



# FOURMILE HILL GEOHERMAL DEVELOPMENT PROJECT

Environmental Impact Statement  
Environmental Impact Report

**Final EIS/EIR  
Executive Summary**

State Clearinghouse No: 96062042



*County of Goshute*

AIR POLLUTION CONTROL DISTRICT





Forest Service  
U.S. Department of Agriculture

Bureau of Land Management  
U.S. Department of the Interior



Dear Reader:

Attached is the Executive Summary of the Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the proposed Fourmile Hill Geothermal Development project. If you wish to receive the complete EIS/EIR, please contact Randall Sharp. The Final EIS/EIR includes some additional information not included in the Draft EIS/EIR, as well as responses to all public comments and statements made at the five public hearings held on the project and written comments received on the Draft EIS/EIR.

The Bureau of Land Management (BLM) and the Forest Service served as lead federal agencies and the Siskiyou County Air Pollution Control District (APCD) served as the state lead in the preparation of this document. Bonneville Power Administration was a cooperating agency. The joint document was prepared pursuant to the requirements of the National Environmental Policy Act and the California Environmental Quality Act.

The attached environmental document represents the joint Final EIS/EIR. The Final EIS/EIR will be used by BLM, Forest Service and APCD to decide the various discretionary actions required to implement the project. The BLM's and the Forest Service's decisions will be identified in a Record of Decision. Statements on the EIS/EIR or the project will be accepted by the agencies and considered in arriving at our decision on this proposed action.

The Final EIS/EIR is distributed for a 30-day notification period that begins October 2, 1998 and ends November 2, 1998. Written information regarding the Final EIS/EIR should be submitted to the following address:

Randall M. Sharp, BLM/Forest Service Project Coordinator  
800 W. 12th Street  
Alturas, CA 96101  
(530) 233-8848

A public hearing will be held by the Siskiyou County Air Pollution Control District Board regarding the certification of the document in respect to satisfying the requirements of the California Environmental Quality Act. A separate notification will be issued for that hearing.

We wish to thank those who have contributed time and knowledge to this project. We appreciate your interest and your commitment to participating in this project.

Sincerely,

Michael P. Lee  
Acting Forest Supervisor  
Klamath National Forest

Christopher Knopp  
Acting Forest Supervisor  
Modoc National Forest

Timothy J. Burke  
Field Manager  
Alturas Resource Area

Klamath National Forest, 1312 Fairlane Road, Yreka, California 96097  
Modoc National Forest, 800 West 12th Street, Alturas, California 96101  
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JAMES R. MASSEY, JR.  
AIR POLLUTION CONTROL OFFICER

PATRICK J. GRIFFIN  
AIR POLLUTION SPECIALIST

September 25, 1998

To Interested Parties:

Enclosed is the *Fourmile Hill Geothermal Development Project* Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR), State Clearinghouse #96062042. The Final EIR has been prepared by the Siskiyou County Air Pollution Control District. It includes comments, responses to those comments, and revisions to the Draft EIR.

A Public Hearing will be held to receive comments on the Final EIR on Tuesday 20th October 1998, at 7 pm in the Miners Inn Convention Center, Yreka, California.

The Final EIS/EIR is also available at the following locations:

Siskiyou County APCD, 525 S. Foothill Drive, Yreka, CA 96097  
Modoc National Forest, 800 W. 12th Street, Alturas, CA 96101  
Klamath National Forest, 1312 Fairlane Road, Yreka, CA 96097  
Modoc City Library, 212 W. 3rd Street, Alturas, CA 96101  
Klamath County Library, 126 South 3rd Street, Klamath Falls, Oregon, 97601  
Siskiyou County Library, 719 4th Street, Yreka, CA 96097

Please contact Eldon Beck, Siskiyou County Air Pollution Control District at (530) 841-4029, if you have any questions.

Sincerely,

Eldon Beck  
Siskiyou County Air Pollution Control District

Enclosures

# FOURMILE HILL GEOTHERMAL DEVELOPMENT PROJECT

Environmental Impact Statement  
Environmental Impact Report

**Final EIS/EIR  
Executive Summary**

State Clearinghouse No. 96062042

September 1998

**NEPA Lead Agencies:**

Randall M. Sharp, Project Coordinator  
(530) 233-8848

U.S. Department of Interior  
Bureau of Land Management  
Alturas Resource Area  
708 West 12th Street  
Alturas, California 96101

U.S. Department of Agriculture  
Forest Service, Modoc National Forest  
800 West 12th Street  
Alturas, California 96101

**CEQA Lead Agency:**

Siskiyou County Air Pollution Control District  
525 South Foothill Drive  
Yreka, California 96097

**Cooperating Agency:**

U.S. Department Of Energy  
Bonneville Power Administration  
P.O. Box 3621  
Portland, Oregon 97208-3621

**Third-party Environmental Consultant:**

MHA Environmental Consulting, Inc.  
520 South El Camino Real, Suite 800  
San Mateo, California 94402

**Abstract:**

*The Fourmile Hill Geothermal Development Project* would be located in eastern Siskiyou and western Modoc Counties, California, on the Klamath and Modoc National Forests and within the Glass Mountain Known Geothermal Resource Area (KGRA). Calpine Corporation proposes to develop a 49.9 megawatt geothermal power plant and wellfield and a 24-mile, 230-kilovolt transmission line. The Glass Mountain KGRA, which is designated by the U.S. Geological Survey, is one of the only remaining undeveloped KGRAs in North America with a demonstrated geothermal resource. Based on the analysis presented in the Final Environmental Impact Statement and Environmental Impact Report (EIS/EIR), the project, after mitigation, would have a significant adverse effect on the environment on traditional cultural values and visual resources. After mitigation, the project would not have any other significant adverse effects on the environment. Effects on visual resources would be avoided by proposed alternatives. Effects on traditional cultural values would be unavoidable. The project could also result in significant cumulative effects through conflicts with religious use of the area by local tribal members. Potentially significant cumulative effects in the Medicine Lake area would be avoided by the preferred alternative. The Final EIS/EIR is distributed for a 30-day notification period that begins October 2 and ends November 2, 1998. Written information regarding the Final EIS/EIR should be submitted to the following address:

Randall M. Sharp, Project Coordinator  
BLM/USFS  
800 West 12th Street  
Alturas, CA 96101

# Final EIS/EIR

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### EXECUTIVE SUMMARY

The Executive Summary includes a description of the purpose and need for the proposed project and alternatives, a summary of key issues raised by the public during the comment period, and a summary of the environmental impacts of the proposed project.

#### VOLUME I: FINAL EIS/EIR

- 1: Introduction and Purpose and Need
- 2: Alternatives, Including the Proposed Project
- 3: Description of the Affected Environment
- 4: Environmental Consequences and Mitigation Measures
- 5: Mitigation Monitoring and Reporting Program
- 6: List of Preparers and Agencies and Persons Contacted
- 7: References
- 8: Index

Volume I of the Final EIS/EIR includes the revised text of the Draft EIS/EIR. The revisions to the document include errata, staff-initiated changes, and additional clarifications, as identified in the responses to public comments.

#### VOLUME II: FINAL EIS/EIR APPENDICES

- A: Mailing List for Draft and Final EIS/EIR
- B: Scoping Materials
- C: Biological Resources
- D: Visual Resources
- E: Meteorological Data
- F: Air Quality Impact Assessment

Volume II includes the appendices that were included in the Draft EIS/EIR. The appendices have been provided as a separate volume due to the increased size of the EIS/EIR. Similar to Volume I, Volume II reflects revisions due to errata, staff-initiated changes, and additional clarifications.

#### VOLUME III: FINAL EIS/EIR RESPONSES TO COMMENTS ON THE DRAFT EIS/EIR

- 1: Introduction
- 2: Agencies, Organizations, and Persons Commenting on the Draft EIS/EIR
- 3: Responses to Comments on the Draft EIS/EIR
- 4: Responses to NEPA/CEQA Issues Comments
- 5: Responses to Project Preference Comments
- 6: Responses to General Comments
- 7: Comment Index
- 8: Index

Volume III presents all public comments on the Draft EIS/EIR as well as comments on other issues, and the agency responses to all of these comments. Public comments were submitted in writing, and heard verbally at public hearings that were held for the Draft EIS/EIR. Individual comments have been organized by parameter in order to provide complete response on all issues.

#### VOLUME IV: FINAL EIS/EIR COMMENTS ON THE DRAFT EIS/EIR

- 1: Original Comment Letters
- 2: Comment Index

Volume IV provides copies of the original comment letters that were received on the Draft EIS/EIR. This volume also includes copies of the transcripts from the Draft EIS/EIR public hearings.



**Final EIS/EIR Executive Summary  
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# KEY TO ACRONYMS

ACRONYM	DEFINITION
AAQS	Ambient Air Quality Standard
AC	Alternating Current
ACGIH	American Conference of Governmental Industrial Hygienists
ACHP	Advisory Council on Historic Preservation
AIRFA	American Indian Religious Freedom Act
AMA	Adaptive Management Area
ANSI	American National Standards Institute
APCD	Air Pollution Control District
APLIC	Avian Power Line Interaction Committee
AQMD	Air Quality Management District
ATC	Authority to Construct
BACT	Best Available Control Technology
BEA	Bureau of Economic Analysis
bgs	Below Ground Surface
BLM	U.S. Department of the Interior, Bureau of Land Management
BOPE	Blowout Prevention Equipment
BPA	Bonneville Power Administration
°C	Degrees Celsius
CA	California
CAA	Clean Air Act
CalEnergy	CalEnergy Company, Inc.
Cal EPA	California Environmental Protection Agency
CAPCOA	California Air Pollution Control Officers' Association
CARB	California Air Resources Board
CCAA	California Clean Air Act
CCR	California Code of Regulations
CDF	California Department of Forestry
CDFG	California Department of Fish and Game
CDMG	California Division of Mines and Geology
CDOG	California Division of Oil and Gas
CEGC	California Energy General Corporation
CEQ	Council of Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
CHP	California Highway Patrol
cm/sec	Centimeter per Second
CNDDDB	California Natural Diversity Data Base
CNPS	California Native Plant Society

## KEY TO ACRONYMS

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CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
COTP	California-Oregon Transmission Project
CPUC	California Public Utilities Commission
CVRWQCB	Central Valley Regional Water Quality Control Board
CWF	Circulating Water Flow
CWHR	California Wildlife Habitat Relationships System
dB	Decibel
dBA	Decibels A-weighted
dbh	Diameter Breast Height
DC	Direct Current
DLG	Digital Line Graph
DWR	Department of Water Resources
EA	Environmental Assessment
EHR	Erosion Hazard Rating
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EMF	Electromagnetic Field
EPA	U.S. Environmental Protection Agency
°F	Degrees Fahrenheit
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FESA	Federal Endangered Species Act
FHWA	Federal Highway Administration
FLPMA	Federal Land Policy and Management Act of 1976
FMRP	Freeport-McMoRan Resource Partners
FONSI	Finding of No Significant Impact
FTB	Fluidized Thermal Backfill
FWARG	Far Western Anthropological Research Group, Inc.
GERA	G.E. Raleigh & Associates
g/MW-hr	Grams per Megawatt-hour
gpm	Gallons per Minute
gr/ACF	Grains per Actual Cubic Foot
GRO	Geothermal Resources Operational Order
GUP	Geothermal Utilization Permit
H <sub>2</sub> S	Hydrogen Sulfide
H <sub>2</sub> SO <sub>4</sub>	Sulfuric Acid
HDPE	High Density Polyethylene
HI	Hazard Index
HPFF	High Pressure Fluid Filled
hz	Hertz
I-5	Interstate 5
IP	Interested Parties
IRPA	International Radiation Protection Association
IS	Initial Study
ISO	International Standards Organization
K	Soil-Erodibility Factor
KGRA	Known Geothermal Resource Area
Khz	KiloHertz
km	Kilometer

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KOP	Key Observation Point
kph <sub>m</sub>	Thousand Pounds per Hour, Mass Flow
kV	Kilovolt
L <sub>dn</sub>	Day-Night Average Noise Level
Leq	Average Hourly Equivalent Sound Level over a 24-hour Period
lb/day	Pounds per Day
LRMP	Land and Resource Management Plan
MCL	Maximum Contaminant Level
MDB&M	Mount Diablo Base and Meridian
mG	Milligauss
MIS	Management Indicator Species
MLSA	Managed Late Successional Area
mm	Micrometer
MMRP	Mitigation Monitoring and Reporting Program
MOU	Memorandum of Understanding
mph	Miles per Hour
MSDS	Material Safety Data Sheets
m/sec	Meters per Second
msl	Mean Sea Level
MW	Megawatt
n/a	Not Available
NAGPRA	Native American Graves Protection and Repatriation Act
NAWS	Naval Air Weapons Station
NCRWQCB	North Coast Region Water Quality Control Board
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
No.	Number
NO	Nitric Oxide
NO <sub>x</sub>	Nitrogen Oxides
NO <sub>2</sub>	Nitrogen Dioxide
NOI	Notice of Intent
NOP	Notice of Preparation
NPAB	Northeast Plateau Air Basin
NPS	National Park Service
NRHP	National Register of Historic Places
NSR	New Source Review
O <sub>2</sub>	Molecule of Oxygen
O <sub>3</sub>	Ozone
OEPC	Office of Environmental Project Compliance
OSHA	Occupational Safety and Health Act
Pb	Lead
PDEIS	Preliminary Draft Environmental Impact Statement
PG&E	Pacific Gas and Electric Company
PM <sub>10</sub>	Particulate Matter Less Than 10 Microns
POO	Plan of Operation
POU	Plan of Utilization
ppb	Parts per Billion
ppm	Parts per Million
ppm <sub>w</sub>	Parts per Million by Weight

## KEY TO ACRONYMS

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PSD	Prevention of Significant Deterioration
PST	Pacific Standard Time
PTO	Permit to Operate
PUHCA	Public Utility Holding Company Act
PURPA	Public Utility Regulatory Policies Act
RCRA	Resource Conservation and Recovery Act
REL	Reference Exposure Level
Rh	Relative Humidity
RMA	Recreation Management Area
ROD	Record of Decision
ROG	Reactive Organic Gases
ROS	Recreation Opportunity Spectrum
ROW	Right-of-Way
RV	Recreational Vehicle
RWQCB	Regional Water Quality Control Board
SCAPCD	Siskiyou County Air Pollution Control District
SCEC	Soil Conservation and Erosion Control Plan
SCFF	Self Contained Fluid Filled
SCS	Soil Conservation Service
SD	Solid Dielectric
SHPO	State Historic Preservation Office
SIA	Special Interest Area
SL	Site License
SNARL	Suggested No-Adverse-Response Level
SO <sub>x</sub>	Sulfur Oxides
SO <sub>2</sub>	Sulfur Dioxide
SO <sub>4</sub>	Sulfate Component of PM <sub>10</sub>
TOG	Total Organic Gases
µg/m <sup>3</sup>	Micrograms per Cubic Meter
URF	Unit Risk Factor
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of the Interior
USFS	U.S. Department of Agriculture, Forest Service
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
USGS	U.S. Department of the Interior, Geological Survey
UTM	Universal Transverse Mercator
v/M	Volts per Meter
VMS	Visual Management System
VQO	Visual Quality Objective
VRM	Visual Resources Management
wf/pp	Wellfield and Power Plant Area
WHR	Wildlife Habitat Relationship

# EXECUTIVE SUMMARY

# EXECUTIVE SUMMARY

Calpine Corporation has submitted a Plan of Utilization (POU) to the Bureau of Land Management (BLM) and the U.S. Forest Service (USFS) to develop a 49.9 megawatt (MW) geothermal power plant and wellfield and 24-mile, 230-kilovolt (kV) transmission line. This project, known as the Fourmile Hill Geothermal Development Project, would be located in the Glass Mountain Known Geothermal Resource Area (KGRA) on the Klamath and Modoc National Forests, in Siskiyou and Modoc Counties, California (Figures S-1, S-2, and S-3). The Glass Mountain KGRA represents one of the only remaining undeveloped KGRAs in North America with a demonstrated geothermal resource.

## **Purpose and Need**

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The purpose of the Fourmile Hill Geothermal Project is to develop the geothermal resource on Calpine's Federal geothermal leases in order to economically produce and deliver electrical energy to the Bonneville Power Administration (BPA) and others. The need for the project was stated by the U.S. Geothermal Steam Act of 1970, the Geothermal Energy Research, Development, and Demonstration Act of 1974, the Federal Land Policy and Management Act (FLPMA) of 1976, and the Energy Policy Act of 1992. The proposed project is consistent with these Federal regulations which seek to foster and encourage private enterprise in the development of alternative energy resources.

## **Lead Agencies Roles and Approvals**

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### ROLES

The proposed project is under the jurisdiction of the BLM and the U.S. Forest Service (USFS) as the Federal lead agencies under the National Environmental Policy Act (NEPA). The Siskiyou County Air Pollution Control District (APCD) is the California Environmental Quality Act (CEQA) lead agency. BPA is participating as a cooperating Federal agency. These agencies are overseeing the preparation of this Environmental Impact Statement/Environmental Impact Report (EIS/EIR) under NEPA and CEQA.

This document is being prepared as a joint EIS/EIR in order to streamline the Federal and state environmental review processes. The lead agencies determined that a third-party contractor was needed to assist in the preparation of the EIS/EIR in order to meet the project timelines. MHA Environmental Consulting, Inc. (MHA) was selected by the

Figure S-1: Regional Location Map

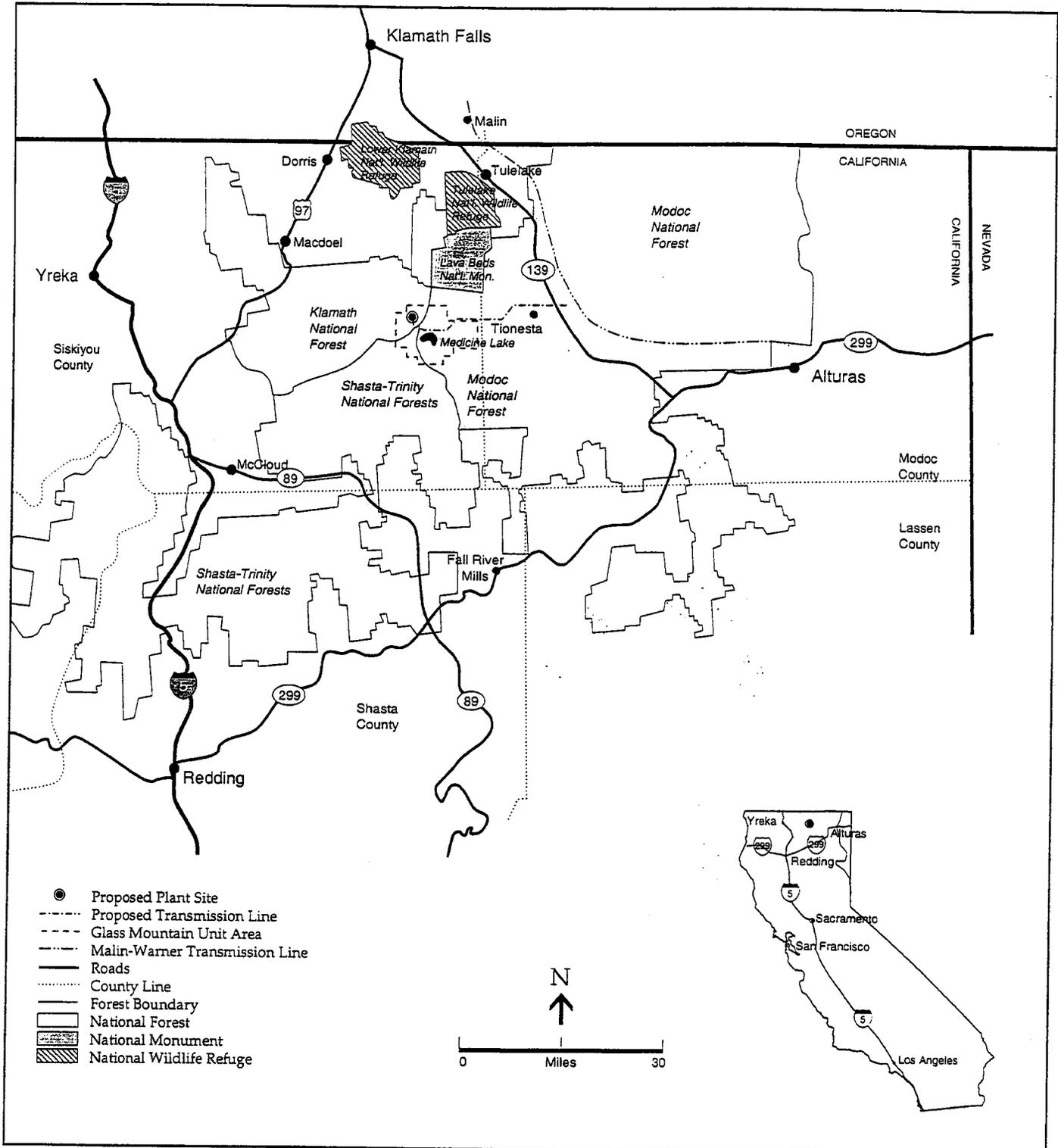


Figure S-2: Proposed Power Plant and Transmission Line Routes

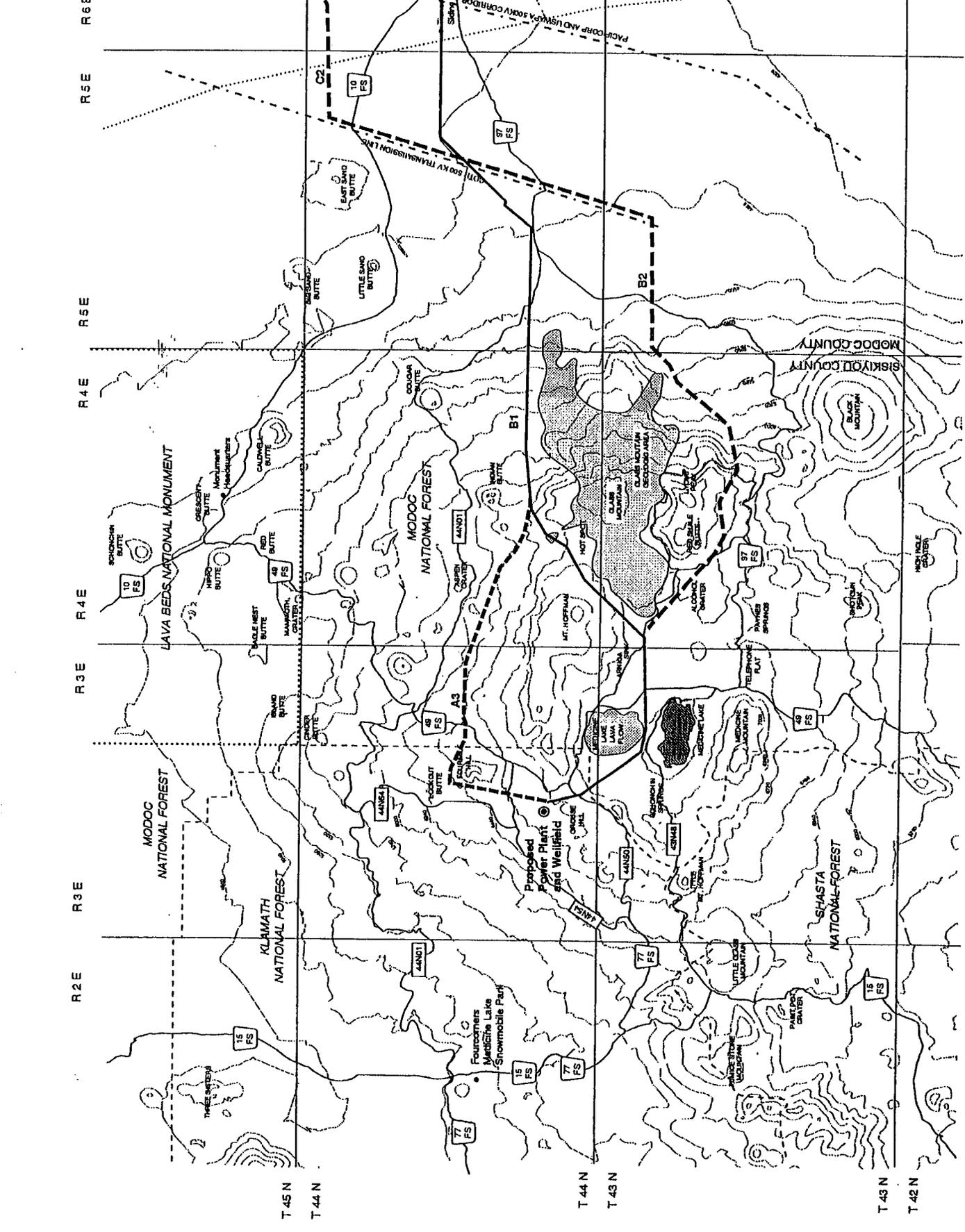
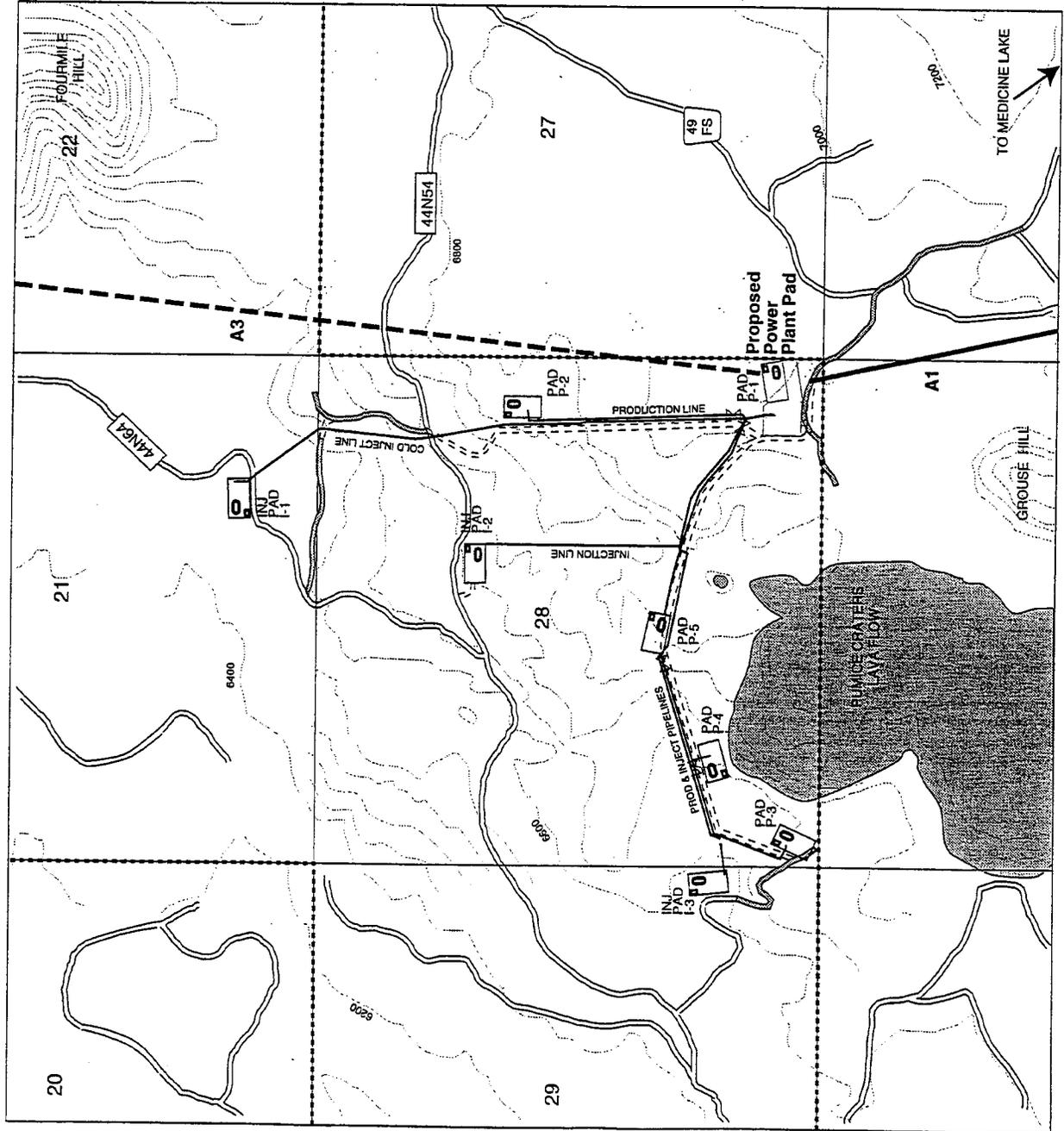


Figure S-3: Power Plant and Wellfield Area



**LEGEND**

- Proposed Transmission Line Route
- - - Alternative Transmission Line Routes
- ..... Calpine Lease Boundary
- ==== Existing Roads
- ==== Existing Roads to be Improved
- ==== Proposed Roads
- ==== Pipelines
- ..... Topographic Lines (every 40 feet)

 N  
 0 0.25 0.5 MILES

agencies to serve as this contractor. MHA prepared the EIS/EIR under the direction of, and with the assistance of, the lead agencies.

### APPROVALS

The BLM will decide whether to approve the Calpine POU and to issue the accompanying Geothermal Utilization Permit, Site License, and Geothermal Drilling Permits. The USFS will decide whether to issue to Calpine right-of-way, water well use, and Forest road use authorizations. The Klamath and the Modoc National Forests will also decide whether to amend the Forest Land Resource Management Plans (LRMP) to establish and designate a utility corridor for the transmission line, and issue Forest orders to prohibit the use of firearms in the immediate power plant and wellfield area. The Klamath National Forest would also decide whether to amend the LRMP to include standards and guidelines for the utility corridor, and whether to revise Standard 24-25, to parallel the language of the American Indian Religious Freedom Act.

The BPA must decide whether to purchase power from the proposed project and to transmit project power output over BPA transmission lines. The Siskiyou County APCD would decide whether to issue an Authority to Construct and Permit to Operate for the proposed project.

## Public Participation

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### SCOPING PROCESS

The scoping process for the Fourmile Hill Geothermal Development Project was initiated in June of 1996 with publication of public notices and distribution of an Interested Parties letter to agencies, citizens, and public interest groups. Four public scoping meetings were held (in Yreka, Alturas, and Dorris, California, and Klamath Falls, Oregon), to present information about the proposed project and to solicit public input. In addition, focused meetings were held with involved Federal and state agencies to solicit their opinions and concerns about the project. Scoping meetings were also held with local American Indian tribes (see the discussion of American Indian Consultation in the next section). Table S-1 describes the key issues raised during the scoping process.

### PUBLIC PARTICIPATION IN THE DRAFT EIS/EIR PREPARATION

The lead agencies conducted an extensive public participation program in accordance with NEPA and CEQA. The program was designed to assist the lead agencies in fully addressing the public's concerns about the environmental impacts of the proposed project, and obtaining comments on the adequacy of the environmental analysis in the Draft EIS/EIR.

Public notices were issued at several stages in the preparation of the Draft EIS/EIR to ensure that the public had adequate opportunities to learn about the project and express their concerns about environmental issues. The Draft EIS/EIR was initially distributed for public and agency review on July 10, 1997, and the public review period for the document officially began on July 18, 1997. A total of over 375 copies of the Draft EIS/EIR for the Fourmile Hill project was distributed to approximately 330 individuals,

**Table S-1: Key Issues Raised During Scoping**

<b>Topic</b>	<b>Issues / Concerns</b>
Hydrology	Potential effects to Medicine Lake water quality and quantity; effects to regional water quality and quantity
Geothermal Resources	Potential effects to regional thermal features
Cultural Resources	Effects to historic and archaeological resources
Traditional Cultural Values	Direct effects to traditional cultural sites; effects on access to traditional cultural sites; effects on traditional American Indian cultural and religious values and uses
Vegetation	The extent and effect of vegetation removal; effects to special-status plant species and old growth forest (late seral areas)
Wildlife	Loss of wildlife habitat; effects to special-status wildlife species (and habitat use) such as northern spotted owl, northern goshawk, and bats
Visual Resources	Visual effect of transmission line crossings of visually sensitive roads; effect on views from Medicine Lake, Tionesta, and Lava Beds National Monument
Plans and Policies	Disturbance of released roadless areas
Land Use/Recreation	Effects on developed recreation and residences at Medicine Lake; effects on snowmobiling
Air Quality	Effect of construction dust at Medicine Lake and Tionesta; effect of power plant emissions
Noise	Construction and operation noise effects at Medicine Lake; construction noise effects at Tionesta

SOURCE: MHA Environmental Consulting, Inc.

agencies, and groups. The Draft EIS/EIR was also made available for public review at all of the lead and cooperating agency offices and at public libraries in the region.

A 74-day public review period was held for the Draft EIS/EIR (the review period was officially closed on September 30, 1997). Five public hearings to receive comments on the Draft EIS/EIR were held during the public review period. These hearings were held at Dorris, Yreka, Mount Shasta, and Medicine Lake, California, and at Klamath Falls, Oregon. In addition, several meetings were held with interested agencies to discuss comments and questions related to the Draft EIS/EIR.

A total of 270 comment letters were received on the Draft EIS/EIR. Approximately 2,300 individual comments were identified from the comment letters and public hearings. Volume III of the Final EIS/EIR provides responses to all of these comments, and the Final EIS/EIR Volume I has been revised to provide clarifications.

## SUMMARY OF KEY COMMENT TOPICS ON THE DRAFT EIS/EIR

This section summarizes the topics of public and agency comments on the Draft EIS/EIR, and the key clarifications and revisions made in the Final EIS/EIR. Key issues and concerns raised by the public are identified, and how these issues and concerns are addressed in the responses is summarized. In addition, information that has become available since the release of the Draft EIS/EIR is summarized; the added information supports the conclusions that were drawn in the Draft EIS/EIR. No new impacts have been identified, and no changes have been made to significance determinations. For detailed comments and responses, see Chapter 3 of Volume III of the Final EIS/EIR.

### **Introduction and Purpose and Need**

The topic areas of comment on introduction and purpose and need issues were:

- Purpose and Need for the Proposed Action
- Agency Roles and Authorizations
- Other Required Permits and Approvals
- Previous Geothermal Activities
- Geothermal Definition
- Economic Justification for and Viability of the Proposed Action

Several commentors questioned the purpose of the project and whether there is a demonstrated need for the project. Many of these commentors also requested information on the economic justification for the proposed action, and questioned the viability of project. Some commentors requested clarification about the roles and approvals of the lead agencies, as well as other permits and approvals. Commentors also asked about previous geothermal exploration activities in the vicinity, as well as the environmental documentation and public notification for these activities. The definition of geothermal power as renewable or “green” power was questioned.

The responses further explain the purpose and need for the project, and provide additional support for the purpose and need. Neither NEPA nor CEQA require that economic justification for a project be provided, and this information has not been presented in the Final EIS/EIR since it is proprietary. The responses further explain the lead agencies roles and approvals, and clarify the roles of the North Coast and Central Valley Regional Water Quality Control Boards (RWQCB). Additional details about previous geothermal exploration activities are provided, and environmental documentation and public notification for these activities is summarized. Finally, the responses further elaborate on the basis for considering geothermal to be a renewable or green resource.

Only minor text changes to the EIS/EIR resulted from the responses to comments on introduction and purpose and need issues. Information about the Draft EIS/EIR distribution, Draft EIS/EIR public review period, and additional interested parties meetings has been added to Chapter 1, Introduction and Purpose and Need, of the EIS/EIR.

### **Alternatives, Including the Proposed Action**

The topic areas of comment on alternatives issues were:

- Project Description
- Well Testing, Design and Maintenance
- Transmission Line Design and Capacity
- Decommissioning
- Alternatives to the Proposed Action
- Alternatives Considered but Eliminated from Detailed Study

Several of the commentors raised questions about the size of the proposed project and the proposed drilling, testing, and maintenance of the geothermal wells. Other comments asked about the design, capacity and reliability of the proposed transmission line. Comments also raised concerns about the consideration of alternatives for the proposed action.

The responses clarify the size of the proposed project and the proposed protocol for the testing, drilling, and maintenance of the geothermal wells. A representative schematic cross-section of the proposed production wells is provided to further illustrate the integral strength of these wells. The proposed design, capacity, reliability, routing, and decommissioning of the transmission lines are further explained in the responses. Responses also provide clarification on the development and consideration of alternatives to the proposed action.

### **Geology and Soils**

The topic areas of comment on geology and soils issues were:

- General
- Potential Effects to Caves
- Geologic Hazards
- Potential Effects to Soils

Several commentors questioned whether the proposed project would increase seismic or volcanic activity in the area. Other commentors questioned whether the project would affect the stability of slopes or create landslides or ground subsidence. Some commentors questioned the effects on soils from either erosion or deposition of air emissions.

The responses explain that the proposed project may induce microearthquakes that could not be felt by humans and that volcanic activity would not increase. The responses also highlight the erosion-control measures that are part of the project that would minimize soil erosion and eliminate the chance of landslides. The substrate in the area is stable and would not experience substantial ground subsidence.

### **Hydrology**

The topic areas of comment on hydrology issues were:

- General
- Regulatory Information

- Local Groundwater and Effects from Groundwater Use
- Local Groundwater and Effects from Geothermal Fluid Use
- Regional Groundwater
- Surface Waters and Effects from Construction Activities
- Surface Waters and Effects from Groundwater Use
- Surface Waters and Effects from Geothermal Fluid Use
- Surface Waters and Effects from Deposition
- Hydrology Mitigation
- Hydrology Monitoring Plan

The responses to comments on hydrology is one of the longest sections in the Final EIS/EIR. The majority of commentors questioned the impacts of the proposed project from the use of either groundwater or geothermal fluids or from the deposition of air emissions. Most commentors questioned whether these uses would affect groundwater, the geothermal reservoir, or surface water, either locally (i.e., in the project area) or regionally. There were many commentors who asserted that the project could affect the water quantity or quality of the springs at Fall River.

The responses provide an extensive discussion of the project's use of both geothermal fluids and groundwater and how this use might affect each resource, both locally and regionally. Additional data are provided to support the conclusions in the Draft EIS/EIR regarding the potential hydrologic impacts of the project. In addition, there is an extensive discussion of the potential effects of air emissions on surface waters in the vicinity of the project.

Because of the number of commentors who asserted that the project would have an adverse effect on the Fall River springs, the response to these comments is extensive. Several hydrology reports were prepared subsequent to release of the Draft EIS/EIR that support the Draft EIS/EIR conclusions about the lack of potential for significant effect. The response to Fall River springs comments summarizes the conclusions drawn earlier in the hydrology section and provides additional support for the conclusion that the project would not have a measurable effect on the springs at Fall River.

The deposition analysis in the Draft EIS/EIR was revised in response to refinement of the estimates of air emissions from the project. In addition, the revised analysis incorporated a new, more realistic assumption into the model. The results of this revised analysis did not change the conclusions in the Draft EIS/EIR. In response to these comments, several mitigation measures were revised to clarify their intent.

Calpine collected water samples from local surface waters in the area (including Medicine Lake) in November 1997. The water quality analysis of these samples has been added to the Draft EIS/EIR. Calpine has also developed a water quality monitoring program in the power plant and wellfield area since publication of the Draft EIS/EIR that has been preliminarily reviewed by the U.S. Environmental Protection Agency (EPA) and Central Valley and North Coast RWQCBs for adequacy. Details of this program are also included in the responses and in the Final EIS/EIR.

## **Geothermal Resources**

The topic areas of comment on geothermal resources issues were:

- Data on Geothermal Resource
- Effects on Life Expectancy of the Geothermal Resource
- Effects on Regional Thermal Features

Most commentors questioned either the chemical composition of the geothermal fluids or the life expectancy of the geothermal resource. Several commentors also questioned the temperature gradient data and expressed frustration that some of these data were proprietary and not available for public review. Other commentors expressed concern about potential effects of the project to the Hot Spot.

The responses clarify the chemical composition of the geothermal fluids and provide new information that became available after publication of the Draft EIS/EIR. The life expectancy of the geothermal resource would be adversely but not significantly affected by the project, as demonstrated by data from other geothermal fields that have been in operation for up to 50 years. Minor changes to the Draft EIS/EIR have been made to clarify this discussion.

The responses also clarify the nature of the temperature gradient data, and explain that a thorough review has been conducted of the proprietary data by third parties. The Hot Spot is a surface feature that has no direct connection with the geothermal reservoir and would therefore not be affected by the project.

## **Cultural Resources**

The topic areas of comment on cultural resources issues were:

- General
- Section 106 Process
- Tribal Participation
- Survey Methodology
- Potential Impacts at the Power Plant and Wellfield Areas
- Potential Impacts Along the Transmission Line
- Mitigation Measures

The responses clarify the USFS implementation of the National Historic Preservation Act Section 106 process, confirm participation of the tribes in the process, and clarify the mitigation measures. The responses also explain that a Class III cultural resource inventory was conducted for the power plant and wellfield area. A Class III inventory of the transmission line would not be conducted prior to a decision on the project in order to avoid unnecessary effects to cultural resources, and to avoid the expense of surveying routes that are not selected. The Section 106 process will be completed prior to the agencies making a decision on the project in accordance with USFS policy.

Minor additions to the EIS/EIR were made to clarify that the entire wellfield and power plant area were inventoried for cultural resources and to clarify a mitigation measure.

### **Traditional Cultural Values**

The main topics of comments on traditional cultural values issues were:

- General
- Importance of the Project Region
- Regulatory Compliance
- Impacts
- Mitigation Measures
- Ethnographic Report

Many commentors expressed opposition to the project based on the sanctity of the region. The commentors identified the Medicine Lake Highlands region and individual sites in the region as areas with religious and spiritual values. Commentors also questioned whether the project complied with the many laws pertaining to protection of cultural resources and Native American heritage, culture, and values. The commentors also identified project impacts to traditional use sites in the region (no new impacts were identified).

The responses acknowledge the traditional cultural values of the area and summarized the tribal participation in the environmental review process. The responses describe the various laws that apply to the project and the consistency with the laws. The responses to comments further clarify that the project would not prevent access to or use of traditional sites, but acknowledge the tribal comments that the project would have a significant adverse effect on the sites and the use of the sites.

Section 3.6, Traditional Cultural Values, in the EIS/EIR has been updated to reflect the second phase of the ethnographic study, which was conducted subsequent to the release of the Draft EIS/EIR. Phase II of the ethnographic study included additional literature review, additional tribal interviews, and field verification of traditional use sites identified in interviews.

Mitigation Measure 4.6.3b was expanded to further define noise control measures.

### **Vegetation**

The topic areas of comment on vegetation issues were:

- General
- Effects of Emissions on Vegetation
- Other Effects on Vegetation
- Potential Impacts to Special-Status Plants
- Impacts to Specific Plant Communities
- Vegetation Mitigation

Many commentors expressed concern about the potential effects of air emissions on vegetation or about the effects of the project on specific plant communities such as wetlands. Other commentors questioned the adequacy of mitigation measures for impacts to special-status plants and to sensitive plant communities.

The responses clarify the analysis of the potential effect of air emissions on vegetation (particularly for boron) that was presented in the Draft EIS/EIR. Wetland habitats would not be affected by the project because the transmission line would be rerouted to avoid these habitats (there are no wetlands in the power plant and wellfield area). The responses also highlight the mitigation measures designed to avoid or reduce impacts to special-status plants and sensitive plant communities. Minor changes to several mitigation measures were made in response to comments in this section.

### **Wildlife**

The topic areas of comment on wildlife issues were:

- General
- Potential Impacts to Special-Status Wildlife
- Impacts to Specific Special-Status Wildlife
- Wildlife Mitigation

The responses summarize the consultations with regulatory agencies to date and explained their role in environmental review process. The USFWS and CDFG have been frequently consulted regarding potential effects to threatened and endangered wildlife species. The Draft EIS/EIR did not include an exhaustive discussion of the habitat requirements of all wildlife because this information was included in biological reports already prepared (some specifically for this project), which were incorporated by reference. However, more information on some species' habitat requirements was provided in the responses.

A new mitigation measure was added to this section to ensure that wildlife would not come in contact with the contents of the sumps. The responses also discuss the amount of noise that would be generated by the project and the potential for this noise would disturb wildlife. Several mitigation measures were highlighted that reduce noise effects. The responses also clarify which roads would be open to the public and to hunting, which might adversely affect wildlife.

The responses provide additional support for the conclusion in the Draft EIS/EIR that the transmission line would not cause bird electrocution and would not significantly affect the chance of bird collisions. The special-status bird with the highest chance of colliding with the line is the sandhill crane. Mitigation in the EIS/EIR was modified to address this species. The responses also provide extensive discussion of the potential effects of the project on the bald eagle, osprey, northern spotted owl, and other raptors.

The Draft EIS/EIR was slightly modified to clarify the discussion of wildlife, particularly for bats. Several mitigation measures were clarified in response to comments in this section. Three other mitigation measures were added to this section that direct Calpine to conduct preconstruction surveys for special-status mollusks.

### **Visual Quality**

The topic areas of comment on visual quality issues were:

- General
- Methodology

- General Impacts of Project Facilities
- Impacts from Specific KOPs
- Consistency with VQOs
- Mitigation Measures

Most of the comments raised concerns about the visual effect of night lighting, steam plumes, and the transmission line, particularly from vantage points in the vicinity of Medicine Lake. Other commentors were concerned about views of the project from Tionesta, Lava Beds National Monument, and the Little Mt. Hoffman Lookout. Some commentors questioned the determination of VQO consistency at various key observation points (KOPs). One commentor proposed an alternate method for analyzing visual effects.

The responses clarify the potential visual effect of the project at various KOPs, and further explain the VQO consistency of the project. The lighting control guidelines in Mitigation Measure 4.9.2c have been clarified, and an additional mitigation measure (Measure 4.9.5c) has been added to further reduce the potential for night-lighting effects in the Medicine Lake vicinity. Since the visual analysis method used in the Draft EIS/EIR provided a fair and representative evaluation of potential impacts, use of an alternate method for analyzing visual effects is not warranted.

The responses also explain that Alternative 6 has been identified in the Final EIS/EIR as the lead agencies' preferred alternative. This alternative would implement transmission line Segment A3 instead of Segments A1 and A2 (which are proposed as part of the proposed action). Alternative 6 would therefore avoid the significant unavoidable visual effects that would occur at Medicine Lake KOPs under the proposed action.

### **Plans and Policies**

The topic areas of comment on plans and policies issues were:

- General
- Land and Resource Management Plans
- Northwest Forest Plan
- Released Roadless Areas

Many commentors asserted that the proposed project was not consistent with either the Klamath or Modoc Land and Resource Management Plan (LRMP). Other commentors questioned whether the proposed project was consistent with various aspects of the Northwest Forest Plan. Many commentors expressed a desire to designate portions of the project area as an "old-growth reserve." Many commentors also expressed concern about the potential impacts of the project on the Mt. Hoffman released roadless area.

The responses explain that the proposed project is consistent with the Klamath and Modoc LRMPs after mitigation. The Klamath LRMP would be amended to bring the plan into consistency with the American Indian Religious Freedom Act. The Klamath LRMP would also be amended to make the plan consistent with the Modoc LRMP regarding utility corridors. The responses also explain in detail how the project is consistent with the provisions of the Northwest Forest Plan.

The comments regarding designating the area as an old-growth reserve are beyond the scope of the EIS/EIR and were referred to USFS staff. The lead agencies for this project have chosen Alternative 6 as their preferred alternative. This alternative does not include Segment A2, which passes through the Mt. Hoffman released roadless area. Thus, there would be no impact to this area if the lead agencies' preferred alternative is selected. If an alternative that contains Segment A2 is selected, it would not substantially alter the character of the Mt. Hoffman released roadless area.

### **Land Use and Recreation**

The topic areas of comment on land use and recreation issues were:

- General
- Effects on the Overall Recreation Experience
- Effects on Dispersed Recreation
- Effects on Developed Recreation Use Areas
- Effects on Residential Areas

The majority of commentors expressed concern about the effects of the project on either the recreational experience in and near Medicine Lake or the experience of snowmobile users. Other commentors expressed concern about the potential effects of the project on hunting.

The responses clarify the potential effects of the project on the recreational experience in and near Medicine Lake and provide additional support for the conclusion that the project would not significantly affect uses in this area. The lead agencies for the project have selected Alternative 6 as their preferred alternative. This alternative does not include transmission line Segment A1; this segment would pass near Medicine Lake and would cross a developed trail. Since Alternative 6 would not use Segment A1, this alternative would avoid effects to recreation at Medicine Lake.

The responses also clarify the proposed project and how it would affect the use of snowmobiles in winter. Due to plowing, approximately seven miles of Forest Road 44N01 would be closed to snowmobile use as a result of this project. The effects of plowing on snowmobile use in the power plant and wellfield area are also discussed. A mitigation measure was modified to clarify how access would be maintained for snowmobiles within this area.

Mitigation Measure 4.15.8b was also clarified to state that "no shooting" signs would be posted in the power plant and wellfield area. This is the only area in which hunting would be partially restricted and would not represent a significant decline in hunting opportunities on the Klamath or Modoc National Forests.

### **Transportation**

The topic areas of comment on transportation issues were:

- Vehicular Trips Generated by the Project
- Road Safety
- Effects on the Four Corners-Medicine Lake Snowmobile Park

Most commentors raised concerns about road safety in the project vicinity and parking issues for the Four Corners-Medicine Lake Snowmobile Park. Commentors were also concerned about the volume of traffic generated by the project.

The responses to transportation comments address the issue of road safety in the project area and explain that specific mitigation measures to ensure safety would be implemented if the project were approved. The responses also clarify that the Four Corners-Medicine Lake Snowmobile Park would not be used as a carpool area for the proposed project. The project-generated traffic volumes are also further explained.

### **Air Quality**

The topic areas of comment on air quality issues were:

- Regulatory Issues
- Significance Thresholds
- Methodology
- Potential for Climatic Changes
- Air Quality Analysis
- Emissions
- Air Quality Impacts
- Odor Impacts
- Health Impacts
- Visibility Impacts
- Monitoring and Reporting
- Enforcement of Laws, Regulations, and Permit Conditions
- Mitigation Measures

The responses clarify the various impacts associated with dust, pollutants, noise and odors from the project. The responses also discuss the possibility for various forms of precipitation to be generated by the project. Further elaboration of the potential health impacts associated with the project is provided, the adequacy of the emissions calculations, modeling methodology, and proposed mitigation measures are supported. Project emission calculations have been refined, and minor changes have been made to the emission estimates provided in the Air Quality Section of the Draft EIS/EIR. No changes to the conclusions in this section have been made.

### **Noise**

The primary areas of comment on noise issues were the following:

- General
- Methodology
- Significance Criteria
- Noise Sources During Construction
- Noise Impacts During Construction
- Noise Sources During Operation
- Noise Impacts During Operation

- Noise During Decommissioning
- Potential Vibration Impacts
- Alternatives
- Mitigation Measures

The responses to comments clarify the methodology used to evaluate potential noise impacts associated with the proposed project. The designation of sensitive receptor sites in the proposed project area was further explained and information was clarified regarding the locations of sensitive receptors in the Tionesta area.

Many commentors expressed objection to the use of the county noise standard associated with actively-used recreational areas (as opposed to passively used open spaces) when evaluating potential noise impacts. The responses explain that the area supports recreational uses that are considered active-uses, such as motor boats and snowmobiles. Thus, the county noise standard associated with active-use is the more appropriate county noise standard to use when evaluating noise impacts associated with the project. Furthermore, it was demonstrated that even if the county noise standard associated with passively used areas was applied to the proposed project, project noise levels would not exceed this standard.

The responses clarify the well drilling and operational noise analysis by explaining the methods used to obtain key noise levels and to determine project-related noise levels at sensitive receptor sites in the area. Minor revisions to the EIS/EIR were made to clarify definitions presented in the noise analysis.

### **Human Health and Safety**

The main topics of comments on human health and safety issues were the following:

- Hazardous Materials
- Well Blowout Hazards
- Fire Hazards
- Electric and Magnetic Field Hazards
- Wellfield Facility Hazards
- Aircraft Hazards
- Threat of Disease
- Mitigation Measures

The primary areas commentors questioned were hazardous waste production and disposal, transport of hazardous materials, accidental release of hazardous materials, and hazards associated with the wellfield facility.

The responses explain that wastes associated with the proposed project would be treated in order to be classified as non-hazardous. However, if wastes deemed hazardous were produced by the project, disposal and transport of these materials would be consistent with all state and Federal regulations. The responses also clarify the procedures and safety plans that would be implemented to prevent accidental release of hazardous materials, and explain that emergency plans would be enacted if an accidental release were to occur.

Commentors expressed concern with the safety of the power plant and wellfield facility. The responses explain that the power plant would have restricted access and that the well pads would be constantly monitored. Furthermore, new roads into the wellfield would be gated and locked, preventing unauthorized access to the area.

Minor revisions to Mitigation Measure 4.11.4a were made to clarify the location of a cold water injection pipeline. In addition, the EIS/EIR was revised to reflect the change in cooling water treatment method from chlorine to sodium hypochlorite.

### **Socioeconomics**

The main areas of comment on socioeconomics issues were:

- General
- Employment
- Short-Term Housing
- Effects on Minority and Low-Income Populations
- Property Values
- Effects on Tourism
- Public Services
- Solid Waste Disposal
- Public Finance

Several commentors expressed concerns regarding the proposed project's potential to reduce property values in the Medicine Lake and Tionesta areas. The responses provide information obtained from published studies regarding the effects of transmission lines on property values in rural areas. This information supports the findings in the EIS/EIR. Minor revisions to the EIS/EIR were made to clarify that the proposed project would have a less-than-significant effect on property values in the Medicine Lake area.

Commentors also expressed concern regarding the need for additional police services to patrol residential areas in the Medicine Lake area as a result of the proposed project. The responses clarify that there would be ample police services during the summer months when construction occurred, and that there would be no additional roads maintained or built which could provide access to these areas during the winter months.

### **Cumulative Effects**

The topic areas of comment on cumulative effects issues were:

- Cumulative Projects
- Cumulative Effects

The responses clarify why the Fourmile Hill and Telephone Flat projects are the only reasonably foreseeable geothermal development at the Glass Mountain KGRA at this time. The responses also expand upon the discussion of potential cumulative effects from the Telephone Flat project that was provided in the Draft EIS/EIR. Subsequent to release of the Fourmile Hill Draft EIS/EIR, specific details on the size, surface disturbance, and potential environmental effects of the proposed Telephone Flat project

were made available through the Telephone Flat Draft EIS/EIR (released for public review in May 1998). The description in the Draft EIS/EIR of the Telephone Flat project was revised to provide these details, as well as clarify the role of the previously approved Glass Mountain exploration wells. The possible cumulative effects of the cumulative projects on various individual environmental parameters have been further explained, and these effects have been revised to incorporate quantitative information from the Telephone Flat Draft EIS/EIR.

### **Other Statutory Sections**

The topic areas of comment on other statutory section issues were:

- Growth-Inducing Impacts
- Short-Term Use Versus Long-Term Productivity
- Significant Irreversible Environmental Changes

The responses further support the conclusions proved in the Draft EIS/EIR regarding the possibility of additional growth in the area occurring due to development of the project. The responses also discuss the analysis of short-term and long-term impacts that might be caused by the project, as well as the possibility of significant irreversible environmental changes occurring if the project is developed as proposed.

### **Mitigation Monitoring and Reporting Program**

Comments on Mitigation Monitoring and Reporting Program (MMRP) issues were discussed under one heading entitled "Comments and Responses." There were only three commentors on the MMRP. The comments on the MMRP requested that:

- The type and amount of mitigation be clarified
- The specialists chosen for the project be selected by the USFS
- The mitigation measures be enforced

The responses clarified the type of mitigation to be used, the selection process for the specialists to be used on the project, and the enforcement protocol for the proposed mitigation measures. The MMRP has been revised to clarify that the mitigation measures apply to Alternatives 1 through 6, except as noted.

### **NEPA/CEQA Issues**

The topic areas of comment on NEPA/CEQA issues were:

- NEPA/CEQA Adequacy
- EIS/EIR Approach
- Draft EIS/EIR Public Involvement
- Plan to Act Against Project Approval

The responses clarify the document's adequacy under the provisions of NEPA and CEQA. In addition, the responses address the general adequacy of the document as an informational tool, as well as the adequacy of the mitigation measures proposed. Finally, the responses articulate the roles of the lead agencies in ensuring NEPA and CEQA compliance.

### **Project Preference**

The topic areas of comment on project preference were:

- Alternative Preference
- Project Opposition
- Project Support

The commentors generally expressed opinions either supporting or opposing construction of the proposed project. The responses provided commentary where appropriate, but primarily served to acknowledge the commentors' viewpoints, and reference these viewpoints to the responsible decision-making agencies.

### **General**

The topic areas of comment on general issues were:

- Public Requests
- General Concern About Project Effects
- Incorporation of Other Comments by Reference
- Statements and Opinions
- Other General Comments

The responses provided information, clarifications, and further explanation in response to these comments where appropriate. Opinions and statements made in the comments were noted, and referred to the responsible decision-making agencies for their consideration.

## **American Indian Consultation**

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Various regulations require that local American Indian groups be consulted regarding proposed projects. Consultations with local American Indian groups are currently being conducted regarding the proposed action.

Three meetings were conducted between October 1995 and April 1996 with American Indian tribal representatives from the Klamath Tribes and the Shasta group at Butte Valley and with a Pit River Tribal representative. A presentation was also made to Pit River Tribal Council members regarding the proposed action in April 1996. Subsequently, three meetings were held in June and July, 1996 with the Klamath Tribes Cultural Heritage Committee and with members of the Ajumawi and Atwamsini Bands of the Pit River Tribe. A site visit for tribal members was held in September 1996 and additional meetings were held in June 1997. Five additional meetings with the Pit River and Klamath Tribes were held from August 1997 through April 1998.

An ethnographic study was conducted as part of this EIS/EIR to identify traditional cultural values and uses in the project region, and to identify tribal concerns about the proposed project. The study included literature review, interviews with tribal members, and field verification of traditional use sites identified by tribal members. Issues raised by local tribal members in interviews indicate that local tribes have concerns that the geothermal operations would impact traditional uses in the Medicine Lake Highlands and cultural resource sites along the transmission line. Concerns were also raised that

the visual and noise effects of the project would alter the natural tranquillity and beauty of the sacred area. Effects on wildlife and water quality were also of concern.

## Overview of the Proposed Action

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### PROJECT LOCATION

The power plant and wellfield area would be located approximately three miles northwest of Medicine Lake, California on Federal Geothermal Leases CA21924 and CA21926. These geothermal leases are located within the boundaries of the Glass Mountain Federal Geothermal Unit (14-08-0001-18160), but the leases are not committed to the Unit or subject to Unit requirements (BLM 1982). The power plant and wellfield area would be located in Sections 21, 28, and 29, Township 44 North, Range 3 East, Mount Diablo Base and Meridian (MDB&M), Siskiyou County. The power plant and wellfield are shown on Figure S-3.

The proposed transmission line would extend east from the power plant site through the Modoc National Forest to a proposed intertie substation along the BPA Malin-Warner transmission line (which parallels Highway 139). The proposed substation would be located on the Modoc National Forest near Perez, California, in Section 12, Township 3 North, Range 6 East, MDB&M, Modoc County.

### PROPOSED ACTION

#### Wellfield and Power Plant

The proposed project would involve production of geothermal fluids (hot water and steam) from an underground geothermal reservoir. The fluids would flow under pressure up and out of the initial 9 to 11 two-phase production wells that would be drilled at the five proposed production well pad sites. The fluids would be transported via surface pipelines from the wells to the proposed dual-flash geothermal power plant, where the steam would be directed to two steam turbine-driven generators. The turbine exhaust steam would be condensed and pumped into a cooling tower. Spent brine and condensate would be pumped through surface pipelines to the three proposed injection wells for injection to the subsurface geothermal reservoir. There would initially be one injection well located at each of the injection well pads.

In order to provide access to the well pad sites and power plant, roads would be constructed and/or improved in the wellfield and power plant area. In addition, a temporary hand-laid water pipeline would be installed from the Arnica Sink area to the wellfield to provide water for well drilling activities during the first construction season.

#### Transmission Line

Electricity generated by the power plant would be transmitted to the existing BPA Malin-Warner transmission line via the proposed 24-mile, 230-kV transmission line. The proposed transmission line would extend from the Fourmile Hill power plant site to a proposed intertie substation along the BPA Malin-Warner transmission line. The proposed transmission line is comprised of segments A1, A2, B1, and C1. This line would be constructed using H-frame wood poles with steel structures used for strength

at certain locations (such as angle points and long spans). Right-of-way width would be approximately 125 feet along the constructed length of the transmission line; however, vegetation clearance would not be required for the entire right-of-way. Access roads for installation of structures and maintenance activities would be constructed along portions of the right-of-way.

#### PROJECT LIFESPAN AND DECOMMISSIONING

Construction of the proposed project would take approximately 3 years, and the planned period of commercial operation is 45 years. At the end of the project lifespan, the project would be decommissioned. All structures and equipment at the power plant site and well pads would be dismantled and removed, and all disturbed areas would be restored to pre-project conditions as practicable and/or to conditions acceptable to the USFS and BLM. Geothermal wells would be plugged and abandoned. The liquid-holding sump at each well pad would be emptied of residual fluid, backfilled with native soil to approximate pre-project contours, and scarified to promote revegetation. The transmission line and substation would also be dismantled and removed.

At the present time, no extension of the lifespan of the project beyond that currently proposed is contemplated or envisioned. If a decision is made at a later date to extend the project lifespan, authorization of this extension may be subject to additional environmental review and documentation.

### **Alternatives to the Proposed Action**

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A range of alternatives has been developed for detailed analysis in the EIS/EIR. These alternatives are feasible, meet the purpose and need for the project, and respond to key environmental issues. Five alternative transmission line routes are considered in detail in the EIS/EIR. In addition to these alternatives, the EIS/EIR evaluates the "No Action" alternative, which is required by both NEPA and CEQA. Table S-2 identifies the various transmission line segments that would be used by the proposed project or alternatives, and Table S-3 identifies which route segments are included in each alternative. Figure S-2 shows the proposed and alternative transmission line routes.

#### ALTERNATIVES COMPARISON

Table S-4 provides a comparative analysis of the potential effects (after mitigation) for key issues for all seven of the project alternatives, including the proposed action. Key issues are those issues that were identified as being of significant concern during the public scoping process for the project (see Section 1.6). Table S-4 identifies the potential effects of the proposed action, and compares the level of impact of each alternative to the proposed action. For many of the alternatives, the effects would be the same or similar to those of the proposed project.

In Table S-4 (as well as throughout this EIS/EIR), a distinction is made between "effects," "adverse effects," and "significant adverse effects." Effects are changes in the environment that would occur as a result of the project but that would not be adverse and would not be significant under CEQA. Adverse effects are effects that would occur as a result of the project, but that would be less than significant under CEQA.

**Table S-2: Transmission Line Route Segments**

Segment Number	Segment Location	Length (Miles)
<i>Proposed Action</i>		
A1	Extends southeast from power plant approximately 2 miles towards Medicine Lake, then east for approximately 3 miles to point south of Mt. Hoffman and east of Arnica Sink.	4.72
A2	A2 extends northeast between Mt. Hoffman and Glass Mountain to the "matchpoint."	3.67
B1	From the matchpoint, B1 extends east approximately 6 miles then turns to the northeast for approximately 1 mile.	6.78
C1	From the eastern ends of B1 and B2, C1 extends northeast, turning due east for 6 miles to a connection with the BPA Malin-Warner transmission line.	8.27
<i>Alternatives</i>		
A3	A3 extends north from the power plant, passing west of Fourmile Hill, then turning southeast. From eastern side of Fourmile Hill, it extends approximately 5 miles southeast to the "matchpoint."	8.17
B2	B2 extends southeast from the eastern end of A1. It then turns east passing to the south of Glass Mountain and Lyons Peak and then to the northeast along the former California-Oregon Transmission Project corridor.	12.74
C2	C2 continues northeast along the former California-Oregon Transmission Project corridor, then turns east and then northeast, following the alignment of road 44N32 and passing north of the Dry Lake Area.	9.66

SOURCE: G.E. Raleigh and Associates, Inc. and MHA Environmental Consulting, Inc. 1997

**Table S-3: Alternatives and Corresponding Transmission Line Route Segments**

Alternative	Segments <sup>1</sup>	Length (miles)
Proposed Action (Alternative 1)	A1, A2, B1, C1	23.4
Alternative 2	A1, A2, B1, C2	24.8
Alternative 3	A1, B2, C1	25.7
Alternative 4	A1, B2, C2	27.1
Alternative 5	A3, B1, C1	23.2
Alternative 6	A3, B1, C2	24.6
Alternative 7	No Action	0.0

<sup>1</sup> These segment designations correspond with the route segment designators shown on Figure 2.3-1.

SOURCE: G.E. Raleigh and Associates, Inc. and MHA Environmental Consulting, Inc. 1997

**Table S-4: Comparison of Key Issues for Alternatives<sup>1</sup>**

<b>Environmental Effect<sup>2</sup></b>	<b>Alt 1</b>	<b>Alt 2</b>	<b>Alt 3</b>	<b>Alt 4</b>	<b>Alt 5</b>	<b>Alt 6</b>	<b>Alt 7</b>
<i>Hydrology</i>							
Effects to Medicine Lake water quality	A	A	A	A	A	A	N
Effects to Medicine Lake water quantity	N	N	N	N	N	N	N
Effects to regional water quality or quantity	N	N	N	N	N	N	N
<i>Geothermal Resources</i>							
Effects on regional thermal features	N	N	N	N	N	N	N
<i>Cultural Resources</i>							
Effects to historic or archaeological resources	E	E	E+	E	E+	E	N
<i>Traditional Cultural Values</i>							
Surface effects on traditional cultural sites	N	N	N	N	N	N	N
Effects on access to traditional sites	N	N	N	N	N	N	N
Effects on traditional cultural values	S	S+	S	S+	S-	S+	N
Effects on traditional cultural uses	S	S+	S	S-	S-	S-	N
<i>Vegetation</i>							
Effects of vegetation removal	A	A+	A+	A+	A-	A-	N
Effects to special status plant species	A	A	A	A	A	A	N
Effects to old growth forest (late seral areas)	A	A	A+	A+	A	A	N
<i>Wildlife</i>							
Effects to general wildlife habitat	A	A+	A+	A+	A-	A-	N
Effects to special-status species (northern spotted owl, northern goshawk, bats)	A	A	A+	A+	A-	A-	N

**Table S-4:** Comparison of Key Issues for Alternatives, continued

<b>Environmental Effect</b> <sup>2</sup>	<b>Alt 1</b>	<b>Alt 2</b>	<b>Alt 3</b>	<b>Alt 4</b>	<b>Alt 5</b>	<b>Alt 6</b>	<b>Alt 7</b>
<i>Visual Resources</i>							
Effects of transmission line crossings of visually-sensitive roads	A	A	A+	A+	A-	A-	N
Effect on views from Medicine Lake	S	S	S	S	A	A	N
Effect on views from Tionesta and vicinity	A	A-	A-	A-	A	A-	N
Effect on views from Lava Beds National Monument	A	A	A	A	A	A	N
<i>Plans and Policies</i>							
Disturbance of roadless release areas	A	A	N	A	N	A	N
<i>Land Use and Recreation</i>							
Effects on Medicine Lake recreation and residences	A	A	A	A	N	N	N
Effects on snowmobiling	A	A	A	A	A	A	N
<i>Air Quality</i>							
Construction dust (PM <sub>10</sub> ) effects at Medicine Lake	A	A	A	A	A-	A-	N
Construction dust (PM <sub>10</sub> ) effects at Tionesta	A	N	A	N	A	N	N
Power plant emissions	A	A	A	A	A	A	N
<i>Noise</i>							
Construction and operation noise effects at Medicine Lake	S	S	S	S	A	A	N
Construction noise effects at Tionesta	S	N	S	N	S	N	N

## Notes:

<sup>1</sup> This table focuses on the effects of key issues, as identified through the scoping process for the project.

<sup>2</sup> N = No effect

E = Effect

A = Adverse effect

A- = Adverse effect less than the proposed action

A+ = Adverse effect greater than the proposed action

S = Significant adverse effect

S- = Significant adverse effect less than the proposed action

S+ = Significant adverse effect greater than the proposed action

SOURCE: MHA Environmental Consulting, Inc. 1997

Significant adverse effects are effects of the project that would be significant under CEQA. In comparing alternatives to the proposed action, a "+" sign is used in Table S-4 for those effects that would be greater than the proposed action, and a "-" sign is used for effects that would be less than the proposed action.

#### LEAD AGENCIES' PREFERRED ALTERNATIVE

At the issuance of the Draft EIS/EIR, the lead agencies had not identified a preferred alternative. NEPA requires that the lead agencies identify a preferred alternative (40 CFR 1502.14(e)). Based on the evaluation contained in the Draft EIS/EIR and public and agency comment on the Draft EIS/EIR, the lead agencies have identified Alternative 6 as their preferred alternative. This alternative would use transmission line segment A3 instead of segments A1 and A2 proposed as part of the proposed action, and segment C2 instead of segment C1 (see Figure S-1). Segment A3 would be routed north from the proposed power plant to avoid the Medicine Lake area, and segment C2 would be located in the vicinity of Dry Lake to avoid passing near Tionesta and Timber Mountain.

#### ENVIRONMENTALLY PREFERABLE ALTERNATIVE

Of the alternatives under consideration in this document, implementation of the No Action alternative would result in the avoidance of the environmental effects that would occur under the proposed project and the other alternatives. The No Action alternative would therefore be considered the environmentally preferable alternative; however, the No Action alternative would not meet the purpose and need for the proposed action.

Pursuant to CEQA Guidelines Section 15126(d)(4), an environmentally superior alternative must also be identified from among other project alternatives in the EIS/EIR. Based on the analysis contained in Chapter 4 of this document and summarized in Tables S-4 and S-5, Alternative 6 would be considered the environmentally superior alternative from among the project alternatives, other than the No Action alternative. Alternative 6 would have the least overall effect on the environment of these alternatives, because it would:

- Avoid construction of the transmission line near Medicine Lake and the associated visual, recreation, noise, and air quality effects at this location
- Minimize effects to traditional cultural values and uses (specifically, to avoid effects near Medicine Lake and Timber Mountain)
- Minimize vegetation disturbance, including tree disturbance, late seral forest removal, and potential effects to habitat for sensitive plant species
- Minimize effects to wildlife habitat, including sensitive species such as northern spotted owl, northern goshawk, and bats
- Avoid transmission line construction next to the community of Tionesta

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## Affected Environment

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The proposed wellfield and power plant would be located within the Medicine Lake Highlands and the proposed and alternative transmission lines would extend from the power plant over or around the Highlands and down onto the Modoc Plateau. The Medicine Lake Highlands is an area that is characterized by volcanic activity. Past volcanic activity has resulted in a variety of features that make up the geologic and topographic characteristics of the Medicine Lake Highlands. The volcanoes within the Highlands include small cinder cones (such as Fourmile Hill) and lava domes and glass flows (such as Glass Mountain), and relatively low, gently sloping shield volcanoes (such as Medicine Lake volcano).

The presence of geothermal resources in this area is due to this volcanic activity. The geothermal system in the immediate area consists of fluids that are heated at depth by a magmatic heat source underlying the Medicine Lake caldera. The heated fluids then rise upwards through fractures. There are two distinct groundwater systems, the geothermal system, and a shallow, cold groundwater aquifer. The shallow groundwater is the source of the water for the water supply wells in the area and is confined by a relatively impermeable layer of clay-rich ash flow tuffs which underlie the lavas. This tuff isolates the shallow groundwater system from the geothermal system.

Medicine Lake, which is located about 3 miles southeast of the power plant site, is the largest surface water body within 10 miles of the project area. The lake lies in the Medicine Lake caldera at approximately 6,700 feet in elevation. Other nearby lakes and springs include Little Medicine Lake, Bullseye Lake, Blanche Lake, Schonchin Spring, Crystal Springs, and Paynes Springs. Paynes Creek is the only perennial stream within five miles of the wellfield and power plant site.

The vegetation in the Medicine Lake Highlands is characterized primarily by a mosaic of upper mountain conifer forest types, including stands of red fir and lodgepole pine, especially in the western portions of the study area. The eastern portion of the project area is on the Modoc Plateau, and vegetation consists of scrub-dominated vegetation types with sparse ponderosa pine and woodlands of western juniper. Wildlife habitat characteristics of the project area are based on these vegetation characteristics. The visual characteristics of the area are also defined by the presence of the Medicine Lake Highlands. The Highlands are an uplifted area on the Modoc Plateau that can be seen from miles away, especially from the east and north.

The project area has been traditionally used by several local tribes, including the Klamath, Pit River, and Shasta Tribes. The Medicine Lake Highlands and the Modoc Plateau are important to tribal members for traditional and spiritual uses. Many of the topographic features formed by volcanic action in the Medicine Lake Highlands are known to hold spiritual significance for past and present-day tribal peoples. Springs and caves are also important features. Many traditional use areas are located throughout the Highlands and the Modoc Plateau, and are known localities for hunting and gathering, mineral resources, social interaction, and medicinal/spiritual purposes, both historically and by present-day tribal peoples. This historical use is supported by existing archaeological evidence from the project vicinity which suggests that humans have been active in the area for approximately the last 10,000 years.

The primary land uses in the Medicine Lake Highlands are recreation, timber, and limited mining. Recreation uses dominate in the Medicine Lake area with the presence of campgrounds and seasonal residences. Dispersed recreation activities occur throughout the National Forests and consist of hiking, hunting, off-road vehicle use, and snow-mobiling and cross-country skiing during the winter. The area is accessed by Primary Forest Route 49, which provides north/south access, and Primary Forest Routes 97 and 77, which provide east/west access. Land uses on the Modoc Plateau consist primarily of grazing activities (sheep and cattle) and residential uses in the community of Tionesta.

The climate in the project area is characterized by warm, dry summers and cool, moist winters. As most of the Medicine Lake Highlands lie at elevations higher than 4,000 feet, the majority of winter precipitation falls as snow. Air quality is generally good in the region, although the air basin is classified by the California Air Resource Board as nonattainment for PM<sub>10</sub> (particulate matter less than 10 microns). Ambient noise levels are low and typical of rural undeveloped areas. The highest noise levels are likely within the Medicine Lake area during the summer season when boating activities are at their peak.

Population in the project area is low and includes the community of Tionesta and scattered residences. Other local communities in the vicinity of the project include Alturas, Dorris, Dunsmuir, Etna, Fort Jones, Montague, Mount Shasta, Tulelake, Weed, and Yreka. The majority of local housing and some jobs occur in these communities. Employment in the region relates to timber, agriculture, recreation, mining, trade and service, and, more recently, development and construction.

## **Environmental Consequences**

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### **EFFECTS OF THE PROPOSED ACTION AND MITIGATION MEASURES**

Table S-5 at the end of this section provides a summary of the environmental consequences and levels of significance of the effects for the proposed action and all alternatives. This table includes all of the impacts for the proposed action identified in Chapter 4 of the EIS/EIR. The level of significance of each impact prior to mitigation is identified. The table identifies whether mitigation is recommended and the level of significance after mitigation. No mitigation would be required for Alternative 7, the No Action alternative. The Draft EIR/EIS identifies mitigation for project effects under each environmental parameter.

### **CUMULATIVE EFFECTS**

The cumulative effects of the proposed action and the cumulative effects of each of the alternatives are addressed in Chapter 4. The project could result in significant cumulative effects through the potential for conflicts with religious use of the area by local tribal members. The temporary noise and air quality effects from project construction could be cumulatively significant if they overlapped with other projects, such as the proposed CalEnergy Telephone Flat geothermal project. Cumulative effects in the Medicine Lake area would be avoided by alternatives.

### UNAVOIDABLE ADVERSE EFFECTS

The unavoidable adverse effects of the project are described in Chapter 4. Unavoidable significant adverse impacts (long-term and after mitigation) would result from the potential for conflicts with traditional cultural values and American Indian concerns, and visual effects of the proposed project. The visual effects would be avoided by alternatives.

### OTHER EFFECTS

As required by NEPA and CEQA, Chapter 4 also addresses potential growth-induced effects, the short-term use compared with long-term productivity, cumulative and long-term adverse environmental effects, and significant irreversible environmental changes.

**Table S-5: Summary of Environmental Consequences and Mitigation Measures for the Proposed Project**

IMPACT ALTERNATIVES	LEVEL OF SIGNIFICANCE BEFORE MITIGATION							MITIGATION RECOMMENDED?							LEVEL OF SIGNIFICANCE AFTER MITIGATION						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
<b>4.2 GEOLOGY AND SOILS</b>																					
4.2.1 Effects on Topography	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.2.2 Effects on Unique Geologic Features and Paleontological Resources	N	N	N	N	N	N	N	Yes	Yes	Yes	Yes	Yes	Yes	No	N	N	N	N	N	N	N
4.2.3 Mineral Resources	N	N	N	N	N	N	N	No	No	No	No	No	No	No	N	N	N	N	N	N	N
4.2.4 Ground Subsidence	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.2.5 Seismic Activity	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.2.6 Volcanic Activity	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.2.7 Liquefaction	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.2.8 Slope Instability	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.2.9 Snow Avalanches	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.2.10 Effects on Soil Erosion	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.2.11 Effects of Deposition of Air Emissions	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
<b>4.3 HYDROLOGY</b>																					
4.3.1 Effect of Water Use	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.3.2 Effects of Geothermal Fluid Production and Injection on Water Quantity	N	N	N	N	N	N	N	Yes	Yes	Yes	Yes	Yes	Yes	No	N	N	N	N	N	N	N
4.3.3 Effects of Increased Surface Runoff	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.3.4 Effects of Flooding	N	N	N	N	N	N	N	No	No	No	No	No	No	No	N	N	N	N	N	N	N
4.3.5 Effects on Stream Channels	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.3.6 Effects of Geothermal Drilling, Production, and Injection on Water Quality	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.3.7 Effects of Air Emissions on Water Quality	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.3.8 Effects of Sanitary Waste on Water Quality	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N

S = Significant      L = Less than Significant      N = No Effect

**Table S-5: Summary of Environmental Consequences and Mitigation Measures for the Proposed Project**

IMPACT	LEVEL OF SIGNIFICANCE BEFORE MITIGATION							MITIGATION RECOMMENDED?							LEVEL OF SIGNIFICANCE AFTER MITIGATION						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
<b>ALTERNATIVES</b>	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.3.9 Effects of Chemical and Hazardous Material Spills on Water Quality	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
<b>4.4 GEOTHERMAL RESOURCES</b>																					
4.4.1 Effects on the Life Expectancy of the Geothermal Reservoir	L	L	L	L	L	L	N	No	No	No	No	No	No	L	L	L	L	L	L	N	
4.4.2 Effects of Injection on Reservoir Characteristics	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N	
4.4.3 Effects on Regional Thermal Features	N	N	N	N	N	N	N	No	No	No	No	No	No	L	L	L	L	L	L	N	
<b>4.5 CULTURAL RESOURCES</b>																					
4.5.1 Effects on Cultural Resources From Surface Disturbance	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N	
<b>4.6 TRADITIONAL CULTURAL VALUES</b>																					
4.6.1 Effects on Medicine Lake Highlands	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	S	S	S	S	S	S	N	
4.6.2 Direct Effects on Traditional Sites in the Medicine Lake Highlands	S	S	S	S	N	N	N	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N	
4.6.3 Effects of Project Noise on Traditional Sites and Uses	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	S	S	S	S	S	S	N	
4.6.4 Effects on Access to Traditional Sites	L	L	L	L	N	N	N	Yes	Yes	Yes	Yes	Yes	No	N	N	N	N	N	N	N	
4.6.5 Effects on Traditional Religious Practices	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	S	S	S	S	S	S	N	
4.6.6 Effects on Landscape Views	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	S	S	S	S	S	S	N	
4.6.7 Effects on Natural and Other Resources in the Project Region:																					
• Archeologic and Historic	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N	
• Water Quality	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N	
• Vegetation	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N	
• Wildlife	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N	
• Human Health and Safety	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N	

S = Significant L = Less than Significant N = No Effect

**Table S-5: Summary of Environmental Consequences and Mitigation Measures for the Proposed Project**

IMPACT	LEVEL OF SIGNIFICANCE BEFORE MITIGATION							MITIGATION RECOMMENDED?							LEVEL OF SIGNIFICANCE AFTER MITIGATION						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
<b>ALTERNATIVES</b>	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	No	S	S	S	S	S	S	N
• Socioeconomics																					
<b>4.7 VEGETATION</b>																					
4.7.1 Effects on General Vegetation	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.7.2 Depositional Effects on Vegetation	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.7.3 Effects on Special-Status Plant Species	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.7.4 Effects on Sensitive Plant Communities	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.7.5 Introduction of Weeds	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
<b>4.8 WILDLIFE</b>																					
4.8.1 Potential for General Wildlife Habitat Loss	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.8.2 Wildlife Effects from Noise and Disturbance	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.8.3 Effects on Special-Status Species	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.8.4 Bird Electrocution and Collision Hazards	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
<b>4.9 VISUAL RESOURCES</b>																					
4.9.1 Temporary Visual Effects of Vehicles and Equipment	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.9.2 Effects on Wellfield and Power Plant Vicinity Views	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.9.3 Effect on Primary Forest Route 49 Views Near the Plant Site	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.9.4 Effects on Views from Medicine Lake Area Roads	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.9.5 Effects on Medicine Lake Views	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	No	S	S	S	S	S	S	N
4.9.6 Effect on Little Mount Hoffman Views	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N

S = Significant    L = Less than Significant    N = No Effect

**Table S-5: Summary of Environmental Consequences and Mitigation Measures for the Proposed Project**

IMPACT	LEVEL OF SIGNIFICANCE BEFORE MITIGATION							MITIGATION RECOMMENDED?							LEVEL OF SIGNIFICANCE AFTER MITIGATION							
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	
<b>ALTERNATIVES</b>																						
4.9.7 Effect on Arnica Sink and Glass Mountain Views	S	S	S	S	L	L	N	Yes	Yes	Yes	Yes	Yes	No	No	L	L	L	L	L	L	N	
4.9.8 Effects on Tionesta and Vicinity Views	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	No	No	L	L	L	L	L	L	N	
4.9.9 Effects on Lava Beds National Monument Views	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	No	No	L	L	L	L	L	L	N	
<b>4.10 PLANS AND POLICIES</b>																						
4.10.1 Consistency with Klamath National Forest Land and Resource Management Plan	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	No	No	L*	L*	L*	L*	L*	L*	N	
4.10.2 Consistency with Modoc National Forest Land and Resource Management Plan	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N	
4.10.3 Consistency with Lease Stipulations	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N	
4.10.4 Consistency with Siskiyou County General Plan	N	N	N	N	N	N	N	No	No	No	No	No	No	No	N	N	N	N	N	N	N	
4.10.5 Consistency with Modoc County General Plan	N	N	N	N	N	N	N	No	No	No	No	No	No	No	N	N	N	N	N	N	N	
<b>4.11 LAND USE AND RECREATION</b>																						
4.11.1 Effect on the Overall Recreation Experience	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	No	No	L	L	L	L	L	L	N	
4.11.2 Effect on Developed Recreation Use Areas	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N	
4.11.3 Effects on Medicine Lake Residences	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N	
4.11.4 Effect on Dispersed Recreation	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	No	No	L	L	L	L	L	L	N	
4.11.5 Consistency with ROS Allocations	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N	

\* If Klamath National Forest LRMP is amended

S = Significant    L = Less than Significant    N = No Effect

Table S-5: Summary of Environmental Consequences and Mitigation Measures for the Proposed Project

IMPACT	LEVEL OF SIGNIFICANCE BEFORE MITIGATION							MITIGATION RECOMMENDED?							LEVEL OF SIGNIFICANCE AFTER MITIGATION						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
<b>ALTERNATIVES</b>																					
4.11.6 Effect on Recreation at the Lava Beds National Monument	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.11.7 Effects on Tiemesta Residences	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.11.8 Effects on Range Lands	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N
4.11.9 Effects on Timber Lands	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N
4.11.10 Effect on Mining and Geothermal Exploration Activities	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.11.1 Effect on Mushroom Harvesting	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
<b>4.12 TRANSPORTATION</b>																					
4.12.1 Effects on Road Traffic	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N
4.12.2 Effect on Structural Integrity of Project Area Roads	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N
4.12.3 Summer Access Issues	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N
4.12.4 Winter Access Issues	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
<b>4.13 AIR QUALITY</b>																					
4.13.1 Effects of Construction PM <sub>10</sub> Emissions	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	S	S	S	S	S	S	N
4.13.2 Effects of Construction H <sub>2</sub> S Emissions	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N
4.13.3 Effects of Construction Emissions of Other Criteria Pollutants	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.13.4 Effects of Operation PM <sub>10</sub> Emissions	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.13.5 Effects of Operation H <sub>2</sub> S Emissions	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	L	L	L	L	L	L	N
4.13.6 Effects of Operation Emissions of Other Criteria Pollutants	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.13.7 Effect of Decommissioning PM <sub>10</sub> Emissions	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.13.8 Effect on Public Health	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.13.9 Effect on Visibility	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	S	S	S	S	S	S	N

S = Significant    L = Less than Significant    N = No Effect

Table S-5: Summary of Environmental Consequences and Mitigation Measures for the Proposed Project

IMPACT	LEVEL OF SIGNIFICANCE BEFORE MITIGATION							MITIGATION RECOMMENDED?							LEVEL OF SIGNIFICANCE AFTER MITIGATION						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
<b>ALTERNATIVES</b>																					
4.13.10 Effect on Global Warming	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.13.11 Conformity Analysis	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
<b>4.14 NOISE</b>																					
4.14.1 Effects on Forest Noise Levels	S	S	S	S	S	S	N	No	No	No	No	No	No	No	S	S	S	S	S	S	N
4.14.2 Noise Effects on Sensitive Receptors Near Medicine Lake	S	S	S	S	N	N	N	Yes	Yes	Yes	Yes	No	No	No	S	S	S	S	N	N	N
4.14.3 Noise Effects on Sensitive Receptors Near Tionesta	S	L	S	L	S	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	S	L	S	L	S	L	N
<b>4.15 HUMAN HEALTH AND SAFETY</b>																					
4.15.1 Storage, Use, Transport, and Disposal of Hazardous Materials	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.15.2 Accidental Releases of Hazardous Materials	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.15.3 Well Blowout Hazards	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.15.4 Geothermal Fluid Hazards	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.15.5 Fire Hazards	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.15.6 Electric and Magnetic Fields	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.15.7 Downed Power Lines	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.15.8 Health Risk from Presence of Project Facilities	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
<b>4.16 SOCIOECONOMICS</b>																					
4.16.1 Effects on Population	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.16.2 Effects on Employment	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.16.3 Effect on Housing and Lodging	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	Yes	No	L	L	L	L	L	L	N
4.16.4 Effect on Minority and Low-Income Populations	S	S	S	S	S	S	N	Yes	Yes	Yes	Yes	Yes	Yes	No	S	S	S	S	S	S	N
4.16.5 Effect on Local Property Values	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.16.6 Effect on Schools	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N

S = Significant    L = Less than Significant    N = No Effect

**Table S-5: Summary of Environmental Consequences and Mitigation Measures for the Proposed Project**

IMPACT ALTERNATIVES	LEVEL OF SIGNIFICANCE BEFORE MITIGATION							MITIGATION RECOMMENDED?							LEVEL OF SIGNIFICANCE AFTER MITIGATION						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
4.16.7 Effect on Police, Fire Protection, and Emergency Services	L	L	L	L	L	L	N	Yes	Yes	Yes	Yes	Yes	No	No	L	L	L	L	L	L	N
4.16.8 Effect on Water and Sanitary Sewer Services	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.16.9 Effect on Solid Waste Disposal	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.16.10 Effect on Utility Systems	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N
4.16.11 Effect on Public Finance	L	L	L	L	L	L	N	No	No	No	No	No	No	No	L	L	L	L	L	L	N

S = Significant      L = Less than Significant      N = No Effect