

The draft statement has adequately considered the effects of the proposed project upon cultural resources. From descriptions included in the archeological report, it appears several of the identified resources meet the criteria for inclusion to the National Register of Historic Places. We recommend that the identified resources be evaluated for their national register significance in consultation with the State Historic Preservation Officer, and results of that consultation be documented in the final statement.

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

PACIFIC GAS AND ELECTRIC COMPANY

PGandE 77 BEALE STREET • SAN FRANCISCO, CALIFORNIA 94106 • (415) 781-4211 • TWX 910-372-6587

J. W. PAGE
MANAGER
LAND DEPARTMENT

November 18, 1977

Code	Action	Surname & Date
DOE		
EIP		
DT		

Mr. H. E. Horton
Acting Regional Director
Department of Energy
Western Power Administration
Sacramento Office
2800 Cottage Way
Sacramento, California 95825

Dear Mr. Horton:

Pacific Gas and Electric Company has reviewed the Draft Environmental Statement, New Melones 230 kv Electrical Transmission Line. Our comments follow.

> Page 11, #13, line 6.
> It is unclear that the range 500 - 2000 feet refers to span length rather than height.

With this exception, we find the document in agreement with the PGandE Environmental Data Statement.

Very truly yours,

P E DeYoung PAW.

P. E. DE YOUNG
Sr. Permit Agent

DSNelson:MZ

FRIENDS OF THE EARTH
124 SPEAR SAN FRANCISCO CALIFORNIA 94105
(415) 495-4770
FRIENDS OF THE EARTH, INC.
State Capitol Office
717 "K" St., Suite 209
Sacramento, California 95814
(916) 446-3109

November 20, 1977

Department of Interior
Bureau of Reclamation
Federal Bldg.
650 Capitol Mall
Sacramento, CA 95814

To Whom It May Concern:

Friends of the Earth (F.O.E.) Sacramento has completed its review of the Draft Environmental Statement for the New Melones 230 kV Transmission Line (referred herein as the proposed project). F.O.E. would first like to thank the Bureau of Reclamation for this opportunity to participate in the public decision-making process.

In general it appears that the proposed project will result in few significant, short-term environmental impacts. F.O.E., however, does have several questions and comments regarding the short-term environmental impacts of the proposed project and would also like to adress a significant, long-term environmental impact that the Draft Environmental Statement failed to mention and which F.O.E. feels to be of the utmost importance.

First, what affects will the proposed project and the related construction have on any migration routes of major mammals, such as deer, that reside in the area? Does the proposed project route cross any major migratory route?

Second, FOE noted that there was no mention of decommissioning procedures or costs to dismantle the proposed project after its or its power generating source's life has exspired. The Draft Environmental Statement mentioned that the New Melones Dam is expected to have a 50 year lifetime and implied that the proposed project would have a similar lifetime. F.O.E. feels that the issue of decommissioning the proposed project must be address in the Final Environmental Statement to accurately access all the cost and environmental impacts of the proposed project.

Third, F.O.E. is concerned that the uses of herbicides (page 50 of the Draft Environmental Statement), even in minimal amounts (whatever they may be) is ill-advised and represents a significant environmental impact. In our opinion the discussion of the use of herbicides in the Draft Environmental Statement was inadequate and failed to address the impacts associated with herbicide use. F.O.E.

FRIENDS OF THE EARTH
124 SPEAR SAN FRANCISCO CALIFORNIA 94105
(415) 495-4770
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State Capitol Office
717 "K" St., Suite 209
Sacramento, California 95814
(916) 446-3109

suggests that PG&E subsititute the use of herbicides with labor intensive methods of vegetation removal. The benefits of such an approach are obvious: increase employment opportunities, conservation of fossil fuels, and removing the threat of environmental contamination.

Fourth, on page 41 of the Draft Environmental Statement mention was made of special construction techniques that would be employed if evidence of archeological artificats were uncovered during the construction process of the proposed project. F.O.E. would like to see an outline of these special construction methods in the Final Environmental Statement.

Earlier it was mentioned that F.O.E. felt that an important long-term environmental impact was not discussed in the Draft Environmental Statement. The long-term environmental impact F.O.E. is referring to are the cumulative environmental impacts associated with an ever increasing reliance by our society on centralized electrical power, in which electrical transmission lines play an integral role. F.O.E. believes that actions leading to increased reliance on centralized electrical generating plants are questionable and will result in a number of significant economic, environmental, and social impacts:e.g, the plutonuim economy, loss of wild rivers, energy waste, greater authoritarian controls, etc.. Projects such as the New Melones Transmission Line are, in our eyes, an attempt to lock us into an ever increasing reliance on centralized electrical energy. F.O.E. is especially concerned that once such projects are constructed and in place arguments to further the electrification of our society will become self-fulfilling. F.O.E. believes that now is the time to re-evaluate our total energy strategy, particularly our need for centrally produced electricity, and to begin implementing projects that will result in a more diversified, environmentally compatible, ecomomical energy supply system.

With this in mind, then, the merits of the proposed project can be re-evaluated and the environmental impacts of the prosed project seen in a new light. F.O.E. understands that the New Melones Dam reservior has yet to be filled and still faces several legal challenges before being completed, especially in regards to the need and need justifications for the Dam. The Draft Environmental Statement, however, makes no mention of this controversy and assumes that the reservior is filled, the dam's generators are producing electricity, and, therefore, there is a need for the transmission lines. F.O.E. is concerned that approval of the transmission lines may be used as a justification

FRIENDS OF THE EARTH
124 SPEAR SAN FRANCISCO CALIFORNIA 94105
(415) 495-4770
FRIENDS OF THE EARTH, INC.
State Capitol Office
717 "K" St., Suite 209
Sacramento, California 95814
(916) 446-3109

for the filling of the New Melones reservior: the Bureau of Reclamation can hardly let the investments of the dam and the transmission line go for naught and thus there exists a powerful de facto case for completion of the reservior. In F.O.E.'s eyes the nature of this sort of decision-making is based on a strange sense of circular logic, and it is this absurd and wasteful logic that F.O.E. challenges.

In conclusion, then, F.O.E. strongly feels that the Final Environmental Statement must include a discussion of the issues of increasing our reliance on centralized electrical generating plants and the need analysis of the New Melones Dam in accessing the long-term environmental impacts of the proposed project. Neglecting these serious issues will, in our opinion, result in the Bureau of Reclamation faling to meet the requirements of the National Environmental Policy Act (NEPA), specifically Section 102 (C) (iv) & (v). At issue are the environmental impacts associate with the present electrical power system in which transmission lines play a significant and essential role.

Thank you.

For the Friends of the Earth,

Best Regards,

Michael Keesee

Michael Keesee
Environmental Impact Report/Statement Coordinator

The Modesto Bee

14th and H • P.O. Box 3928 • Modesto, California 95352 • Phone (209) 524-4041

Code	Actn	Surname & Date
DOE		Estes 12/5
E/P	X	
Rcd.	DEC 5 1977	

December 1, 1977

Western Area Power Administration
US Department of Energy
Sacramento Office
2800 Cottage Way
Sacramento, CA 95825

Dear Sirs,

This is a request to see additional economic data included in the final draft of the environmental impact statement on the New Melones 230 kV Electrical Transmission Line, Central Valley Project. I understand the period for commenting upon the draft remains open through Dec. 3.

While economic considerations do not necessarily govern environmental questions, I understand they can and should be considered. The draft report provides no economic information, particularly on alternatives to the chosen line and route, including having the federal government build the chosen alternative rather than PG&E.

Thank you.

Sincerely yours,

Thorne Gray

Thorne Gray,
Staff Writer.

TG:wf

FRIENDS OF THE RIVER
401 San Miguel Way, Sacramento, CA 95819 • 916/451-9955

652

Code | Surname & Date
DOE | 12/14
E/P |
Rcd: DEC 14 1977

Comments on the Draft Environmental Statement on the New Melones 230 kV Electrical Transmission Line

I hope that you have been able to hold the record open for these late comments, and I thank you in advance for doing so.

Especially in light of the US Supreme Court's recent agreement to hear US v. California, a case concerning the State's right's to apply conditions to water rights granted to the Bureau of Reclamation for New Melones Reservoir, Friends of the River strongly objects to the conclusion that these transmission lines should be constructed at this time.

It is my understanding that if the Court upholds the State in this matter, the reservoir will not be filled to capacity for an indeterminate period, until water contractors within the service area can be found (if they are ever found during the life of the project). At the reservoir levels designated by the State (Water Resources Control Board Decision 1422, 1973), there will be no hydroelectric production from New Melones, and thus no need for transmission lines. The no action alternative, which Friends of the River favors, should be rewritten to address the real possibility that these lines will be useless for quite a period of time, and their economic and environmental costs will go for nothing.

16498 DEC 12 1977

Friends of the River contends, as does the State, that the upper canyon of the Stanislaus River is more valuable to the people of the State than is the hydroelectric potential of New Melones.

FOR also questions why, after leading four years of activity against New Melones, including a state-wide ballot initiative in 1974, the Bureau did not place us on its distribution list for this document. We hereby request that you do so in the future for all materials concerning New Melones.

We thank you for considering our views.

Alexander Gaguine

Alexander Gaguine
Friends of the River

cc Huey Johnson, Secretary for Resources
Ron Robie, DWR
Jerry Meral, DWR
John Bryson, SWRCB
Sen. Peter Behr
Guy Martin, USDI
Bob Ueltzen
Rick Glick
Claire Dedrick, PUC
John Turner, SWRCB

Surname 12/12

WAPA

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

DEC 5 1977

Mr. Al R. Jonez
Assistant to the
Commissioner-Ecology
Bureau of Reclamation
U.S. Department of the Interior
Washington, D.C. 20240

Dear Mr. Jonez:

We have had the draft environmental statement for the New Melones 230 kV Electrical Transmission Line, Central Valley Project, California, reviewed in the relevant agencies of the Department of Agriculture and have no comments.

Sincerely,

Glen H. Loomis, for

ERRETT DECK
Coordinator
Office of Environmental Quality Activities

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

B. E. Martin, Regional Director
Bureau of Reclamation
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento CA 95825

DEC 19 1977

Dear Mr. Martin:

The Environmental Protection Agency has received and reviewed the draft environmental statement for the New Melones 230KV Electrical Transmission Line, Central Valley Project.

EPA's comments on the draft environmental statement have been classified as Category LO-2. Definitions of the categories are provided on the enclosure. The classification and the date of EPA's comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act. Our procedure is to categorize our comments on both the environmental consequences of the proposed action and the adequacy of the environmental statement.

16768 DEC 20 1977

EPA appreciates the opportunity to comment on this draft environmental statement and requests one copy of the final environmental statement when available.

Sincerely,

for Paul De Falco, Jr.
Regional Administrator

Enclosure

cc: Council on Environmental Quality

Code	Action	Surname & Date
150		
150		C R Long 12-22

Air Quality Comments for New Melones 230Kv Electrical Transmission Line:

The New Melones draft environmental impact statement provides no data relating to existing pollutant levels and air quality. No discussion of local impacts resulting from construction or emissions indirectly associated with the project, and no discussion of air quality impacts associated with each alternative have been included.

The Air Quality impact from the project arises mainly from construction of the transmission line, with adverse effects after completion being minimal.

Scanning the entire draft statement for isolated comments on air quality makes for difficult reviewing, and an effort to organize this information should be made in the final statement. A discussion of fugitive dust and slash burning, and the procedures followed to abate dust should also be included.

On page 41, a reference to blasting occurs. A description of areas designated as blasting sites is needed. Serpentine rock occurs in a large section of the proposed site, and is a recognized source of asbestos. Blasting in this area may cause serious health problems.

EIS CATEGORY CODES

Environmental Impact of the Action

LO--Lack of Objections

EPA has no objection to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER--Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to reassess these aspects.

EU--Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1--Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2--Insufficient Information

EPA believes that the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3--Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

If a draft impact statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make such a determination.

AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Oxidant (Ozone)	1 hour	0.10 ppm (200 ug/m^3)	Ultraviolet Photometry	160 ug/m^3 (0.08 ppm)	Same as Primary Std.	Chemiluminescent Method
Carbon Monoxide	12 hour	10 ppm (11 mg/m^3)	Non-Dispersive Infrared Spectroscopy	—	Same as Primary Standards	Non-Dispersive Infrared Spectroscopy
	8 hour	—		10 mg/m^3 (9 ppm)		
	1 hour	40 ppm (46 mg/m^3)		40 mg/m^3 (35 ppm)		
Nitrogen Dioxide	Annual Average	—	Saltzman Method	100 ug/m^3 (0.05 ppm)	Same as Primary Standards	Proposed: Modified J-H Saltzman (O_3 corr.) Chemiluminescent
	1 hour	0.25 ppm (470 ug/m^3)		—		
Sulfur Dioxide	Annual Average	—	Conductimetric Method	80 ug/m^3 (0.03 ppm)	—	Pararosaniline Method
	24 hour	0.05 ppm (131 ug/m^3)[9]		365 ug/m^3 (0.14 ppm)	—	
	3 hour	—		—	1300 ug/m^3 (0.5 ppm)	
	1 hour	0.5 ppm (1310 ug/m^3)		—	—	
Suspended Particulate Matter	Annual Geometric Mean	60 ug/m^3	High Volume Sampling	75 ug/m^3	60 ug/m^3	High Volume Sampling
	24 hour	100 ug/m^3		260 ug/m^3	150 ug/m^3	
Sulfates	24 hour	25 ug/m^3	AIHL Method No. 61	—	—	—
Lead	30 Day Average	1.5 ug/m^3	AIHL Method No. 54	—	—	—
Hydrogen Sulfide	1 hour	0.03 ppm (42 ug/m^3)	Cadmium Hydroxide Stractan Method	—	—	—
Hydrocarbons (Corrected for Methane)	3 hour (6-9 a.m.)	—	—	160 ug/m^3 (0.24 ppm)	Same as Primary Standards	Flame Ionization Detection Using Gas Chromatography
Ethylene	8 hour	0.1 ppm	—	—	—	—
	1 hour	0.5 ppm				
Visibility Reducing Particles	1 observation	In sufficient amount to reduce the prevailing visibility to less than 10 miles when the relative humidity is less than 70% (8)		—	—	—

APPLICABLE ONLY IN THE LAKE TAHOE AIR BASIN:

Carbon Monoxide	8 hour	6 ppm (7 mg/m^3)	NDIR	—	—	—
Visibility Reducing Particles	1 observation	In sufficient amount to reduce the prevailing visibility to less than 30 miles when the relative humidity is less than 70% (8)		—	—	—

(FOOTNOTES ON REVERSE SIDE)

NOTES:

1. California standards are values that are not to be equaled or exceeded.

2. National standards, other than those based on annual averages or annual geometric means, are not to be exceeded more than once per year.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 mm of mercury. All measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of Hg (1,013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent procedure which can be shown to the satisfaction of the Air Resources Board to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health. Each state must attain the primary standards no later than three years after that state's implementation plan is approved by the Environmental Protection Agency (EPA).

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after implementation plan is approved by the EPA.

7. Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.

8. Prevailing visibility is defined as the greatest visibility which is attained or surpassed around at least half of the horizon circle, but not necessarily in continuous sectors.

9. At locations where the state standards for oxidant and/or suspended particulate matter are violated. Federal standards apply elsewhere.

CALIFORNIA AIR QUALITY DATA
OCTOBER NOVEMBER DECEMBER 1975
Vol. VII No. 4

AIR ANALYSIS COMMENTS

DATA SECTION

CALIFORNIA AIR RESOURCES BOARD
TECHNICAL SERVICES DIVISION
P. O. Box 2815 Sacramento, California 95812

December 1976

CORRECTION TO OXIDANT DATA

The method used by the Air Resources Board to calibrate oxidant air monitoring instruments was changed on June 1, 1975. The change was made to assure that the data would be accurate. Measurements based on the prior method in most areas of the State were higher than true values.

To determine the correct oxidant concentrations prior to June 1, 1975, the data collected by the following agencies should be corrected by the following factors:

1 -- Los Angeles County -- no correction necessary

2 -- San Diego County -- multiply reported concentration by .85

3 -- All other counties and ARB -- multiply reported concentration by .80

These correction factors may be applied to summary statistics of concentration data themselves, e.g., "average maximum-hour", "average of all hours", but cannot be applied to such data as "number of days (or hours) exceeding standard".

The Board's staff is adjusting all the historical oxidant data to the new calibration base. Oxidant summaries for 1975, showing hours and days over the standards, will appear in the January-March 1976 issue of "California Air Quality Data". The comparable 1974 and 1973 summaries of adjusted oxidant data will appear in the April-June issue. The percent frequency distributions and other items of adjusted oxidant data will appear in "Three-Year Summary of California Air Quality Data -- 1973-75". This forthcoming publication will follow the format of "Ten-Year Summary of California Air Quality Data -- 1963-72" and, except for oxidant (it is uncorrected in the ten-year report), serves to update that document.

1974-75 Surface Airflow Patterns in the South Coast, Bay Area, and San Joaquin Valley Air Basins

Meteorological maps showing the surface airflow patterns within an air basin at different times of the day are useful in predicting air quality. They also provide valuable air pollution climatological information when typed and summarized by time of day and season. Specific maps are helpful in analyzing air pollution episodes. An example of episode analyses was presented in the April, May, June 1973 issue of "California Air Quality Data." The Board's staff regularly prepares meteorological maps for four time periods daily (4 a.m., 10 a.m., 4 p.m., 10 p.m.) for three air basins. A description of the various airflow types and a summary of their occurrences during 1974-75 is given below.

South Coast Air Basin Surface Airflow Patterns

The airflow patterns in the South Coast Air Basin can generally be characterized by one of the six directional types illustrated in Figure 1. For example, as shown in Table 1, the westerly type II was the predominant type during 1974-75, with an overall 41 percent occurrence. On the other hand, easterly type III was the predominant type at 4 a.m. during the October-December quarter with a 44 percent occurrence.

As indicated in Table 1, about four percent of the airflow charts depict winds too light to have any directional patterns; these airflows are characterized as calm type VII. About 17 percent of the airflow charts do not fit the designated directional types; these airflows are characterized as miscellaneous type VIII.

San Francisco Bay Area Air Basin Surface Air Flow Patterns

The airflow patterns in the Bay Area Air Basin can generally be characterized by one of the five directional types illustrated in Figure 2. For example, as shown in Table 2, the westerly type I was the predominant type in 1974-75. However, the occurrence of this type in April-June and July-September (75 and 89 percent) was markedly higher than in the other two quarters.

A study of 10 days in the Bay Area on which oxidant concentrations reached .2 ppm or more indicates that such days tend to have miscellaneous type VII airflow at 10 a.m. Specific charts for such days usually show 10 a.m. winds onshore off the bay (generally upslope) and northeasterly winds in the Fairfield vicinity. A discussion of a day with adverse air quality was presented in the April-June 1975 issue of this publication.

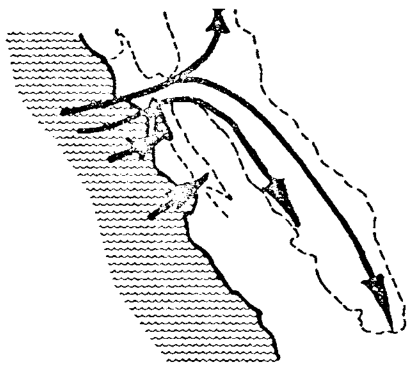
San Joaquin Valley Air Basin Surface Airflow Patterns

The four directional types illustrated by Figure 3 characterize most of the airflow patterns in the San Joaquin Valley. For example, the northwesterly type I was predominant in 1974-75.

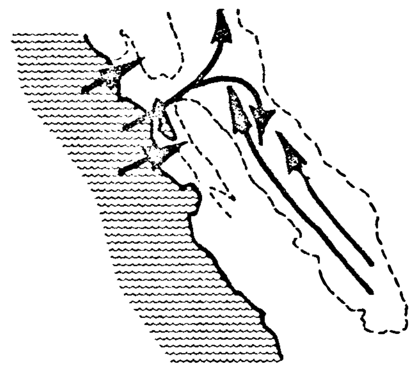
Examination of the tables can uncover seasonal variations in airflow types. For example, the predominant airflow type is the northwesterly type I in summer, but the southeasterly type III is dominant in winter.

Figure 3

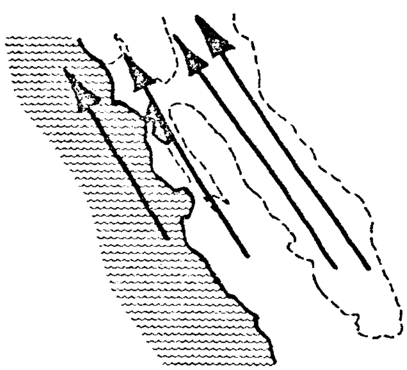
SAN JOAQUIN VALLEY AIRFLOW TYPES



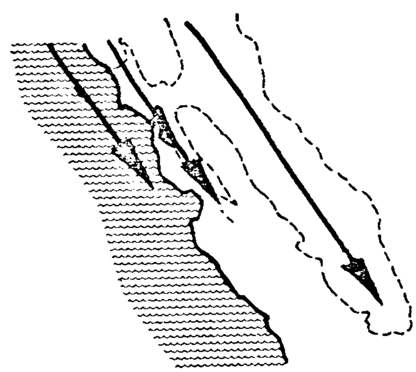
Northwest, Type I



South, Type II



Southeast, Type III



North, Type IV

Calm, Type V

Miscellaneous, Type VI

Table 3

PERCENT OCCURRENCE OF AIRFLOW TYPES BY SEASON AND TIME OF DAY
SAN JOAQUIN VALLEY (1974-75 DATA)

Type	I Northwest	II South	III Southeast	IV North	V Calm	VI Misc.
January-March						
4 a.m.	11%	9%	26%	11%	26%	18%
10 a.m.	11	8	35	15	10	21
4 p.m.	33	16	14	9	4	23
10 p.m.	22	8	26	10	16	19
All Times	19	10	25	11	14	20
April-June						
4 a.m.	57	10	3	4	7	20
10 a.m.	70	12	2	3	1	13
4 p.m.	89	4	0	2	0	4
10 p.m.	90	2	1	3	1	3
All Times	77	7	1	3	2	10
July-September						
4 a.m.	75	6	0	0	9	10
10 a.m.	84	5	1	2	1	7
4 p.m.	97	1	0	1	0	1
10 p.m.	94	2	0	2	1	2
All Times	88	3	0	1	3	5
October-December						
4 a.m.	10	3	14	9	47	17
10 a.m.	16	7	19	11	22	25
4 p.m.	41	8	8	12	12	18
10 p.m.	17	6	11	11	40	16
All Times	21	6	13	11	30	19
Yearly						
4 a.m.	40	7	11	6	21	16
10 a.m.	47	8	14	8	8	16
4 p.m.	66	7	6	6	4	12
10 p.m.	57	4	9	6	14	9
All Times	52	7	10	6	11	13

* Within a seasonal grouping, each entry represents the percent occurrence of that type for the stated time of day. The percents add to near 100% horizontally.

Impact of Meteorological Conditions on Particulate Concentrations

Some aspects of the relationship between meteorological conditions and particulate concentrations have been discussed in earlier issues of this publication. These include: evaluation of high-volume sampler data (June-August 1971, pg. 5); wind speed and high particulate loadings due to blowing dust (March-May 1971, pg. 4); mean 2-day particulate levels for two different burning periods (September-December 1971, pg. 4); effect of wind transit time on lead concentrations at Sacramento (July-September 1973, pg. 2, 5); naturally occurring airborne dust (January-March 1974, pg. 2-3); and lead and total particulate concentrations on days with adverse and favorable meteorological conditions in the San Francisco Bay area (April-June 1975, pg. 4-6).

One of the highest correlations between a particular meteorological condition and a particular pollutant concentration is that between the temperature aloft, some 5,000 ft above sea level, and oxidant concentration which has also been discussed in earlier issues of this publication. Two references are: mountain temperatures and Azusa oxidant 1957-1972 (January-March 1972, pg. 5) and California oxidant occurrence vs. temperature aloft at 5,000 ft (April-June 1972, pg. 3-4). Work to date by Spencer Duckworth of the Board's staff indicates that marked changes in the temperature aloft are also conducive to marked changes in particulate concentration. Some examples are given below.

Table 7

MEAN VALUES OF TEMPERATURE ALOFT AND
PARTICULATE CONCENTRATION FOR SELECTED MONTHS

Air Basin	No. Stns	Mon Year	Mean 850-mb Temp (^{o}C)	Temp Chg (^{o}C)	Mean Part Conc (ug/m^3)	Conc Change (ug/m^3)
Sacramento	6	Mar 72	9.4		68	
Valley	6	Mar 73	3.3	-6.1	37	-31
"	6	Sep 72	15.6		69	
"	6	Sep 74	20.0	+4.4	105	+36
San Diego	2	Mar 72	14.2		106	
"	2	Mar 73	3.4	-10.8	62	-44
Bay Area	10	Feb 72	6.1		69	
"	10	Feb 73	3.4	-2.7	47	-22
"	11	Sep 72	14.9		60	
"	11	Sep 74	20.8	+5.9	85	+25
South Coast	13	Feb 72	9.7		129	
"	13	Feb 73	4.7	-5.0	76	-53
"	16	Mar 72	13.3		138	
"	16	Mar 73	3.0	-10.3	62	-76

As shown in Table 7, a marked decrease in the monthly mean temperature aloft (some 5,000 ft above sea level) tends to be associated with a decrease in the mean particulate concentration ranging from 22 to 76 ug/m^3. Likewise, a marked increase in temperature tends to be associated with an increase in particulate ranging from 25 to 36 ug/m^3, based on the selected examples. Staff work is continuing to see if these apparent relationships are quantitative over a wide range of temperature.

Oxidant Patterns in the San Joaquin Valley Air Basin

Areawide oxidant patterns have been drawn for various time periods and areas of the state, including the San Joaquin. Three examples were shown in the 1973 Board report "The Distribution of Carbon Monoxide and Oxidant Concentrations in Urban Areas." One example shows the August 1972 distribution of max-hour oxidant in the southern San Joaquin. The pattern shows a high of about .12 ppm at Visalia, decreasing to about .08 ppm on the west side of the valley. The other two patterns show the July-September 1970-72 distribution of max-hour oxidant in the South Coast and the annual 1969-70 distribution of days per year with a max-hour $\geq$.10 ppm in the Bay Area. These patterns are helpful in estimating the portion of the regional area with maximum exposure, as well as in estimating oxidant levels at places between sampling stations, where no measurements were taken.

To more fully document oxidant occurrence in the San Joaquin Valley and its impact on agricultural crops, the Board has recently established some new oxidant sampling stations. Two of these stations, shown in Figure 4, are at Arvin and Conner, south of Bakersfield. The Arvin site was chosen to provide ozone concentration measurements in close proximity to a location where studies of air pollution effects on cotton growth and fruiting are being conducted.

As shown in Figure 5, the April 1976 oxidant concentration at Arvin was similar to that at Conner, and both levels were higher than that measured at Bakersfield. The lower concentrations at Bakersfield, in part, are due to the depressing effect of nitric oxide emissions (from sources such as motor vehicles) on oxidant levels measured in the immediate vicinity.

As part of a program to more fully document the representativeness of air monitoring stations, the Board is conducting an extensive survey in the vicinity of Fresno, during the summer of 1976. The survey is designed to determine in detail the exposure of the Fresno station, which was installed to measure community-wide pollution. The survey procedure includes the use of three air monitoring vans to sample at six different locations and two air monitoring station wagons to measure concentrations along prescribed routes. The measured concentrations will then be used to determine the hour-by-hour oxidant patterns around the Fresno station. These results will be reported in the form of an exposure factor which indicates the relative difference in oxidant level between the station and surrounding locations.

FIGURE 4

LOCATION OF MONITORING SITES IN THE LOWER SAN JOAQUIN VALLEY

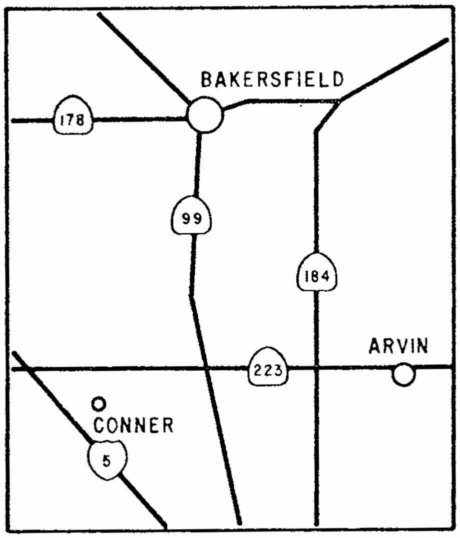
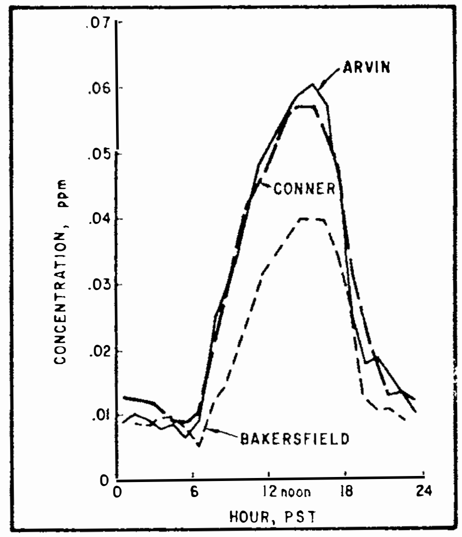


FIGURE 5

AVERAGE HOURLY OZONE CONCENTRATIONS APRIL 1976



Air Resources Board Adopts Special Ambient Air Quality Standards for Carbon Monoxide and Visibility for the Lake Tahoe Air Basin

At its March 30, 1976 meeting, the Air Resources Board adopted ambient air quality standards for carbon monoxide and visibility reducing particles for the recently formed Lake Tahoe Air Basin. The new standards are:

> Carbon monoxide -- six parts per million (ppm) for eight hours; and
>
> Visibility reducing particles -- in sufficient amount to reduce the prevailing visibility to less than 30 miles when the relative humidity is less than 70 percent.

The carbon monoxide standard was adopted because the lowered oxygen tension in the body at high altitude leads to greater absorption of carbon monoxide. Also, persons participating in strenuous recreational activities at high altitude are often unacclimated. This standard for carbon monoxide was recommended by the State Department of Health and its Air Quality Advisory Committee. For other air basins, the eight hour carbon monoxide standard is nine ppm. The 35 ppm one-hour carbon monoxide standard is applicable statewide.

The visibility standard was adopted because the unique scenic quality of the Basin is enhanced by the ability to see clearly from crest to crest across the lake, the longest line of sight being about 30 miles in a north-south direction. For other air basins, the visibility standard is 10 miles. Daily visibility observations are being taken in the Basin by personnel of the Air Resources Board.

CALIFORNIA AIR QUALITY DATA
JANUARY FEBRUARY MARCH 1976
Vol. VIII No. 1

AIR ANALYSIS COMMENTS

Summary of 1975 Air Quality Data

JANUARY-MARCH 1976 DATA SECTION

CALIFORNIA AIR RESOURCES BOARD
TECHNICAL SERVICES DIVISION
P.O. Box 2815 Sacramento, California 95812

AIR ANALYSIS COMMENTS

Summary of 1975 Air Quality Data

Introduction

Seven tables containing summary air quality information for 1975 are given on pages 4-25. These tables show occurrences above selected reference levels or air quality standards for oxidant, carbon monoxide, nitrogen dioxide, total particulate and lead. For sulfur dioxide, the highest 24-hour concentration measured each month is given.

The national and state air quality standards are summarized on page 14 of the Vol. VII, No. 3 (July-September 1975) issue of this publication. The state 24-hour standard for sulfur dioxide is under court challenge from a Western Oil & Gas suit filed in February 1976.

Since June 1, 1975, oxidant concentration measurements in California have been based on calibrations using the ultraviolet photometry method. Measurements by this method are more accurate and slightly lower than those based on the previous calibration method. Some further discussion of this topic is given in the following section on oxidant. As discussed, most oxidant data taken prior to June 1, 1975 must be adjusted before it can be compared to data taken after that date. In the summaries presented here, the oxidant data for January 1-May 31, 1975 have been adjusted.

Summaries of pollutant concentrations (other than oxidant) for earlier years may be compared directly to the summaries given in this issue. Some summaries for 1974 air quality data are given in Vol. VI, No. 4; Vol. VII, No. 1 and Vol. VII, No. 3. Other summaries are given in the publications: "California Air Quality Data -- Supplement for Environmental Impact Assessments" (1973 & 1974 issues) and "Ten-Year Summary of California Air Quality Data 1963-1972." These earlier publications, as well as a subscription to this publication, can be obtained by request to the Board's public information office.

Oxidant

The occurrences of adjusted hourly oxidant concentrations greater than .08 ppm are given in Table 1. The .08 ppm level is the national standard for this pollutant. Thus, the data in Table 1 show the occurrences of hours and days in excess of the standard.

The occurrences of adjusted hourly oxidant concentrations of .20 ppm or more are given in Table 2. The .20 ppm level is the first stage of the California Air Pollution Emergency Plan, and a stage 1 episode is declared whenever a .20 ppm oxidant level occurs or is predicted.

As indicated above, oxidant measurements in California have been based on calibrations using the ultraviolet photometry method since June 1, 1975. Measurements made prior to that date should be adjusted before comparisons are made with recent data, and the Board's staff is now in the process of completing adjustments back to 1963. In the meantime, readers wishing to make their own adjustments to single hourly concentrations (such as the max-hour which appears in this publication) may do so by using the following factors: Stations located in San Diego County: multiply by .85 factor. Stations located in Los Angeles County: no adjustment necessary. Stations located in all other counties of the state: multiply by .8 factor. A guide to the county locations of the various stations can be found on pages 11-18 of Vol. VII, No. 2 (April-June 1975) issue of this publication.

Carbon Monoxide

The occurrences of 8-hour carbon monoxide concentrations greater than 9 ppm are given in Table 3. The 9 ppm level is one of the national standards for this pollutant. Thus, the data in Table 3 show the occurrences of hours and days, by station, when concentrations in excess of the standard were measured.

A moving 8-hour average is used in determining the hours count shown in Table 3, and a given hour may contribute to more than one 8-hr average. For example, if the midnight to 8 a.m. period exceeds 9 ppm, the count is eight hours. If the 8-hour moving average continues to be greater than 9 ppm, each new hour involved in the average is added to the original count. Thus, the greatest count of hours in excess of the standard is 24, assuming all the 8-hour moving averages exceed 9 ppm.

Nitrogen Dioxide

The occurrences of hourly nitrogen dioxide concentrations in excess of the California air quality standard (.25 ppm) are given in Table 4.

Sulfur Dioxide

The highest 24-hour sulfur dioxide concentrations measured each month, by station, are given in Table 5.

Particulate Matter

A summary of total suspended particulate matter concentrations is given in Table 6. The 260, 150, and 100 ug/m^3 levels are the national primary, national secondary, and California 24-hour standards, respectively.

The annual geometric means shown can be compared to the California annual standard of 60 ug/m^3. A measure of the dispersion around this mean (the geometric standard deviation) is given in the right hand column.

Lead

A summary of monthly lead particulate concentrations is given in Table 7. The number of monthly lead concentrations per year exceeding the California air quality standard (1.5 ug/m^3) are shown in the far right hand column.

N-12

TABLE 1
OCCURRENCES OF OXIDANT HAVING A VALUE OF GREATER THAN .08 PPM
1975

BASIN, STATION	JAN+		FEB+		MAR+		APR+		MAY+		JUN		JUL		AUG		SEP		OCT		NOV		DEC		ANNUAL	
	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY
SAN DIEGO																										
Chollas Heights*	3	2	0	0	2	1	0	0	9	2	0	0	0	0	4	3	5	4	11	3	1	1	1	1	36	17
Chula Vista*	3	2	4	2	5	2	2	1	18	5	1	1	1	1	16	7	21	6	31	7	19	5	2	1	123	40
El Cajon	0	0	0	0	0	0	3	2	19	5	7	5	2*	1*	22*	9*	12*	6*	14*	3*	1*	1*	0*	0*	80	32
Escondido-VlyPkwy*	10	2	7	2	8	2	2	2	17	6	18	4	1	1	36	12	30	8	28	5	23	8	1	1	181	53
Imperial Bch-NALF*	–	–	–	–	–	–	–	–	–	–	–	–	0	0	18	8	22	6	42	10	35	8	32	7	–	–
Oceanside-So Clvlnd	4	3	0	0	2	2	1	1	7	4	13	2	4*	2*	5*	2*	37*	8*	39*	9*	40*	6*	9*	4*	161	43
San Diego-Isle Ave	0	0	3	2	3	2	1	1	7	3	0	0	0*	0*	7*	3*	9*	4*	23*	5*	13*	3*	0*	0*	66	23
San Diego-Overland*	9	2	11	4	11	4	8	2	38	7	6	3	2	1	18	6	21	6	34	7	29	10	5	2	192	54
San Ysidro	7	3	7	4	4	2	0	0	1	1	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SACRAMENTO VALLEY																										
Chico	0	0	0	0	0	0	0	0	1	1	3	2	1	1	4	3	6	2	2	1	0	0	0	0	17	10
Davis - 5th St*	0	0	0	0	0	0	0	0	0	0	–	–	15	5	3	2	12	6	0	0	0	0	0	0	–	–
Red Bluff-Lincoln*	3	1	0	0	0	0	0	0	3	1	2	1	7	4	13	6	5	3	6	2	0	0	0	0	39	18
Redding Market	0	0	0	0	0	0	0	0	10	2	32	9	20	7	–	–	–	–	–	–	–	–	–	–	–	–
Sacramento-Creekside	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	25	8	2	1	0	0	0	0	–	–
Sacramento-1025 "P"	0	0	0	0	0	0	0	0	14	3	5	1	41	10	21	6	34	12	1	1	0	0	0	0	116	33
Woodland-W.Main*	0	0	0	0	0	0	0	0	3	1	3	2	34	9	7	5	13	6	0	0	–	–	0	0	60	23
Yuba City	0	0	0	0	4	1	0	0	16	3	16	6	7	3	–	–	–	–	–	–	–	–	–	–	–	–
SAN JOAQUIN VALLEY																										
Bakersfield-Chester	0	0	0	0	0	0	0	0	15	5	65	16	24	24	106	24	65	28	12	7	0	0	0	0	287	104
Delano*	–	–	–	–	–	–	–	–	3	2	7	4	27	8	51	12	0	0	13	3	1	1	0	0	–	–
Five Points	0	0	–	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fresno-Olive	0	0	0	0	0	0	0	0	20	6	36	7	20	7	26	9	42	15	10	4	0	0	0	0	154	48
Merced**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	3	2	2	0	0	0	0	0	0	–	–
Merced-18th & S*	–	–	–	–	–	–	0	0	6	3	20	6	18	3	22	8	34	13	11	5	0	0	0	0	–	–
Merced-Trailer	0	0	2	1	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Modesto-J St	0	0	0	0	0	0	0	0	8	2	14	5	2	2	4	2	6	3	2	1	0	0	0	0	36	15
Parlier	5	2	1	1	0	0	0	0	50	15	114	21	101	23	151	26	95	21	32	9	6	2	0	0	555	120
Stockton-Hazelton	0	0	0	0	0	0	0	0	11	3	3	3	9	4	31	9	18	6	4	1	0	0	0	0	76	26
Visalia-Old Jail*	0	0	2	1	1	1	0	0	6	2	36	10	19	7	5	3	3	3	5	3	0	0	0	0	77	30

* Measurements by ultraviolet absorption method.
** Measurements by chemiluminescence method.
\+ Measurements adjusted to the new U.V. calibration standard.

TABLE

OCCURRENCES OF CARBON MONOXIDE HAVING

AN 8-HOUR MOVING AVERAGE OF GREATER THAN 9 PPM

1975

BASIN, STATION	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		ANNUAL	
	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY	HR	DY
SOUTH COAST (CONT'D)																										
Temple City	97	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71	9	77	9	245	28
Temple City*	–	–	–	–	–	–	–	–	–	–	–	–	0	0	0	0	0	0	0	0	57	9	174	21	–	–
Upland-Civic Cent	0	0	0	0	0	0	0	0	26	3	14	1	61	3	0	0	32	2	0	0	10	2	0	0	143	11
West Los Angeles	205	17	25	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	79	6	230	23	539	48
Whittier	164	16	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88	10	196	21	456	49
SAN DIEGO																										
El Cajon*	17	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	2	54	8	82	14
Escondido-Val *	0	0	0	0	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	1
San Diego-Isl Av*	34	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	8	28	6	128	20
SACRAMENTO VALLEY																										
Chico	22	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	4	41	8
Sacramento-1025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	1	11	1
SAN JOAQUIN VALLEY																										
Bakersfield-Ches	48	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	9	9	2	104	16
Delano	–	–	–	–	–	–	–	–	–	–	–	–	0	0	0	0	0	0	0	0	13	2	0	0	–	–
Fresno-Olive	77	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	2	19	3	125	14	168	16	398	45
Merced	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	0	0	0	9	2	–	–
Modesto-J St	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	6	0	0	31	6
Stockton-Hazelton	13	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	4	18	4	55	10
Visalia-Old Jail	149	10	0	0	0	0	15	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	164	11
SOUTHEAST DESERT																										
Indio-Oasis St	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	2	10	2
Lancaster	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	2	10	2

*Measured by flame ionization detection (FID)

TABLE 5

HIGH 24-HOUR AVERAGE SULFUR DIOXIDE CONCENTRATIONS, PPM

1975

BASIN, STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SOUTH COAST (CONT'D)												
West Los Angeles	.04	.04	.03	.03	.03	.02	.02	.02	.02	.02	.03	.03
Whittier	.06	.06	.06	.03	.04	.04	.05	.05	.04	.05	.05	.04
SAN DIEGO												
El Cajon	.01	.01	.01	.01	.02	.02	.01	.01	.02	.02	.01	.01
Chula Vista	.01	.00	.00	.00	.00	.00	.00	.00	.01	.00	.00	-
Imperial Beach-NALF	-	-	-	-	-	-	.00	.00	.00	.00	.00	-
San Diego-Island	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.02	.02
Oceanside-So Clevel	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	-
San Ysidro	.01	.00	.00	.00	.00	.00	-	-	-	-	-	-
San Diego-Overland	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	-
SAN JOAQUIN VALLEY												
Five Points	.01	.01	.02	.01	.02	.02	.01	.02	.02	.01	.02	.00
SOUTHEAST DESERT												
El Centro	.01	.02	.01	.01	.02	.01	.02	.01	.01	.01	.03	.01

TABLE 6
SUMMARY OF PARTICULATE MATTER DATA

1975

BASIN, STATION	TOTAL NO. OF SAMPLES	NO. OF SAMPLES > 260 µg/m3	> 150 µg/m3	≥ 100 µg/m3	MAX µg/m3	MIN µg/m3	ANNUAL GEOMETRIC MEAN ug/m3**	σ_g **
SACRAMENTO VALLEY (CON'T.)								
Davis - 5th St	59	0	0	13	134	17	64.2	1.6
Dunnigan - Main St	57	0	0	6	114	10	50.3	1.9
Live Oak - Fire Stn	38	0	1	17	225	16	76.1	1.9
Los Molinos	50	0	0	2	135	8	40.5	2.1
Manzanita - 99	54	0	0	4	111	13	46.2	1.8
Marysville - Shell Road	59	0	2	8	162	7	50.5	1.9
Nord	53	0	1	3	165	14	45.6	1.9
Oroville - Bird St	56	0	0	2	124	11	44.3	1.7
Pleasant Grove	41	1	2	4	263	14	47.9	1.9
Red Bluff	55	0	2	6	172	9	55.4	1.8
Red Bluff - A G Comm Office	57	0	0	4	145	9	44.1	1.9
Red Bluff - Lincoln	58	0	2	7	174	10	49.1	1.9
Redding - H.D. Roof	59	0	0	5	134	12	47.0	1.8
Redding - Market	32	0	0	0	94	20	42.0	1.5
Rio Vista - Main St .	57	0	0	0	64	64	64.0	1.0
Sacramento - Branch Center	40	0	0	1	110	3	52.1	1.8
Sacramento - 1025 P St	59	0	0	7	135	19	59.9	1.5
Smartville	58	0	1	2	177	5	34.4	2.1
Sutter City	45	0	2	17	201	8	63.2	2.2
Vacaville	8	0	0	1	105	37	--	--
West Sacramento - 15th St	74	0	2	15	192	19	66.5	1.6
Wheatland	54	0	0	8	136	12	56.6	1.8
Woodland - W Main St	13	0	0	6	150	48	--	--
Yuba City	35	0	3	11	170	17	62.0	1.9
SAN JOAQUIN VALLEY								
Bakersfield - H.D. Flower	58	3	25	46	321	34	132.4	1.6
Bakersfield - Chester St	63	7	21	51	323	41	138.7	1.5
Coalinga	14	0	6	12	243	58	--	--
Corcoran - Fire Stn	5	0	1	3	153	48	--	--
Five Points	59	1	8	24	275	14	82.9	1.9

** Calculations not performed for stations with less than 30 samples

TABLE 6
SUMMARY OF PARTICULATE MATTER DATA

1975

BASIN, STATION	TOTAL NO. OF SAMPLES	NO. OF SAMPLES > 260 µg/m3	NO. OF SAMPLES >150 µg/m3	NO. OF SAMPLES ≥ 100 µg/m3	MAX µg/m3	MIN µg/m3	ANNUAL GEOMETRIC MEAN ug/m3**	σg **
SAN JOAQUIN VALLEY (CON'T.)								
Fresno - Cal State	60	1	8	37	288	17	99.1	1.7
Fresno - Cedar St	9	0	1	6	243	60	--	--
Fresno - Olive	50	0	9	29	233	36	111.0	1.4
Goshen	55	7	25	43	407	31	139.3	1.6
Kern Refuge	28	0	7	10	239	16	--	--
Los Banos	53	0	1	12	174	23	68.9	1.5
Madera - Library	42	0	7	17	249	28	91.4	1.6
Merced	50	0	0	17	150	20	75.7	1.6
Merced - Trailer	18	0	0	2	116	20	--	--
Merced - 18th & S St	38	0	1	12	162	31	82.0	1.4
Modesto - J St	59	0	6	29	211	40	97.6	1.5
Modesto - Oakdale Rd	44	0	1	6	152	20	65.4	1.6
New Jerusalum	4	0	0	0	69	20	--	--
Parlier	55	1	13	37	289	17	106.2	1.7
Patterson	55	0	2	19	206	18	73.7	1.7
Porterville	52	3	13	39	287	24	121.9	1.5
Salida	46	0	0	9	147	27	73.0	1.5
Stockton - Hazelton St	41	4	4	16	640	18	81.5	2.2
Taft	45	1	3	27	272	23	95.8	1.8
Three Rivers	56	0	1	5	181	9	52.0	1.8
Tracy - Caltrans	4	0	0	0	93	36	--	--
Turlock	54	0	1	18	157	19	80.7	1.6
Visalia - Old Jail	56	1	29	46	470	33	141.7	1.5
SOUTHEAST DESERT								
Banning - Allesandro	48	0	0	8	148	11	54.7	1.8
Boron - Fire Station	57	2	4	10	1234	12	65.4	2.0
Brawley - Fire Stn	51	10	41	49	795	56	210.3	1.5
Calexico - Fire Stn	51	19	44	47	535	75	220.4	1.5
China Lake	53	1	2	3	534	16	49.7	1.8
El Centro - Broadway	59	6	22	48	1358	61	145.0	1.6
Indio - Oasis St	59	4	21	45	659	63	135.2	1.5

** Calculations not performed for stations with less than 30 samples

TABLE 7

1975

ANNUAL SUMMARY OF LEAD DATA *

BASIN, STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	NUMBER OF MONTHLY AVG. $\geq 1.50\ \mu g/m^3$
SAN JOAQUIN VALLEY													
Bakersfield-Chester St	2.67	2.04	0.92	0.88	1.01	1.06	1.10	1.32	2.21	2.16	3.75	3.98	6
Fresno-Cedar St	2.17	1.67	1.36	--	--	--	--	--	--	--	--	--	-
Fresno-Olive	--	--	1.63	1.45	1.29	1.36	1.43	1.67	2.05	2.23	3.93	2.25	-
Madera-Library	--	--	0.65	0.40	0.63	0.54	0.51	--	1.33	1.15	1.65	1.61	2
Merced	--	--	--	0.35	--	--	--	--	--	--	--	--	-
Merced-18th & S St	--	--	--	--	0.55	0.36	0.38	0.46	0.62	0.81	1.77	2.43	-
Merced-Trailer	1.10	1.00	0.45	0.46	--	--	0.77	--	--	--	--	--	-
New Jerusalum	--	--	--	0.26	--	--	--	--	--	--	--	--	-
SOUTHEAST DESERT													
El Centro-Bdwy	1.01	0.70	0.50	0.33	0.37	0.31	0.33	0.41	0.46	0.62	1.56	0.75	1
Indio-Oasis St	1.12	1.23	0.64	0.35	0.48	0.60	0.54	0.45	0.70	0.82	1.31	1.38	0
MOUNTAIN COUNTIES													
Sonora	1.40	0.77	0.63	0.64	0.77	0.42	0.66	0.80	1.06	1.40	1.54	1.79	2
LAKE COUNTY													
Lakeport-Lakeport Blvd	0.27	0.08	0.08	0.12	0.12	0.08	0.13	0.17	0.19	0.16	0.26	0.35	0

* All data adjusted to a standard (glass fiber filter) data base

CALIFORNIA AIR QUALITY DATA
APRIL MAY JUNE 1976

Vol. VIII No. 2

AIR ANALYSIS ARTICLES

DATA SECTION

TECHNICAL SERVICES DIVISION
AIR ANALYSIS BRANCH
P.O. Box 2815 Sacramento, California 95812

The California Sulfate Problem

The Air Resources Board (ARB) is concerned with sulfate pollution in California, particularly in the South Coast Air Basin. The Board's concern has been evident in the various hearings held to discuss sulfate impact and the Board's actions in setting a sulfate standard, establishing emergency episode criteria for sulfate in combination with oxidant, and in petitioning the California PUC for reallocation of natural gas.

This article presents an overview of the California sulfate problem. Other related articles follow and are listed in the index on page one. A station-by-station summary of 1975 sulfate concentrations is included as part of the last article in this series on sulfate. A major ARB report on sulfate is identified in the section "Announcement of New Publications."

A summary of 1975 sulfate concentrations for seven air basins is given in Table 1. As shown, the highest concentrations occur in the South Coast Air Basin. In this basin the highest daily, quarterly mean and annual mean concentrations for 1975 were 60, 15, and 11 ug/m^3, respectively. By comparison, the highest concentrations in the Bay Area Air Basin were 13, four, and two ug/m^3. The highest quarterly average occurred in the third quarter in most air basins.

Daily concentrations in excess of the state standard were reported six percent of the time in the South Coast and two percent of the time in the San Diego and South Central Coast Air Basins. With the exceptions of those parts of the San Diego and South Central Coast Air Basins adjacent to the South Coast, no other California Air Basins show any sulfate concentrations in excess of the standard (25 ug/m^3).

The station in the South Central Coast Air Basin that shows sulfate concentrations in excess of the standard is Thousand Oaks. This station is located in the southeastern part of Ventura County, about two miles from the Los Angeles County - Ventura County border, which is part of the basin boundary.

The station in the San Diego Air Basin that shows sulfate concentrations in excess of standard is Vista. This station is located in the northwestern part of San Diego County about 20 miles from the Orange County - San Diego County border, which is part of the basin boundary.

A preliminary study of sulfate occurrence at Thousand Oaks indicates that a high sulfate level at this station is generally associated with a high concentration in the South Coast. During 1972-75 there were 55 days at Thousand Oaks with a sulfate level in excess of the standard. The mean of the 55 maximum daily sulfate concentrations at stations in the South Coast on the day prior, the same day, and the day after (a 25 ug/m^3 or more day at Thousand Oaks) is 33, 37, and 35 ug/m^3 respectively.

A similar preliminary study for Vista indicates there were 53 days during 1972-75 at Vista with sulfate levels an excess of standard. The mean of the 53 maximum daily sulfate concentrations at stations in the South Coast on the day prior, the same day, and the day after (a 25 ug/m^3 or more day at Vista) is 32, 34, and 29 ug/m^3 respectively.

Based on the above and similar kinds of findings, it is concluded that sulfate episodes in California tend to be areawide events that occur only in the South Coast Air Basin and close-in parts of two contiguous basins.

Table 1

1975 SULFATE CONCENTRATION SUMMARY, BY AIR BASIN

Air Basins & No. of Stns.		Average ($\mu g/m^3$)					Total Samples					Highest 24-Hr ($\mu g/m^3$)					24-Hr Samples Exceeding Standard of 25 $\mu g/m^3$: Number*					24-Hr Samples Exceeding Standard of 25 $\mu g/m^3$: Percent of Total				
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Yr	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Yr	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Yr	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Yr	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Yr
S.F. Bay Area	19	2.1	2.0	3.5	2.2	2.5	169	161	183	142	655	13.3	7.9	9.7	7.8	13.3	0	0	0	0	0	0	0	0	0	0
South Central	2	4.6	10.1	10.9	6.7	8.2	84	88	104	98	374	35.1	32.0	28.9	22.6	35.1	2	2	2	0	6	2.4	2.3	1.9	0	1.6
South Coast	30	6.5	11.5	15.1	9.7	10.7	701	756	661	653	2771	59.7	41.0	44.9	49.0	59.7	31	51	59	26	167	4.4	6.7	8.9	4.0	6.0
San Diego	2	5.4	9.2	10.2	8.5	8.4	91	98	95	94	378	26.0	41.2	24.3	35.1	41.2	1	4	0	4	9	1.1	4.1	0	4.3	2.4
Sacramento	1	4.5	2.5	3.9	2.6	3.4	7	7	7	6	27	11.1	3.9	5.8	5.8	11.1	0	0	0	0	0	0	0	0	0	0
San Joaquin	1	3.9	2.6	5.5	4.8	4.2	6	8	8	7	29	6.9	4.5	7.3	8.2	8.2	0	0	0	0	0	0	0	0	0	0
S.E. Desert	3	1.8	4.4	5.6	3.5	3.9	42	45	43	42	172	10.1	10.9	10.8	9.7	10.9	0	0	0	0	0	0	0	0	0	0

* Total Number of samples taken at all stations (number does not represent basin days).

Table 6 (Cont'd)

1975 SULFATE CONCENTRATION SUMMARY, BY BASIN AND MONITORING STATION

Air Basins & Stations	Average ($\mu g/m^3$)					Total Samples					Highest 24-Hr ($\mu g/m^3$)					24-Hr Samples Exceeding Standard of 25 $\mu g/m^3$: Number					24-Hr Samples Exceeding Standard of 25 $\mu g/m^3$: Percent of Total				
	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Yr	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Yr	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Yr	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Yr	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Yr
San Diego																									
San Diego (NASN)	5.9	10.7	9.7	6.3	8.0	8	7	5	6	26	10.0	21.1	13.0	7.7	21.1	0	0	0	0	0	0	0	0	0	0
Vista (CHESS)	5.4	9.1	10.2	8.7	8.4	83	91	90	88	352	26.0	41.2	24.3	35.1	41.2	1	4	0	4	9	1.2	4.4	0	4.5	2.6
Sacramento Valley																									
Sacramento (NASN)	4.5	2.5	3.9	2.6	3.4	7	7	7	6	27	11.1	3.9	5.8	5.8	11.1	0	0	0	0	0	0	0	0	0	0
San Joaquin Valley																									
Fresno (NASN)	3.9	2.6	5.5	4.8	4.2	6	8	8	7	29	6.9	4.5	7.3	8.2	8.2	0	0	0	0	0	0	0	0	0	0
Southeast Desert																									
Lancaster	2.1	4.1	4.4	3.3	3.5	15	15	15	15	60	4.8	10.9	6.5	7.2	10.9	0	0	0	0	0	0	0	0	0	0
Victorville	1.6	4.7	6.9	4.4	4.4	15	15	15	13	58	10.1	9.6	10.8	7.7	10.8	0	0	0	0	0	0	0	0	0	0
Barstow	1.7	4.3	5.6	3.0	3.7	12	15	13	14	54	5.4	9.2	8.5	9.7	9.7	0	0	0	0	0	0	0	0	0	0

CALIFORNIA AIR QUALITY DATA
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AIR ANALYSIS COMMENTS*

DATA SECTION

* Please note that these comments are not confined to the data reporting period.

AIR RESOURCES BOARD -- TECHNICAL SERVICES DIVISION

Air Analysis Branch and EDP Management Section

P. O. Box 2815 Sacramento, California 95812

FIGURE 1


CALIFORNIA AIR BASINS
NORTHEAST
PLATEAU
NORTH COAST
SACRAMENTO VALLEY
LAKE CO
MOUNTAIN COUNTIES
LAKE TAHOE
SCALE IN MILES
0
100
SAN FRANCISCO BAY AREA
GREAT BASIN VALLEYS
SAN JOAQUIN VALLEY
NORTH CENTRAL COAST
SOUTH CENTRAL COAST
SOUTHEAST DESERT
SOUTH COAST
SAN DIEGO
JULY 1, 1977

California Air Basin Boundary Changes

The last air basin map to appear in this publication was presented in the April-June 1975 issue (Vol. VII, No. 2). Since that time there have been three Board actions which changed basin boundaries. The boundaries as of July 1, 1977 are described below and shown in Figure 1. The air monitoring data in this issue are all arranged according to the new basin boundaries.

. . Mountain Counties - Lake Tahoe Air Basins

At its December 15, 1975 meeting, the Air Resources Board (ARB) voted to remove the Tahoe area from the Mountain Counties Air Basin and to create a new Lake Tahoe Air Basin. A report on this action is given in the December 1975-January 1976 issue of the Board's publication "California Air Resources Board Bulletin." Copies of the "Bulletin" are available from the Board's Public Information Office.

. . South Coast - South Central Coast Air Basins

At its June 25, 1976 meeting the ARB voted to relocate Ventura County and a portion of Santa Barbara County from the South Coast to the South Central Coast Air Basin. A report on this action is given in the July 1976 issue of the Board's "Bulletin."

In announcing the adoption of the resolution, ARB Chairman Tom Quinn said the Board still believes that Ventura County and a portion of Santa Barbara County do share a common air mass to some extent with the South Coast Air Basin and that it is vital that they consider the effect on air quality in adjoining air basins when establishing regulations to control emmissions.

. . San Diego - Southeast Desert Air Basins

At its May 25, 1977 meeting the ARB voted to place all of San Diego County in the San Diego Air Basin. A report on this action is given in the June 1977 issue of the Board's "Bulletin."

The Board found that meteorological and topographic factors which originally justified placing a portion of San Diego County in the Southeast Desert Air Basin were outweighed by the administrative and cost advantage of changing the air basin boundaries, so that all of San Diego County is in the San Diego Air Basin.

The Areal Representativeness of Air Monitoring Stations

In 1976 the ARB's Technical Services Division began a field survey of its air monitoring stations at Fresno and Bakersfield to determine the areal representativeness of these stations. A report on the first phase of this study by Spencer Duckworth, Don Crowe, George Shahinian, and Freeman Smith of the Division staff has been published. The report entitled "The Areal Representativeness of Air Monitoring Stations -- Fresno Study Phase I (Oxidant)" is available from the ARB's Public Information Office.

Summary of Air Quality Data for 1975-1976

The maximum pollutant concentrations measured in 1975-1976 are given, by air basin, in Table 1. The number of "basin-days" on which an air quality standard (or episode critera level) was exceeded in each air basin is given in Table 2. A basin-day in this summary is a day on which the standard or criteria level was exceeded at one or more stations in the basin. The annual geometric mean (AGM) total suspended particulate concentrations for 1975-1976 along with the monthly occurrence of lead concentrations in excess of the standard are given in Table 3 for a key station in each basin.

The standard used for compiling occurrences in these tables is the most restrictive of the applicable state or national standards. For example, the hourly state standard is used for nitrogen dioxide in place of the annual national standard; the state monthly standard for lead and the state 24-hour standard for sulfate are used since no applicable national standards have been established.

The following discussion is focused on the occurrence of days when Stage 1 episode criteria levels were exceeded. The occurrence of these kinds of days is an indicator of relatively adverse air quality. Episode levels (state) have not been established, as yet, for pollutants like particulate, nitrogen dioxide, and lead. Hence, for these pollutants the discussion is focused on the occurrences in excess of the standard.

. . Oxidant

One or more hours of oxidant concentration in excess of the Stage 1 episode criteria level were recorded in 1976 in each of seven air basins. The greatest number of basin-days (with oxidant concentration in excess of the episode criteria level at one or more stations in the basin) occurred in the South Coast Air Basin. In this basin the oxidant episode criteria level was exceeded on 102 days. In the Southeast Desert, San Diego, and South Central Coast Air Basins the oxidant episode criteria level was exceeded on 20, 9, and 6 days respectively. One episode occurred in each of three basins, viz. the San Francisco Bay Area, the North Central Coast and the San Joaquin Valley Air Basins.

. . Carbon Monoxide

There were 15 basin-days in 1976 in the South Coast Air Basin with the 12-hour carbon monoxide concentration exceeding the Stage 1 episode criteria level. No other occurrences were reported.

. . Nitrogen Dioxide

There are no episode criteria levels for nitrogen dioxide in the State Plan.

The one-hour air quality standard was exceeded on 101 days in the South Coast, 16 days in the San Diego, 11 days in the San Francisco Bay Area, and 2 days in the Southeast Desert Air Basins.

Table 1 -- MAXIMUM POLLUTANT CONCENTRATIONS, BY AIR BASIN, FOR 1975 AND 1976

Pollutant (Units)	Oxidant (ppm)		Carbon Monoxide (ppm)		Nitrogen Dioxide (ppm)				Sulfur Dioxide (ppm)						T.S.P. (ug/m3)		Sulfate (ug/m3)		Lead (ug/m3)	
Interval	1 Hour		1 Hour		1 Hour		Annual		1 Hour		24 Hour		Annual		24 Hour		24 Hour		30 Day	
Air Basin	75	76	75	76	75	76	75	76	75	76	75	76	75	76	75	76	75	76	75	76
North Coast	--	--	15	--	--	--	--	--	--	--	--	--	--	--	445	373	--	8	--	.42
San Francisco Bay Area	.23	.21	31	29	.28	.30	.04	.04	.23	.11	.06	.05	.01	.01	201	246	13	19	5.95	5.79
North Central Coast	.11	.21	15	11	.13	.12	.02	.02	--	--	--	--	--	--	161	221	--	10	1.13	1.10
South Central Coast **	.25	.23	22	22	.21	.19	.03	.04	.04	.10	.02	.02	T	T	258	269	35	25	3.28	4.43
South Coast	.39	.38	41	43	.67	.53	.08	.08	.27	.25	.06	.10	.02	.02	467	649	60	44	9.39	10.04
San Diego	.28	.29	19	19	.46	.33	.04	.06	.07	.09	.02	.02	.01	.01	430	223	41	23	3.56	4.10
Northeast Plateau	--	--	--	--	--	--	--	--	--	--	--	--	--	--	259	360	--	8	.62	1.07
Sacramento Valley	.19	.16	20	23	.20	.23	.02	.03	--	.04	--	.02	--	T*	263	277	11	9	1.62	3.40
San Joaquin Valley	.19	.22	32	33	.19	.23	.03	.04	.06	.05	.02	.02	.01	.01*	640	480	8	38	3.98	7.47
Great Basin Valleys	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Southeast Desert	.27	.28	17	14	.30	.30	.03	.02	.04	.09	.03	.02	.01	.01*	1358	1363	11	32	1.56	1.02
Mountain Counties	--	.11	--	--	--	--	--	--	--	--	--	--	--	--	344	120	--	7	1.79	1.78
Lake County	--	--	--	--	--	--	--	--	--	--	--	--	--	--	60	198	--	5	.35	.50
Lake Tahoe	.09	.10	11	10	.17	.09	.02	.01	.01	T	T	T	T	T	142	155	--	7	--	.91
Air Quality Standard	.08		35		.25		.05		.50				.03		100		25		1.50	

* May not be representative.
-- Indicates no data available.
** Includes Santa Barbara and Ventura Counties.
T Indicates trace, i.e., <.01 when rounded.

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Table 2 -- NUMBER OF BASIN-DAYS ON WHICH AIR QUALITY STANDARDS, STAGE 1 EPISODES AND OTHER LEVELS WERE EXCEEDED DURING 1975 AND 1976

	Oxidant				Carbon Monoxide		Nitrogen Dioxide		Sulfur Dioxide				Sulfate			
	One-Hour Standard		One-Hour Episode		12-Hour Episode		One-Hour Standard		24-Hour Other		24-Hour Episode		24-Hour Standard		24-Hour Episode*	
	75	76	75	76	75	76	75	76	75	76	75	76	75	76	75	76
North Coast	--	--	--	--	0	--	--	--	--	--	--	--	--	0	--	0
San Francisco Bay Area	68	64	5	1	0	0	2	11	6	2	0	0	0	0	0	0
North Central Coast	16	33	0	1	0	0	0	0	--	--	--	--	--	0	--	0
South Central Coast **	156	168	5	6	0	0	0	0	0	0	0	0	6	1	1	0
South Coast	241	248	119	102	19	15	81	101	68	53	0	0	37	35	27	25
San Diego	95	146	2	9	0	0	10	16	0	0	0	0	9	0	0	0
Northeast Plateau	--	--	--	--	--	--	--	--	--	--	--	--	--	0	--	0
Sacramento Valley	68	52	0	0	0	0	0	0	--	0	--	0	0	0	0	0
San Joaquin Valley	131	163	0	1	0	0	0	0	0	0	0	0	0	3	0	0
Great Basin Valley	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Southeast Desert	162	174	15	20	0	0	4	2	0	0	0	0	0	1	0	0
Mountain Counties	--	6	--	0	--	--	--	--	--	--	--	--	--	0	--	0
Lake County	--	--	--	--	--	--	--	--	--	--	--	--	--	0	--	0
Lake Tahoe	5	3	0	0	0	0	0	0	0	0	0	0	--	0	--	0
Concentration Criteria	.08 ppm		.20 ppm		20 ppm		.25 ppm		.04 ppm		.20 ppm		25 ug/m3		25 ug/m3	

* Coincident with a .20 ppm hourly oxidant concentration.
** Includes Santa Barbara and Ventura Counties.
-- Indicates no data available

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Table 3

TOTAL SUSPENDED PARTICULATE AND LEAD
CONCENTRATION SUMMARY FOR SELECTED STATIONS*
1975 - 1976 DATA

Air Basin	Particulate AGM (ug/m^3)#			Number of months with Lead in excess of std.#		
	Station	75	76	Station	75	76
North Coast	Ft. Bragg	96	110	Ft. Bragg	--	0
San Francisco Bay Area	Livermore	80	87	San Jose	4	5
North Central Coast	Hollister	54	54	Salinas	0	0
South Central Coast+	Santa Paula	89	74	Santa Barbara	4	5
South Coast	Riverside	149	131	Riverside	11	12
San Diego	El Cajon	85	78	El Cajon	5	7
Northeast Plateau	Susanville	67	74	Yreka	0	0
Sacramento Valley	Live Oak	76	106	Sacramento	1	3
San Joaquin Valley	Visalia	142	146	Bakersfield	6	5
Great Basin Valleys		--	--		--	--
Southeast Desert	Calexico	220	241	El Centro	1	0
Mountain Counties	Lincoln	57	64	Sonora	2	1
Lake County	Kelseyville	27	30	Lakeport	0	0
Lake Tahoe	S. Lk. Tahoe	51	59	S. Lake Tahoe	--	0

* The station in each air basin is the one with the most adverse 1975 values that also reported data for 1976.

\# The annual standard for particulate is 60 ug/m^3 annual geometric mean (AGM) The standard for lead is 1.5 ug/m^3 30-day average.

\+ Includes Santa Barbara and Ventura Counties.

-- Indicates no data available

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. . Sulfur Dioxide

There were no reported occurrences of sulfur dioxide above the Stage 1 episode criteria level.

At the time the data in Table 2 were compiled, the Board was reconsidering the 24-hour sulfur dioxide standard. Hence the occurrences in Table 2 are shown relative to a .04 ppm 24-hour concentration level rather than a standard. Comments about the standard established at the June 1977 Board Meeting are given below.

. . Sulfate

There were 25 days in 1976 in the South Coast Air Basin with sulfate-oxidant concentrations in excess of the episode criteria level. No other occurrences were reported.

. . Total Suspended Particulate

There are no episode criteria levels for particulate in the State Plan.

The 1976 annual geometric mean (AGM) concentrations of total suspended particulate at key stations with adverse exposure were in excess of the standard (60 ug/m^3) in all air basins where measurements were taken <u>except</u> the North Central Coast, South Central Coast, Lake County, and Lake Tahoe Air Basins. There was little change from 1975 to 1976 in the AGM concentrations at these stations.

. . Lead

There are no episode criteria levels for lead in the State Plan.

The air quality standard for lead was exceeded on one or more occasions in 1975 at key stations with adverse exposure in all air basins where measurements were taken <u>except</u> the North Central Coast, the Northeast Plateau and Lake County Air Basins. On the average and on a statewide basis these key stations showed little change in the occurrence of lead concentrations in excess of the standard from 1975 to 1976.

<u>Air Resources Board Establishes New SO_2 Standard</u>

On June 29, 1977 the ARB adopted Resolution 77-41 establishing the new California Air Quality Standard for Sulfur Dioxide (24-hour). The new standard for the protection of the public health is:

> 0.05 ppm (conductimetric method, or equivalent), in the presence of oxidant (ozone) in excess of the state standard, or in the presence of suspended particulate matter in excess of the state 24-hour suspended particulate matter standard.

<u>The Particulate Measurement Problem</u>

The measurement of particulate by the high-volume sampling method has serious shortcomings that have been discussed at various conferences for many years.

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