

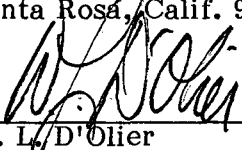
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**THERMAL POWER COMPANY**  
Santa Rosa Office

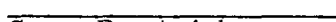
Project Title: Cascade Geothermal Drilling  
**CLACKAMAS 5000-FOOT THERMAL GRADIENT HOLE**  
Cooperative Agreement No. DE-FC07-85ID12614

**PROJECT INSTITUTIONAL PLAN**  
11 March 1986

Submitted by:  
Thermal Power Company  
3333 Mendocino Avenue  
Santa Rosa, Calif. 95401

  
\_\_\_\_\_  
W. L. D'Olier  
Participant  
Project Manager

Approved by:  
U.S. DOE, Idaho Operations Office  
785 DOE Place  
Idaho Falls, Idaho 83402

  
\_\_\_\_\_  
Susan Prestwich  
DOE Project Officer

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I. Introduction

A. Project Overview

The Project Institutional Plan addresses the legal, social, and environmental aspects of Thermal Power Company's (TPC) intended activities in connection with the drilling, coring and completion of a 5000-foot thermal gradient hole. This Plan specially describes the required permits and other governmental approvals necessary for performance of TPC's activities. The gradient hole operations are estimated to begin on June 1, 1986 and to complete by August 31, 1986. This plan is submitted in compliance with DOE's reporting requirements under a Cooperative Agreement with TPC for the U.S. Department of Energy's Cascades Deep Thermal Gradient Drilling Program Contract No. DE-FC07-85ID12614. The thermal gradient hole will be located on issued federal geothermal lease OR12344 located within Marion County, Oregon in the Mt. Hood National Forest.

B. Right of Access

TPC has access to federal geothermal resources lease number OR 12344, through an agreement with Chevron USA, Inc. Chevron was assigned lease OR12344 on September 1, 1985. (See Section V, Attachment A.)

II. Permits Required

A. Surface Water Appropriation Permit

1. Purpose

A surface water appropriation permit is required in order to use public water which is the anticipated source for the water required in the drilling and coring operations. The U.S. Forest Service has recommended a tanker fill site where Public Road 4690 crosses the Clackamas River. This site is located 1200 feet south and 333 feet east from the NW corner of Section 22, Township 8S, Range 8 E. Approximately 4,000 gallons per day will be needed during coring and drilling operations.

2. Agency Approval

Because the classification of the upper Clackamas subbasin does not specifically designate uses associated with geothermal exploration, TPC submitted a request for an exception to the Upper Clackamas River Basin Program on December 16, 1985 along with an application for a Surface water Appropriation Permit to the State of Oregon Water Resources Department.

The 1985 amendment to water law eliminated the legal basis for the exception process by merging the authorities of the Water Policy Review Board and the Director. The Water Resources Commission has not yet adopted new administrative rules to handle public interest determinations regarding water right applications. Therefore, the Water Resources Department recommended to the Water Resources Commission that Thermal Power Company's application be processed with a temporary rule allowing limited-duration use of public water in geothermal exploration activities in the upper Clackamas subbasin. These written recommendations were submitted to the Commission on February 14, and were approved by the Commission on February 28. The water appropriation permit will be issued shortly according to Tom Kline of the Water Resources Department. See Section V, Attachment B for copies of relevant documentation relating to the water appropriation permit.

3. Discussion

The water appropriation permit will be valid for 180 days from issuance.

B. Geothermal Fluid Discharge Permit

1. Purpose

A geothermal fluid discharge permit is required from the State of Oregon, Department of Environmental Quality, to discharge geothermal fluids.

2. Agency Approval

The application of a geothermal fluid discharge permit was submitted to the State of Oregon, Department of Environmental Quality on December 16, 1985 (see Section V, Attachment C).

3. Discussion

As described in the Plan of Exploration (Section V, Attachment A, pages 3-4), during the intended drilling operation, all drilling fluids will be contained in an excavated lined sump. Geothermal fluids, if produced from the borehole, will be flowed into a large portable steel tank. The sump will be used for back-up storage. At completion, these fluids will be chemically analyzed prior to disposal.

In the unlikely event that any hazardous levels of constituents are detected in the chemical analyses, TPC will jointly formulate a recommendation of disposal with the Oregon Department of Environmental Quality (DEQ) and obtain concurrence from the BLM, Forest Service and DOE prior to taking remedial action.

On February 10, 1986, TPC was advised by the Director of the Oregon Department of Environmental Quality that TPC's request had been approved (See Section V, Attachment C.)

C. Geothermal Drilling Permit

1. Purpose

In accordance with the requirements of 30 U.S.C. 1023, 30 CFR 270.71, and federal geothermal lease stipulations, a geothermal drilling permit must be obtained from the U.S. Department of the Interior, Bureau of Land Management, prior to proceeding with any drilling activities on federal lands. In addition, TPC must also obtain a drilling permit from the State of Oregon's Department of Geology and Mineral Industries (DOGAMI). DOGAMI has agreed to accept the same drilling permit application that was submitted to obtain federal approval.

2. Agency Approvals

The geothermal drilling permit application was submitted to the Bureau of Land Management in Portland on November 14, 1985 and to DOGAMI on December 4, 1985. The drilling permit was approved by DOGAMI on January 9, 1986, contingent upon the approval of the county in which intended drilling activity occurs. TPC has received county approval, as described in Section D. However, U.S. Department of Interior - Bureau of Land Management (BLM) approval is still pending.

3. Discussion

Pursuant to a Memo of Understanding between DOE, the Forest Service and BLM, these agencies reached a joint determination on the appropriate environmental review necessary for BLM approval of TPC's Plan of Exploration and drilling permit application.

The Forest Service and BLM are now in the process of a Categorical Exclusion Review (CER) of TPC's intended activities. The BLM has not as yet approved the Plan of Exploration nor issued a drilling permit. TPC would like to obtain a valid drilling permit by March 31, 1986 to allow sufficient lead time in order to execute an agreement with the selected drilling contractor.

TPC will need to submit a request for an extension of the DOGAMI drilling permit, as it will expire 180 days from its issuance on January 9, 1986. TPC does not anticipate difficulty in obtaining approval for an extension.

The drilling permit information is shown in Attachment D, Section V.

D. County Permits and Approvals

1. Purpose

Marion County has indicated no permits are required for TPC's intended activities. However DOGAMI has requested Marion County's approval in order to validate the drilling permit.

2. Agency Approvals

Marion County has been notified in writing of TPC's intended activities in a letter dated January 21, 1986 (see Section V, Attachment I). Marion County has also been provided with copies of the following documents: (a) Plan of Exploration; (b) Application for a Geothermal Fluid Discharge Permit; (c) Request for an Exception to the Basin Program for the Upper Clackamas River; and (d) Application for a Permit to Appropriate Surface Water.

3. Discussion

Marion County's written approval was received on February 7, 1986 and is shown in Attachment E, Section V.

E. Miscellaneous

As shown in Attachment V, Section F, TPC has a nationwide geothermal lease bond and exploration operation bond to meet federal requirements for drilling activities on a federal lease. TPC is authorized to transact business in the State of Oregon, as evidenced by its Certificate of Authority dated August 8, 1975, as also shown in this section.

### III. Environmental Review and Reports

BLM and Forest Service are conducting a Categorical Exclusion Review for the project. TPC will cooperate with BLM and DOE and provide any requested information to facilitate the preparation of environmental related documents.

In support of the Plan of Operations TPC has conducted a drillsite specific sensitive plant survey and a cultural resource survey. As described in the survey reports included as Appendices 2 and 3 to the Plan of Exploration (see Section V, Attachment A) no rare, endangered or sensitive plants were seen in the drillsite or in the surrounding harvest unit, nor would any be expected at another time of year. The cultural resources survey report states that the neither the literature and records reviewed nor the surface reconnaissance revealed any physical evidence of significant prehistoric, historic or religious activities within the project area. If cultural materials are encountered during the course of the project, however, the site significance will be assessed prior to continuing.

TPC has prepared a site specific Environmental Evaluation Report (EER) shown in Section V, Attachment H, in accordance with DOE environmental guidelines.

### IV. Controls and Mitigation Measures

TPC intends to minimize environmental impacts of its activities by adhering to procedures for the prevention and control of: (a) fire, (b) soil erosion, (c) pollution of surface and groundwater, (d) air and noise pollution, (e) public health and safety, (f) damage to fish, wildlife and natural resources, (g) waste disposal, (h) monitoring of air quality, noise, and drilling mediums, (i) monitoring of solids, liquids and gases, and (j) drillsite abandonment. These procedures and the Emergency Contingency Plan are included in the Plan of Exploration (See Section V, Attachment D).





**Chevron Resources Company**

A Division of Chevron Industries, Inc.  
595 Market Street, San Francisco, California  
Mail Address: P.O. Box 7147, San Francisco, CA 94120-7147

July 22, 1985

Geothermal Lease #OR12344  
Clackamas Area, OR

Mt. Hood National Forest  
2955 N. W. Division Street  
Gresham, OR 97030  
Attn: Forest Supervisor

Bureau of Land Management  
Division of Mineral Resources  
P. O. Box 2965  
Portland, OR 97201  
Attn: R. Fujimoto

Gentlemen:

This letter is to advise you that Chevron U.S.A. Inc. has exercised its option on the subject lease and received an assignment form executed by the present lessee of record, John W. Hook. We are in the process of filing this assignment for approval with the appropriate BLM office.

Chevron also has a joint venture farm-in agreement with Thermal Power Company that includes the subject lease. It is proposed that the initial well, should Thermal and DOE execute a cooperative agreement, be located on a portion of said lease.

Under the terms of the farm-in agreement, Thermal will act as operator for this initial well.

Sincerely,

A handwritten signature in black ink, appearing to read "O. C. Loose". The signature is written in a cursive style with a long horizontal stroke at the end.

O. C. Loose  
District Land Supervisor

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

Serial No.

OR 12344

New Serial No.

ASSIGNMENT AFFECTING RECORD TITLE  
TO GEOTHERMAL RESOURCES LEASE  
PART I

1

CHEVRON USA INC.  
c/o Chevron Resources Company  
P.O. Box 7147  
San Francisco, CA 94120-7147

The undersigned, as owner of 100 percent of record title of the above-designated geothermal resources lease issued effective (date) December 1, 1983, hereby transfers and assigns to the assignee shown above, the record title interest in and to such lease as specified below.

2. Describe the lands affected by this assignment (43 CFR 3241.2-5) Clackamas Co., OR

T8S-R8E WM  
Unsurveyed Sec. 16: A11  
" Sec. 21: A11  
" Sec. 28: A11  
" Sec. 33: N½

Total Area 2,240 Acres

3. What part of assignor(s) record title interest is being conveyed to assignee? (Give percentage or share) 100%

4. What part of the record title interest is being retained by assignor(s)? None

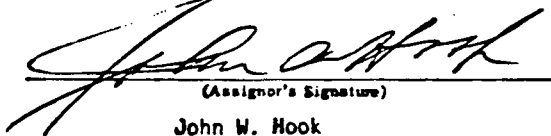
5a. What overriding royalty or production payments is the assignor reserving herein? (See Item 4 of General Instructions; specify percentage; no assignment will be approved which does not comply with 43 CFR 3241.7-2 on limitation of overriding royalties) 3%

b. What overriding royalties or production payments, if any, were previously reserved or conveyed? (Percentage only) None

It is agreed that the obligation to pay any overriding royalties or payments out of production of geothermal resources created herein, which, when added to overriding royalties or payments out of production previously created, aggregate in excess of 50 percent, of the rate of royalty due the United States, shall be suspended.

I CERTIFY That the statements made herein are true, complete, and correct to the best of my knowledge and belief and are made in good faith.

Executed this 10 day of July, 1985

  
(Assignor's Signature)  
John W. Hook

P.O. Box 3133  
(Assignor's Address)

Salem OR 97302  
(City) (State) (Zip Code)

Title 18 U.S.C., Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious, or fraudulent statements or representations as to any matter within its jurisdiction.

THE UNITED STATES OF AMERICA

Assignment approved as to the lands described below:

Same as item 2 except that this land is located in Marion County.

Assignment approved effective SEP 1 1985

By   
(Authorized Officer)

Chief, Minerals Operations Section AUG 20 1985  
(Title) (Date)

NOTE: This form may be reproduced provided that copies are exact reproductions on one sheet of both sides of this official form in accordance with the provisions of 43 CFR 3241.2-4.

## ASSIGNEE'S REQUEST FOR APPROVAL OF ASSIGNMENT

## A. ASSIGNEE CERTIFIES THAT

1. Assignee is qualified to hold a geothermal resources lease under 43 CFR 3202.1
2. Assignee is  Individual  Municipality  Association  Corporation
3. Assignee is the sole party in interest in this assignment (*information as to interests of other parties in this assignment must be furnished as prescribed in Specific Instructions*)
4. Filing fee of \$50 is attached (*See Item 2 of General Instructions*)
5. Assignee's interests, direct and indirect, in geothermal resources leases, do not exceed 20,480 chargeable acres (43 CFR 3201.2)

B. ASSIGNEE AGREES to be bound by the terms and provisions of the lease described here, provided the assignment is approved by the Authorized Officer.

C. IT IS HEREBY CERTIFIED That the statements made herein are true, complete, and correct to the best of undersigned's knowledge and belief and are made in good faith.

Executed this 6<sup>th</sup> day of August . 19 85

CHEVRON USA INC.

By J. W. Davis  
(Assignee's Signature)

Attorney-In-Fact

c/o Chevron Resources Co.  
P.O. Box 7147  
San Francisco, CA 94120-7147

(Address, include zip code)

Title 18 U.S.C., Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious, or fraudulent statements or representations as to any matter within its jurisdiction.

## GENERAL INSTRUCTIONS

1. *Use of form* - Use only for assignment of record title interest in geothermal resources leases, and for assignments of working or royalty interests, operating agreements, or subleases. An assignment of record title may only cover lands in one lease. If more than one assignment is made out of a lease, file a separate instrument of transfer with each assignment.
2. *Filing and number of copies* - File three (3) completed and manually signed copies in proper BLM office. A \$50 nonrefundable filing fee must accompany assignment. File assignment within ninety (90) days after date of final execution.
3. *Effective date of assignment* - Assignment, if approved, taken effect on the first day of the month following the date of filing of all required papers.
4. *Overriding royalties or payments out of production* - Describe in an accompanying statement any overriding royalties or payments out of production created by assignment but not set out therein. If payments out of production are reserved by assignor, outline in detail the amount, method of payment, and other pertinent terms.
5. *Effect of assignment* - Approval of assignment of a definitely described portion of the leased lands creates separate leases. Assignee, upon approval of assignment, becomes lessee of the Government as to the assigned interest and is responsible for complying with all lease terms and conditions, including timely payment of annual rental and maintenance of any required bond; except in the case of assignment of undivided interests, royalties, and operating agreements.
6. A copy of the executed lease, out of which this assignment is made, should be made available to assignee by assignor.

## SPECIFIC INSTRUCTIONS

(Items not specified are self-explanatory)

## PART I

Item 1 - Type or print plainly, in ink, between and below heavy dots, the assignee's full name and mailing address, including zip code.

## PART II

## A. Certification of assignee

3. If assignee is an association or partnership, assignee must furnish a certified copy of its articles of association or partnership, with a statement that (a) it is authorized to hold geothermal resources leases; (b) that the person executing the assignment is authorized to act on behalf of the organization in such matters; and (c) names and addresses of members controlling more than 10 percent interest.

If assignee is a corporation, it must submit a statement containing the following information: (a) State in which it was incorporated; (b) that it is authorized to hold geothermal resources leases; (c) that officer executing assignment is authorized to act on behalf of the corporation in such matters; and (d) percentage of voting stock and percentage of all stock owned by aliens or those having addresses outside the United States. If 10 percent or more of the stock of any class is

owned or controlled by or on behalf of any one stockholder, a separate showing of his citizenship and holdings must be furnished.

If evidence of qualifications and ownership has previously been furnished as required by the above, reference by serial number of record in which it was filed together with a statement as to any amendments. Qualifications of assignee must be in full compliance with the regulations (43 CFR 3241.1-2).

4. *Statement of interests* - Assignee must indicate whether or not he is the sole party in interest in the assignment; if not, assignee must submit, at time assignment is filed, a signed statement giving the names of other interested parties. If there are other parties interested in the assignment, a separate statement must be signed by each assignee, giving the nature and extent of the interest of each, the nature of agreement between them, if oral; and a copy of agreement, if written. All interested parties must furnish evidence of their qualifications to hold such lease interests. Separate statements and written agreements, if any, must be filed with the filing of the assignment.

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

Serial Number **OR 12344**  
USGS - KGRA Determination:

GEOTHERMAL RESOURCES LEASE  
 Competitive  Noncompetitive

In consideration of the terms and conditions contained herein, and the grant made hereby, this lease is entered into by the UNITED STATES OF AMERICA (hereinafter called the "Lessor"), acting through the Bureau of Land Management (hereinafter called the "Bureau") of the Department of the Interior (hereinafter called the "Department"), and

**John W. Book**  
7315 Battle Creek Road Southeast  
Salem, Oregon 97302

(hereinafter called the "Lessee").

This lease is made pursuant to the Geothermal Steam Act of 1970 (84 Stat. 1566; 30 U.S.C. 1001-1025) (hereinafter called "the Act") to be effective on **DEC 1 1983** (hereinafter called the "effective date"). It is subject to all the provisions of the Act and to all the terms, conditions, and requirements of (a) all regulations promulgated by the Secretary of the Interior (hereinafter called "the Secretary") in existence upon the effective date, specifically including, but not limited to, 43 CFR Parts 3000 and 3200 and 30 CFR Parts 270 and 271. (b) all geothermal resources operational orders (hereinafter called "GRO orders") issued pursuant thereto, all of which are incorporated herein and by reference made a part hereof, and (c) any regulations hereafter issued by the Secretary (except those inconsistent with any specific provisions of this lease other than regulations incorporated herein by reference) all of which shall be, upon their effective date, incorporated herein and, by reference, made a part hereof.

Sec. 1. GRANT - The Lessor hereby grants and leases to the Lessee the exclusive right and privilege to drill for, extract, produce, remove, utilize, sell, and dispose of geothermal steam and associated geothermal resources, (hereinafter called "geothermal resources"), in or under the following described lands situated within the County of **Marion** State of **Oregon**:

National Resource Lands		Acquired Lands	
T.	R.	T.	R.
8 S.	8 E.		
Willamette Meridian			
Unsurveyed Sec. 16: All;			
Unsurveyed Sec. 21: All;			
Unsurveyed Sec. 28: All;			
Unsurveyed Sec. 33: N $\frac{1}{2}$ .			
Total Area: 2,240.00 acres		Total Area	

Containing **2,240.00** acres (hereinafter called the "leased area" or "leased lands"), together with:

- (a) The nonexclusive right to conduct within the leased area geological and geophysical exploration in accordance with applicable regulations; and
- (b) The right to construct or erect and to use, operate, and maintain within the leased area, together with ingress and egress thereupon all wells, pumps, pipes, pipelines, buildings, plants, sumps, brine pits, reservoirs, tanks, waterworks, pumping stations, roads, electric power generating plants, transmission lines, industrial facilities, electric, telegraph or telephone lines, and such other works and structures and to use so much of the surface of the land as may be necessary or reasonably convenient for the production, utilization, and processing of geothermal resources or to the full enjoyment of the rights granted by this lease, subject to compliance with applicable laws and regulations; *Provided that*, although the use of the leased area for an electric power generating plant or transmission facilities or a commercial or industrial facility is authorized hereunder, the location of such facilities and the terms of occupancy therefor shall be under separate instruments issued under any applicable laws and regulations; and
- (c) The nonexclusive right to drill potable water wells in accordance with state water laws within the leased area and to use the water produced therefrom for operations on the leased lands free of cost, provided that such drilling and development are conducted in accordance with procedures approved by the Supervisor of the Geological Survey (hereinafter called "Supervisor"); and
- (d) The right to convert this lease to a mineral lease under the Mineral Leasing Act of February 25, 1920, as amended, and supplemented (30 U.S.C. 181-287) or under the Mineral Leasing Act for Acquired Lands (30 U.S.C. 351-359), whichever is appropriate, if the leasehold is primarily valuable for the production of one or more valuable by-products which are leaseable under those statutes, and the lease is incapable of commercial production or utilization of geothermal steam; *Provided that*, an application is made therefor prior to the expiration of the lease extension by reason of by-product production as hereinafter provided, and subject to all the terms and conditions of said appropriate Acts. The Lessee is also granted the right to locate mineral deposits under the mining laws (30 U.S.C. 21-54), which would constitute by-products if commercial production or utilization of geothermal steam continued, but such a location to be valid must be completed within ninety (90) days after the termination of this lease. Any conversion of this lease to a mineral lease or a mining claim is contingent on the availability of such lands for this purpose at the time of the conversion. If the lands are withdrawn or acquired in aid of a function of any Federal Department or agency, the mineral lease or mining claim shall be subject to such additional terms and conditions as may be prescribed by such Department or agency for the purpose of making operations thereon consistent with the purposes for which these lands are administered; and
- (e) The right, without the payment of royalties hereunder, to reinject into the leased lands geothermal resources and condensates to the extent that such resources and condensates are not utilized, but their reinjection is necessary for operations under this lease in the recovering or processing of geothermal resources. If the Lessee, pursuant to any approved plan, disposes of the unusable brine and produced waste products into underlying formations, he may do so without the payment of royalties.

Sec. 2. TERM

- (a) This lease shall be for a primary term of ten (10) years from the effective date and so long thereafter as geothermal steam is produced or utilized in commercial quantities but shall in no event continue for more than forty (40) years after the end of the primary term. However, if at the end of that forty-year period geothermal steam is being produced or utilized in commercial quantities, and the leased lands are not needed for other purposes, the Lessee shall have a preferential right to a renewal of this lease for a second forty-year term in accordance with such terms and conditions as the Lessor deems appropriate.
- (b) If actual drilling operations are commenced on the leased lands or under an approved plan or agreement on behalf of the leased lands prior to the end of the primary term,

- and are being diligently prosecuted at the end of the primary term, this lease shall be extended for five (5) years and so long thereafter, but not more than thirty-five (35) years, as geothermal steam is produced or utilized in commercial quantities. If at the end of such extended term geothermal steam is being produced or utilized in commercial quantities, the Lessee shall have a preferential right to a renewal for a second term as in (a) above.
- (c) If the Lessor determines at any time after the primary term that this lease is incapable of commercial production and utilization of geothermal steam, but one or more valuable by-products are or can be produced in commercial quantities, this lease shall be extended for so long as such by-products are produced in commercial quantities but not for more than five (5) years from the date of such determination.

### Sec. 3. RENTALS AND ROYALTIES

(a) *Annual Rental* - For each lease year prior to the commencement of production of geothermal resources in commercial quantities on the leased lands, the Lessee shall pay the Lessor on or before the anniversary date of the lease a rental of \$ 1.00 (One Dollar) per acre or fraction thereof.

(b) *Escalating Rental* - Beginning with the sixth lease year and for each year thereafter until the lease year beginning on or after the commencement of production of geothermal resources in commercial quantities, the Lessee shall pay on or before the anniversary date of the lease an escalating rental in an amount per acre or fraction thereof equal to the rental per acre for the preceding year and an additional sum of one (1) dollar per acre or fraction thereof. If the lease is extended beyond ten (10) years for reasons other than the commencement of production of geothermal resources in commercial quantities, the rental for the eleventh year and for each lease year thereafter until the lease year beginning on or after the commencement of such production will be the amount of rental for the tenth lease year. If any expenditures are made in any lease year for diligent exploration on the leased lands in excess of the minimum required expenditures for that year, the excess may be credited against any rentals in excess of \$ 1.00 (One Dollar) per acre or fraction thereof due the Lessor for that or any future year.

(c) *Royalty* - On or before the last day of the calendar month after the month of commencement of production in commercial quantities of geothermal resources and thereafter on a monthly basis, the Lessee shall pay to the Lessor:

(1) A royalty of ~~25~~ percent on the amount or value of steam, or any other form of heat or other associated energy produced, processed, removed, sold, or utilized from this lease or reasonably susceptible to sale or utilization by the Lessee.

(2) A royalty of ~~FIVE~~ percent of the value of any by-product derived from production under this lease, produced, processed, removed, sold, or utilized from this lease or reasonably susceptible of sale or utilization by the Lessee, except that as to any by-product which is a mineral named in Sec. 1 of the Mineral Leasing Act of February 25, 1920, as amended, (30 U.S.C. 181), the rate of royalty for such mineral shall be the same as that provided in that statute and the maximum rate of royalty for such mineral shall not exceed the maximum royalty applicable under that statute.

(3) A royalty of ~~FIVE~~ percent of the value of commercially demineralized water which has been produced from the leased lands, and has been sold or utilized by the Lessee or is reasonably susceptible of sale or utilization by the Lessee. In no event shall the Lessee pay to the Lessor, for the lease year beginning on or after the commencement of production in commercial quantities on the leased lands or any subsequent lease year, a royalty of less than two (2) dollars per acre or fraction thereof. If royalty paid on production during the lease year has not satisfied this requirement, the Lessee shall pay the difference on or before the expiration date of the lease year for which it is paid.

(d) *Waiver and Suspension of Rental and Royalties* - Rentals or royalties may be waived, suspended, or reduced pursuant to the applicable regulations on the entire leasehold or any portion thereof in the interest of conservation or for the purpose of encouraging the greatest ultimate recovery of geothermal resources if the Lessor determines that it is necessary to do so to promote such development, or because the lease cannot be successfully operated under the terms fixed herein.

(e) *Undivided Fractional Interests* - Where the interest of the Lessor in the geothermal resources underlying any tract or tracts described in Sec. 1 is an undivided fractional interest, the rentals and royalties payable on account of each such tract shall be in the same proportion to the rentals and royalties provided in this lease as the individual fractional interest of the Lessor in the geothermal resources underlying such tract is to the full fee interest.

(f) *Readjustments* - Rentals and royalties hereunder may be readjusted in accordance with the Act and regulations to rates not in excess of the rates provided therein, and at not less than twenty (20) year intervals beginning thirty-five (35) years after the date geothermal steam is produced from the lease as determined by the Supervisor.

Sec. 4. *PAYMENTS* - It is expressly understood that the Secretary may establish the values and minimum values of geothermal resources to compute royalties in accordance with the applicable regulations. Unless otherwise directed by the Secretary, all payments to the Lessor will be made as required by the regulations. If there is no well on the leased lands capable of producing geothermal resources in commercial quantities, the failure to pay rental on or before the anniversary date shall cause the lease to terminate by operation of law except as provided by Sec. 3244.2 of the regulations. If the time for payment falls on a day on which the proper office to receive payment is closed, payment shall be deemed to be made on time if made on the next official working day.

Sec. 5. *BONDS* - The Lessee shall file with the Authorized Officer of the Bureau (hereinafter called the "Authorized Officer") shall maintain at all times the bonds required under the regulations to be furnished as a condition to the issuance of this lease or prior to entry on the leased lands in the amounts established by the Lessor and to furnish such additional bonds or security as may be required by the Lessor upon entry on the lands or after operations or production have begun.

### Sec. 6. WELLS

(a) The Lessee shall drill and produce all wells necessary to protect the leased land from drainage by operations on lands not the property of the Lessor, or other lands of the Lessor leased at a lower royalty rate, or on lands as to which royalties and rentals are paid into different funds from those

into which royalties under this lease are paid. However, in lieu of any part of such drilling and production, with the consent of the Supervisor, the Lessee may compensate the Lessor in full each month for the estimated loss of royalty through drainage in the amount determined by said Supervisor.

(b) At the Lessee's election, and with the approval of the Supervisor, the Lessee shall drill and produce other wells in conformity with any system of well spacing or production allotments affecting the field or area in which the leased lands are situated, which is authorized by applicable law.

(c) After due notice in writing, the Lessee shall diligently drill and produce such wells as the Supervisor shall require so that the leased lands may be properly and timely developed and for the production of geothermal steam and its by-products, including commercially demineralized water for beneficial uses in accordance with applicable state laws. However, the Supervisor may waive or modify the requirements of this subparagraph (c) in the interest of conservation of natural resources or for economic feasibility or other reasons satisfactory to him. If the products or by-products of geothermal production from wells drilled on this lease are susceptible of producing commercially demineralized water for beneficial uses, and a program therefor is not initiated with due diligence, the Lessor may at its option elect to take such products or by-products and the Lessee shall deliver all or any portion thereof to the Lessor at any point in the Lessee's geothermal gathering or disposal system without cost to the Lessee, if the Lessee's activities, under the lease, would not be impaired and such delivery would otherwise be consistent with field and operational requirements. The retention of this option by the Lessor shall in no way relieve the Lessee from the duty of producing commercially demineralized water, where required to do so by the Lessor, except when the option is being exercised and then only with respect to wells where it is being exercised, or limit the Lessor's right to take any action under Sec. 25 to enforce that requirement.

Sec. 7. *INSPECTION* - The Lessee shall keep open at all reasonable times for the inspection of any duly authorized representative of the Lessor the leased lands and all wells, improvements, machinery, and fixtures thereon and all production reports, maps, records, books, and accounts relative to operations under the lease, and well logs, surveys, or investigations of the leased lands.

Sec. 8. *CONDUCT OF OPERATIONS* - The Lessee shall conduct all operations under this lease in a workmanlike manner and in accordance with all applicable statutes, regulations, and GRO orders, and all other appropriate directives of the Lessor to prevent bodily injury, danger to life or health, or property damage, and to avoid the waste of resources, and shall comply with all requirements which are set forth in 43 CFR Group 3200, including, but not limited to, Subpart 3204, or which may be prescribed by the Lessor pursuant to the regulations, and with the special stipulations which are attached to the lease, all of which are specifically incorporated into this lease. A breach of any term of this lease, including the stipulations attached hereto, will be subject to all the provisions of this lease with respect to remedies in case of default. Where any stipulation is inconsistent with a regular provision of this lease, the stipulation shall govern.

### Sec. 9. INDEMNIFICATION

(a) The Lessee shall be liable to the Lessor for any damage suffered by the Lessor in any way arising from or connected with the Lessee's activities and operations conducted pursuant to this lease, except where damage is caused by employees of the Lessor acting within the scope of their authority.

(b) The Lessee shall indemnify and hold harmless the Lessor from all claims arising from or connected with the Lessee's activities and operations under this lease.

(c) In any case where liability without fault is imposed on the Lessee pursuant to this section, and the damages involved were caused by the action of a third party, the rules of subrogation shall apply in accordance with the law of the jurisdiction where the damage occurred.

Sec. 10. *CONTRACTS FOR SALE OR DISPOSAL OF PRODUCTS* - The Lessee shall file with the Supervisor not later than thirty (30) days after the effective date thereof any contract, or evidence of other arrangement for the sale or disposal of geothermal resources.

Sec. 11. *ASSIGNMENT OF LEASE OR INTEREST THEREIN* - Within ninety (90) days from the date of execution thereof, the Lessee shall file for approval by the Authorized Officer any instruments of transfer made of this lease or of any interest therein, including assignments of record title and working or other interests.

Sec. 12. *REPORTS AND OTHER INFORMATION* - At such times and in such form as the Lessor may prescribe, the Lessee shall comply with all reporting requirements of the geothermal resources leasing, operating, and unit regulations and shall submit quarterly reports containing the data which it has collected through the monitoring of air, land, and water quality and all other data pertaining to the effect on the environment by operations under the lease. The Lessee shall also comply with such other reporting requirements as may be imposed by the Authorized Officer or the Supervisor. The Lessor may release to the general public any reports, maps, or other information submitted by the Lessee except geologic and geophysical interpretations, maps, or data subject to 30 CFR 270.79 or unless the Lessee shall designate that information as proprietary and the Supervisor or the Authorized Officer shall approve that designation.

Sec. 13. *DILIGENT EXPLORATION* - In the manner required by the regulations, the Lessee shall diligently explore the leased lands for geothermal resources until there is production in commercial quantities applicable to this lease. After the fifth year of the primary term the Lessee shall make at least

the minimum expenditures required to qualify the operations on the leased lands as diligent exploration under the regulations.

**Sec. 14. PROTECTION OF THE ENVIRONMENT (LAND, AIR AND WATER) AND IMPROVEMENTS** - The Lessee shall take all mitigating actions required by the Lessor to prevent: (a) soil erosion or damage to crops or other vegetative cover on Federal or non-Federal lands in the vicinity; (b) the pollution of land, air, or water; (c) land subsidence, seismic activity, or noise emissions; (d) damage to aesthetic and recreational values; (e) damage to fish or wildlife or their habitats; (f) damage to or removal of improvements owned by the United States or other parties; or (g) damage to or destruction or loss of fossils, historic or prehistoric ruins, or artifacts. Prior to the termination of bond liability or at any other time when required and to the extent deemed necessary by the Lessor, the Lessee shall reclaim all surface disturbances as required, remove or cover all debris or solid waste, and, so far as possible, repair the offsite and onsite damage caused by his activity or activities incidental thereto, and return access roads or trails and the leased lands to an acceptable condition including the removal of structures, if required. The Supervisor or the Authorized Officer shall prescribe the steps to be taken by Lessee to protect the surface and the environment and for the restoration of the leased lands and other lands affected by operations on the leased lands and improvements thereon, whether or not the improvements are owned by the United States. Timber or mineral materials may be obtained only on terms and conditions imposed by the Authorized Officer.

**Sec. 15. WASTE** - The Lessee shall use all reasonable precautions to prevent waste of natural resources and energy, including geothermal resources, or of any minerals, and to prevent the communication of water or brine zones with any oil, gas, fresh water, or other gas or water bearing formations or zones which would threaten destruction or damage to such deposits. The Lessee shall monitor noise, air, and water quality conditions in accordance with any orders of the Supervisor.

**Sec. 16. MEASUREMENTS** - The Lessee shall gauge or otherwise measure all production, sales, or utilization of geothermal resources and shall record the same accurately in records as required by the Supervisor. Reports on production, sales, or utilization of geothermal resources shall be submitted in accordance with the terms of this lease and the regulations.

**Sec. 17. RESERVATIONS TO LESSOR** - All rights in the leased area not granted to the Lessee by this lease are hereby reserved to the Lessor. Without limiting the generality of the foregoing such reserved rights include:

(a) *Disposal* - The right to sell or otherwise dispose of the surface of the leased lands or any resource in the leased lands under existing laws, or laws hereafter enacted, subject to the rights of the Lessee under this lease;

(b) *Rights-of-way* - The right to authorize geological and geophysical explorations on the leased lands which do not interfere with or endanger actual operations under this lease, and the right to grant such easements or rights-of-way for joint or several use upon, through or in the leased area for steam lines and other public or private purposes which do not interfere with or endanger actual operations or facilities constructed under this lease;

(c) *Mineral Rights* - The ownership of and the right to extract oil, hydrocarbon gas, and helium from all geothermal steam and associated geothermal resources produced from the leased lands;

(d) *Casing* - The right to acquire the well and casing at the fair market value of the casing where the Lessee finds only potable water, and such water is not required in lease operations; and

(e) *Measurements* - The right to measure geothermal resources and to sample any production thereof.

**Sec. 18. ANTIQUITIES AND OBJECTS OF HISTORIC VALUE** - The Lessee shall immediately bring to the attention of the Authorized Officer any antiquities or other objects of historic or scientific interest, including but not limited to historic or prehistoric ruins, fossils, or artifacts discovered as a result of operations under this lease, and shall leave such discoveries intact. Failure to comply with any of the terms and conditions imposed by the Authorized Officer with regard to the preservation of antiquities may constitute a violation of the Antiquities Act (16 U.S.C. 431-433). Prior to operations, the Lessee shall furnish to the Authorized Officer a certified statement that either no archaeological values exist or that they may exist on the leased lands to the best of the of the Lessee's knowledge and belief and that they might be impaired by geothermal operations. If the Lessee furnishes a statement that archaeological values may exist where the land is to be disturbed or occupied, the Lessee will engage a qualified archaeologist, acceptable to the Authorized Officer, to survey and salvage, in advance of any operations, such archaeological values on the lands involved. The responsibility for the cost for the certificate, survey, and salvage will be borne by the Lessee, and such salvaged property shall remain the property of the Lessor or the surface owner.

**Sec. 19. DIRECTIONAL DRILLING** - A directional well drilled under the leased area from a surface location on nearby land not covered by the lease shall be deemed to have the same effect for all purposes of this lease as a well drilled from a surface location on the leased area. In such circumstances, drilling shall be considered to have been commenced on the nearby land for the purposes of this lease, and production of geothermal resources from the leased area through any directional well located on nearby land, or drilling or reworking of any such directional well shall be considered production or drilling or reworking operations (as the case may be) on the leased area for all purposes of this lease. Nothing contained in this section shall be construed as

granting to the Lessee any right in any land outside the leased area.

**Sec. 20. OVERRIDING ROYALTIES** - The Lessee shall not create overriding royalties of less than one-quarter (1/4) of one percent of the value of output nor in excess of 50 percent of the rate of royalty due to the Lessor specified in Sec. 3 of this lease except as otherwise authorized by the regulations. The Lessee expressly agrees that the creation of any overriding royalty which does not provide for a prorated reduction of all overriding royalties so that the aggregate rate of royalties does not exceed the maximum rate permissible under this section, or the failure to suspend an overriding royalty during any period when the royalties due to the Lessor have been suspended pursuant to the terms of this lease, shall constitute a violation of the lease terms.

**Sec. 21. READJUSTMENT OF TERMS AND CONDITIONS** - The terms and conditions of this lease other than those related to rentals and royalties may be readjusted in accordance with the Act at not less than ten-year intervals beginning ten (10) years after the date geothermal steam is produced from the leased premises as determined by the Supervisor.

**Sec. 22. COOPERATIVE OR UNIT PLAN** - The Lessee agrees that it will on its own, or at the request of the Lessor where it is determined to be necessary for the conservation of the resource or to prevent the waste of the resource, subscribe to and operate under any reasonable cooperative or unit plan for the development and operation of the area, field, or pool, or part thereof embracing the lands subject to this lease as the Secretary may determine to be practicable and necessary or advisable in the interest of conservation. In the event the leased lands are included within a unit, the terms of this lease shall be deemed to be modified to conform to such unit agreement. Where any provision of a cooperative or unit plan of development which has been approved by the Secretary, and which by its terms affects the leased area or any part thereof, is inconsistent with a provision of this lease, the provisions of such cooperative or unit plan shall govern.

**Sec. 23. RELINQUISHMENT OF LEASE** - The Lessee may relinquish this entire lease or any officially designated subdivision of the leased area in accordance with the regulations by filing in the proper BLM office a written relinquishment, in triplicate, which shall be effective as of the date of filing. No relinquishment of this lease or any portion of the leased area shall relieve the Lessee or its surety from any liability for breach of any obligation of this lease, including the obligation to make payment of all accrued rentals and royalties and to place all wells in the leased lands to be relinquished in condition for suspension or abandonment, and to protect or restore substantially the surface or subsurface resources in a manner satisfactory to the Lessor.

**Sec. 24. REMOVAL OF PROPERTY ON TERMINATION OR EXPIRATION OF LEASE**

(a) Upon the termination or expiration of this lease in whole or in part, or the relinquishment of the lease in whole or in part, as herein provided, the Lessee shall within a period of ninety (90) days (or such longer period as the Supervisor may authorize because of adverse climatic conditions) thereafter remove from the leased lands, no longer subject to the lease all structures, machinery, equipment, tools, and materials in accordance with applicable regulations and orders of the Supervisor. However, the Lessee shall, for a period of not more than six (6) months, continue to maintain any such property needed in the relinquished area, as determined by the Supervisor, for producing wells or for drilling or producing geothermal resources on other leases.

(b) Any structures, machinery, equipment, tools, appliances, and materials, subject to removal by the Lessee, as provided above, which are allowed to remain on the leased lands shall become the property of the Lessor on expiration of the 90-day period or any extension of that period which may be granted by the Supervisor. If the Supervisor directs the Lessee to remove such property, the Lessee shall do so at its own expense, or if it fails to do so within a reasonable period, the Lessor may do so at the Lessee's expense.

**Sec. 25. REMEDIES IN CASE OF DEFAULT**

(a) Whenever the Lessee fails to comply with any of the provisions of the Act, or the terms and stipulations of this lease, or of the regulations issued under the Act, or of any order issued pursuant to those regulations, and that default shall continue for a period of thirty (30) days after service of notice by the Lessor, the Lessor may (1) suspend operations until the requested action is taken to correct the noncompliance, or (2) cancel the lease in accordance with Sec. 12 of the Act (30 U.S.C. 1011). However, the 30-day notice provision applicable to this lease under Sec. 12 of the Act shall also apply as a prerequisite to the institution of any legal proceedings by the Lessor to cancel this lease while it is in a producing status. Nothing in this subsection shall be construed to apply to, or require any notice with respect to any legal action instituted by the Lessor other than an action to cancel the lease pursuant to Sec. 12 of the Act.

(b) Whenever the Lessee fails to comply with any of the provisions of the Act, or of this lease, or the regulations, or of any GRO Orders, or other orders, and immediate action is required, the Lessor without waiting for action by the Lessee may enter on the leased lands and take such measures as it may deem necessary to correct the failure, including a suspension of operations or production, all at the expense of the Lessee.

(c) A waiver of any particular violation of the provisions of the Act, or of this lease, or of any regulations promulgated by the Secretary under the Act, shall not prevent the cancellation of this lease or the exercise of any other remedy or remedies under paragraphs (a) and (b) of this section by reason of any other such violation, or for the same violation occurring at any other time.

(d) Nothing herein shall limit or affect the Lessee's right to a hearing and appeal as provided in Sec. 12 of the

Act and in the regulations promulgated thereunder.

(e) Upon cancellation, the Lessee shall remove all property in accordance with Sec. 24 hereof, and shall restore the leased lands in a manner acceptable to the Lessor or as may be otherwise required by the Lessor.

**Sec. 26. HEIRS AND SUCCESSORS IN INTEREST** - Each obligation hereunder shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns, of the respective parties hereto.

**Sec. 27. UNLAWFUL INTEREST** - No Member of, or Delegate to Congress, or Resident Commissioner, after his election or appointment, either before or after he has qualified, and during his continuance in office, and no officer, agent, or employee of the Department shall be admitted to any share or part in this lease or derive any benefit that may arise therefrom; and the provisions of Sec. 3741 of the Revised Statutes (41 U.S.C. Sec. 22), as amended, and Sections 431, 432, and 433 of Title 18 of the United States Code, relating to contracts made or entered into, or accepted by or on behalf of the United States, form a part of this lease so far as the same may be applicable.

**Sec. 28. MONOPOLY AND FAIR PRICES** - The Lessor reserves full power and authority to protect the public interest by promulgating and enforcing all orders necessary to insure the sale of the production from the leased lands at reasonable prices, to prevent monopoly, and to safeguard the public interest.

**Sec. 29. EQUAL OPPORTUNITY CLAUSE** - The Lessee agrees that, during the performance of this contract:

(1) The Lessee will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Lessee will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Lessee agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Lessor setting forth the provisions of this Equal Opportunity clause.

(2) The Lessee will, in all solicitations or advertisements for employees placed by or on behalf of the Lessee, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(3) The Lessee will send to each labor union or representative of workers with which Lessee has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Lessor, advising the labor union or workers' representative of the Lessee's commitments under this Equal Opportunity clause, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Lessee will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, as amended, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by the Secretary

of the Interior and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the Lessee's noncompliance with the Equal Opportunity clause of this lease or with any of said rules, regulations, or orders, this lease may be canceled, terminated or suspended in whole or in part and the Lessee may be declared ineligible for further Federal Government contracts or leases in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, as amended, and such other sanctions as may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, as amended, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Lessee will include the provisions of Paragraphs (1) through (7) of this Section (29) in every contract, subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, as amended, so that such provisions will be binding upon each contractor, subcontractor, or subcontract, or purchase order as the Secretary may direct as a means of enforcing such provisions including sanctions for noncompliance; provided, however, that in the event the Lessee becomes involved in, or is threatened with, litigation with a contractor, subcontractor, or vendor as a result of such direction by the Secretary, the Lessee may request the Lessor to enter into such litigation to protect the interests of the Lessor.

**Sec. 30. CERTIFICATION OF NONSEGREGATED FACILITIES** - By entering into this lease, the Lessee certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The Lessee agrees that a breach of this certification is a violation of the Equal Opportunity clause of this lease. As used in this certification, the term "segregated facilities" means, but is not limited to, any waiting rooms, work areas, rest rooms and wash rooms, or restaurants or other eating areas, time clocks, or locker rooms, and other storage or dressing rooms, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are in fact segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise. Lessee further agrees that (except where it has obtained identical certifications from proposed contractors and subcontractors for specific time periods) it will obtain identical certifications from proposed contractors and subcontractors prior to the award of contracts or subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause; that it will retain such certifications in its files; and that it will forward the following certification to such proposed contractors and subcontractors (except where the proposed contractor or subcontractor has submitted identical certifications for specific time periods); it will notify prospective contractors and subcontractors of requirement for certification of nonsegregated facilities. A Certification of Nonsegregated Facilities, as required by the May 9, 1967 Order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a contract or subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each contract and subcontract or for all contracts and subcontracts during a period (i.e., quarterly, semiannually, or annually).

**Sec. 31. SPECIAL STIPULATIONS** - (stipulations, if any, are attached hereto and made a part hereof)

**PLEASE NOTE:** As a result of amendments to 43 CFR 3200, published in the Federal Register on April 20, 1983, this lease form is changed as follows:

1. Paragraph (b) of Section 3, Escalating Rental, was deleted;
2. That part of lines 3 and 4 of Section 13, "production in commercial quantities applicable to this lease" was changed to read "a well capable of commercial production on the leased lands".
3. In accordance with SO 3087, December 3, 1982, the defined duties of the Supervisor will be performed by the Deputy State Director for Mineral Resources, BLM.

This lease is subject to additional stipulations attached. See Exhibit "A".

"The undersigned hereby certifies compliance with 43 CFR Part 3200 and the Geothermal Steam Act of 1970."

In witness whereof the parties have executed this lease.  
Lessee:

  
(Signature of Lessee)

(Signature of Lessee)

Nov 22, 1983  
(Date)

SEAL

THE UNITED STATES OF AMERICA, Lessor:

By   
(Authorized Officer)

Chief, Minerals Operations Section

(Title)

NOV 25 1983

(Date)

**Special Stipulations  
Mt. Hood National Forest**

The Lessee shall comply with the following special conditions and stipulations unless they are modified by mutual agreement of the Lessee, Authorized Officer, Supervisor and the responsible surface management official. (In addition to the definition found in Section 5 of this lease document and as defined in the regulations under 43 CFR 3000.0-5(f), the term "Authorized Officer" as used in this lease for the lands whose surface is managed by an agency other than the Bureau of Land Management is: (a) for sections 5 and 11, the Authorized Officer of the Bureau of Land Management; (b) for sections 12, 14, and 18 involving surface management responsibilities, the authorized representative of the United States Department of Agriculture Forest Service.)

1. All surface disturbing operations, other than "casual use" as defined by 43 CFR 3209.0-2(d), must be culturally cleared by the responsible surface management official. When a lessee cultural report is necessary to comply with standard lease term No. 18, it must be signed and certified by a qualified archaeologist acceptable to the responsible surface management official.
2. The Lessee shall make every possible effort to prevent, control and suppress any fire on federally owned or managed lands or near the lease operational site. All uncontrolled fires shall be immediately reported to Central Dispatch (503) 667-6410.
3. Prior to submission of a plan of operation for surface disturbing operations, the Lessee shall meet with the appropriate surface management agency representatives, to be apprised of specific requirements, restrictions, administrative rules and regulations, e.g., operating plan. This meeting may be waived if the Lessee is sufficiently aware of local problems and ground rules of the area involved in the proposed operation.
4. The leased lands may be in an area suitable for the habitat of threatened or endangered plant or animal species. All known viable habitat of these species will be identified for the lessee by the Authorized Officer or other responsible surface management representative at the pre-operational conference or field inspection with recommended mitigation measures. These may include (1) on-site biological and/or botanical surveys by authorities acceptable to the surface manager, (2) avoidance, or (3) Lessee recommendation of programs complying with the provisions of the Endangered Species Act of 1973 as amended.



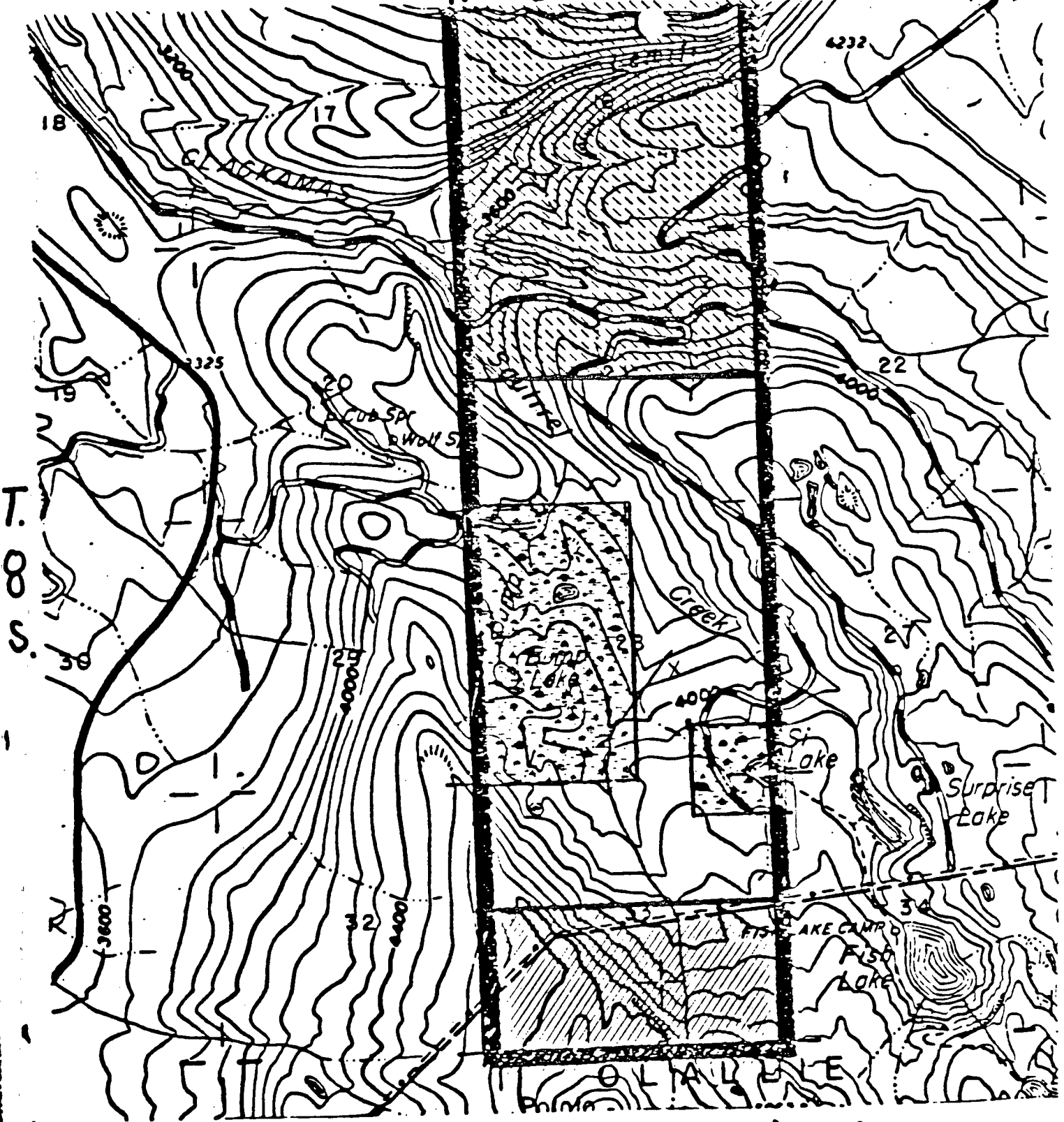
5. In order to protect Clackamas River Corridor, the Lessee shall not occupy or use the surface of the following described lands unless the Lessee can demonstrate, by appropriate plan of operation to the satisfaction of the Authorized Officer, the Deputy State Director for Mineral Resources, BLM and the Surface Manager, that this area will not be adversely affected by the proposed activities.

Willamette Meridian

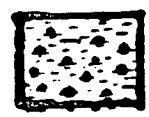
T. 8 S., R. 8 E.,  
Sec. 16, S1/2S1/2  
Sec. 21, N1/2

6. Operations adjacent to any surface water or wet soil areas, such as streams, springs, seeps, reservoirs, or meadows, will require a buffer zone. The size will be specifically identified by the Deputy State Director for Mineral Resources, BLM and surface management agency.

R. 8 E.



SCENIC INFLUENCE (Landscape mgmt.) AREA  
Lease Area Map



WETLANDS  
Lease No. OR 12344.



FURTHER PLANNING STATUS



GEOHERMAL GLACHAMAT BLICK

MAP  
#1

K. O. C.

4232

18

17

325

20

22

F. 80 S

CUB SPR  
WOLF S

Sautte

BURD  
CRACK

BURD  
LAKE

28

S. LAKE

SURPRISE  
LAKE

4000

4000

4000

FISH LAKE CAMP

FISH  
LAKE

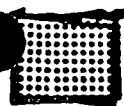
32

34



SOMA FORAGE AREA

Lease Area Map



SOMA CORE AREA

Lease No. OR 12344.

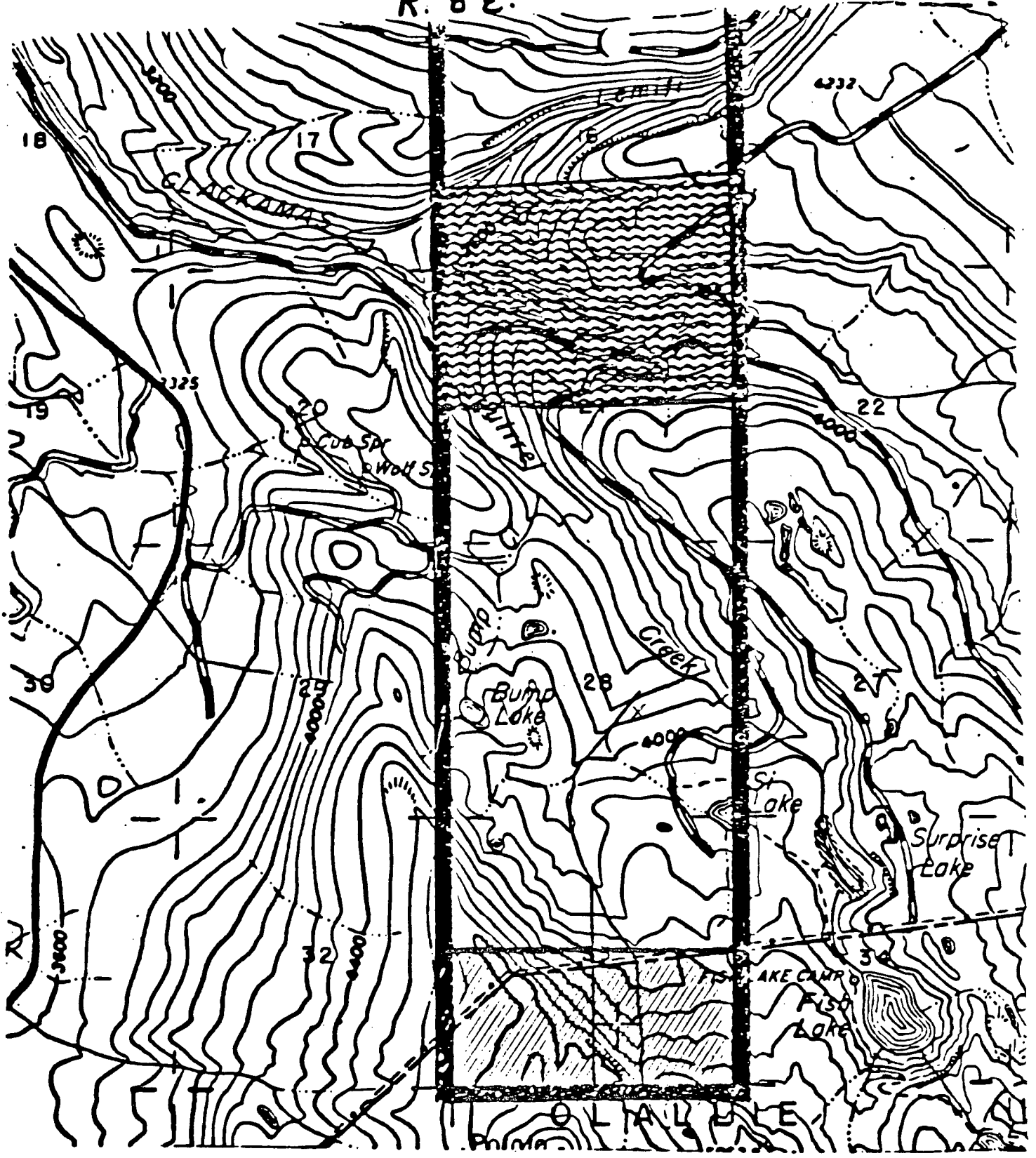


GEOHERMAL - CLACKAMAS BLOCK

MAP  
12

R. 8 E.

T. 8 S.



WILD & SCENIC RIVER INFLUENCE AREA

### Lease Area Map



FURTHER PLANNING STATUS (State)  
Lease No. OR 12344.



N scenic Arc.



# United States Department of the Interior

BUREAU OF LAND MANAGEMENT

OREGON STATE OFFICE  
P.O. Box 2965 (825 NE Multnomah Street)  
Portland, Oregon 97208

IN REPLY REFER TO

OR 12344  
3210 (943.3)

OCT 24 1983

CERTIFIED MAIL--RETURN RECEIPT REQUESTED

#830,122

## DECISION

John W. Hook	:	Noncompetitive Geothermal
7315 Battle Creek Road Southeast	:	Lease Application(s)
Salem, Oregon 97302	:	Filed: February 25, 1974

### NONCOMPETITIVE LEASE(S) OFFERED APPLICATION SUSPENDED IN PART

**LEASE OFFERED:** The original and four copies of lease form 3200-21 are enclosed for your signature. This lease covers the lands which are now available for leasing. Please sign on the reverse in the space provided for lessee's signature, date and return all five copies to this office. Your signature(s) constitute your agreement to comply with the lease terms and the stipulations attached to the lease form.

After we have received the forms properly signed and dated, we will obtain a final report regarding present land status. If the report shows that the lands are not in a KGRA, we will have the lease signed on behalf of the United States, and will determine the effective date. That date will be the first day of the month after the lease is signed for the Lessor, unless you specifically request that it be effective as of the first day of the month in which it is signed.

**SUSPENDED IN PART:** Your application is suspended as to the following lands which are under the administration of the Forest Service, U.S.D.A. Regulation 43 CFR 320 1.1-3 provides that geothermal leases for public, withdrawn or acquired, lands may be issued only with the consent of the head of that Department. The Forest Service has not consented to leasing these lands:

Willamette Meridian, Oregon

T. 8 S., R. 8 E.,

Sec. 33: S1/2

(320.00 acres)

Further action will be taken as to the suspended lands when we receive the Forest Service recommendations.

An extension of time is hereby granted as to the subject application being offered for leasing. As there is a possibility that legislation will be passed which will raise the per state acreage limitation to 51,200 acres, this delay is extended until the end of the current session of Congress.

This decision is not final, but is an interlocutory decision from which no appeal may be taken.

*David E. Sinclair*

Chief, Minerals Operations Section

Enclosures

**RECEIVED**

**DEC 10 1985**

Reply To: 2820

Date: December 5, 1985

**TPC - Santa Rosa**

Joe Iovenitti  
Thermal Power  
3333 Mendocino Ave., Suite 120  
Santa Rosa, CA 95401

Dear Mr. Iovenitti:

This letter concerns your need to obtain water for use during geothermal drilling operations on Federal Geothermal Lease OR 12344. As we understand, you will need an average of 4000 gallons per day, but use could increase to 25,000 gallons per day. We suggest that using the Clackamas River as a water source.

The alternative water sources considered include: Squirrel Creek, Olallie Creek, lakes in the Olallie Scenic Area, and the North Fork of the North Fork of Breitenbush River. Squirrel and Olallie Creeks both flow into the Upper Clackamas, so they are part of the closed basin, and you would face the same water reservation issues. Use of lakes in the Olallie Scenic Area would likely interfere with the recreational purpose of this area. A suitable intake point on the North Fork of the North Fork of Breitenbush River could be as distant as thirty road miles from the drill site.

Based on our understanding of your water needs, and potential conflicts or infeasibilities of other sources, we recommend use of the existing tanker fill adjacent to Road 4690 on the Clackamas River as your water source.

  
E. R. HARDMAN  
District Ranger



**Diamond Shamrock**  
Thermal Power Company

December 16, 1985

Water Resources Commission  
Water Resources Department  
3850 Portland Road N.W.  
Salem, Oregon 97310

Attention: Mr. T. E. Kline  
Mr. L. Jebousek

Subject: **EXCEPTION TO THE EXISTING BASIN PROGRAM,  
UPPER CLACKAMAS RIVER, APPLICATION FOR  
PERMIT TO APPROPRIATE SURFACE WATER**

Gentlemen:

Submitted herewith is Thermal Power Company's request for an exception to the existing basin program for the Upper Clackamas River. We believe that our intended use of the water requested, described below and in the enclosed documents, satisfies the requirements of ORS 536.380. This regulation outlines the procedure by which the Commission may consider approval of proposed water uses which are not currently included in the basin use program, according to Mr. T. E. Kline in a written communication dated 21 August 1985.

Thermal Power Company is planning to drill and complete a 5000-foot thermal gradient hole in the Mt. Hood National Forest on the issued Federal geothermal lease OR12344 in the NW 1/4 SE 1/4 of Section 28, T8S, R8E, Willamette Meridian, Marion County, Oregon. This activity will be conducted as part of the U. S. Department of Energy's Cascades Deep Thermal Gradient Drilling Program. The operation, estimated to begin on 1 June 1986 and completed in August 1986, will consist of rotary drilling the upper 500 feet and coring the remaining 4500 feet of the borehole. In the drilling and coring process, water will be used as the principal component of the drilling fluid. The estimated water requirements are 4,000 gallons per day. Under conditions of severe lost circulation, where no fluid returns occur, up to 25,000 gallons per day may be utilized. The U. S. Forest Service, Surface Manager of said lands, has suggested a potential tanker fill location (i.e., to fill the water truck used in the drilling operation) where the Clackamas River crosses Road 4690 (see Figure 1).

**Thermal Power Company**

A subsidiary of Diamond Shamrock, 3333 Mendocino Avenue, Suite 120, Santa Rosa, California 95401  
Phone 707 576-7022



Also enclosed as supporting documentation to this request are: (a) the Plan of Exploration; (b) Application for Geothermal Drilling Permit, as submitted to the BLM-Portland and State of Oregon Department of Geology and Mineral Industries; and (c) a letter from the Surface Manager indicating that there are no other viable alternatives for obtaining water for this intended drilling-coring operation, except as described above and illustrated on Figure 1.

Thermal Power Company considers the proposed use of the water for this intended operation to be in the public interest. The principal objective of the Clackamas 5000-foot hole is to determine whether or not a geothermal system exists in the region. The most immediate benefit to the public following this operation will be the release of the information acquired from the joint Thermal Power Company/Department of Energy thermal gradient hole. These data will assist the comprehension on the occurrence of geothermal systems in a young volcanic province, such as the High Cascades Range, which in turn can be used by energy planners in assessing the future energy needs of Oregon and determining how to best meet those needs.

We are not aware of any objections to the proposed water use. As stated above, the Bureau of Land Management, Forest Service, Oregon Department of Geology and Mineral Industries, have been notified. Mr. Norman Bickle of the Marion County Planning Department, has been contacted with respect to the entire operation and specifically this request, and no objections were raised. No major adverse impacts exist with this proposed use. No conflicts with future applications for classified water uses will occur from this transient operation.

We are hopeful that the Commission will grant the exception to the basin use program for the thermal gradient hole because it involves a relatively small amount of water used over a short period of time. Therefore, we are also submitting the Application for Permit to Appropriate Surface Water for the 5,000-foot thermal gradient hole project.

Please contact the undersigned at 707/576-7232 for any additional comments, explanation and information which you may require in considering this request for exception and subsequent surface water appropriation permit. Your early attention to these matters will be greatly appreciated.

Sincerely yours,



J. L. Iovenitti  
Senior Geologist

JLI/ma

enclosures

Application No.....

Permit No.....

# STATE OF OREGON WATER RESOURCES DEPARTMENT

## Application for Permit to Appropriate Surface Water

I, Thermal Power Company.....  
(Name of Applicant)

of 3333 Mendocino Avenue, Suite 120, Santa Rosa.....  
(Mailing Address) (City)

State of California....., 95401..... Phone No. 707/576-7232..... do hereby  
(Zip Code)

make application for a permit to appropriate the following described waters of the State of Oregon:

1. The source of the proposed appropriation is Clackamas River.....  
....., a tributary of N/A

2. The point of ~~diversion~~<sup>access</sup> is to be located 1200 ft. S..... and 333 ft. E.....  
(N. or S.) (E. or W.)  
from the NW..... corner of Section 22, T8S, R8E, see Figure 1,.....  
(Public Land Survey Corner)

(If there is more than one point of diversion, each must be described)

..... being within the NW..... ¼ of the NW..... ¼ of  
Sec. 22..... Tp. 8S..... R. E....., W. M., in the county of.....  
(N. or S.) (E. or W.)

3. Location of area to be irrigated, or place of use if other than irrigation.

Township	Range	Section	List ¼ ¼ of Section	List use and/or number of acres to be irrigated
8S	8E	28	NW ¼, SE ¼	Geothermal drilling fluid

cubic feet per second..... from approximately 1 June to 1 August 1986  
(If water is to be used from more than one source, give quantity from each)

5. The use to which the water is to be applied is..... for the drilling and completion of a  
5000-foot thermal gradient hole.

6. **DESCRIPTION OF WORKS**

*Include dimensions and type of construction of diversion dam and headgate, length and dimensions of supply ditch or pipeline, size and type of pump and motor, type of irrigation system to adequately describe the proposed distribution system.*

The detailed water requirements for the drilling and completion operation for the  
Clackamas 5000-foot thermal gradient hole are described in the attached Plan of  
Exploration. A water truck will be used to access the water from the Clackamas  
River (Figure 1) and a nominal 10,000 gallon storage tank would be on the drillsite.

If for domestic use state number of families to be supplied..... N/A

The hole is estimated to  
7. ~~Construction work will~~ begin on or before..... 1 June 1986

The hole is estimated to  
8. ~~Construction work will~~ be completed on or before..... 1 August 1986


9. The water will be completely applied to the proposed use on or before..... 1 October 1986

Application No. ....

Permit No. ....

Remarks:..... It is the opinion of the U. S. Forest Service, Clackamas Ranger.....  
District and Thermal Power Company that no other viable nor safer alternative  
exists to obtaining water from the Upper Clackamas River for this short duration  
project involving relatively minor amounts of water.

This permit, when issued, is for the beneficial use of water. By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan. It is possible that the land use you propose may not be allowed if it is not in keeping with the goals and the acknowledged plan. Your city or county planning agency can advise you about the land-use plan in your area.



Signature of Applicant

W. L. D'Olier, Vice President, Geothermal Exploration

*This is to certify that I have examined the foregoing application, together with the accompanying maps and data, and return the same for.....*

*In order to retain its priority, this application must be returned to the Water Resources Director with corrections on or before ....., 19.....*

*WITNESS my hand this ..... day of....., 19.....*

*Water Resources Director*

*By .....*

*This instrument was first received in the office of the Water Resources Director at Salem, Oregon, on the ..... day of ....., 19....., at ..... o'clock .....M.*

*Application No.....*

*Permit No.....*

# Permit to Appropriate the Public Waters of the State of Oregon

*This is to certify that I have examined the foregoing application and do hereby grant the same SUBJECT TO EXISTING RIGHTS INCLUDING THE EXISTING FLOW POLICIES ESTABLISHED BY THE WATER POLICY REVIEW BOARD and the following limitations and conditions:*

*The right herein granted is limited to the amount of water which can be applied to beneficial use and shall not exceed ..... cubic feet per second measured at the point of diversion from the stream, or its equivalent in case of rotation with other water users, from .....*

.....

*The use to which this water is to be applied is .....*

*If for irrigation, this appropriation shall be limited to ..... of one cubic foot per second or its equivalent for each acre irrigated .....*

.....

*and shall be subject to such reasonable rotation system as may be ordered by the proper state officer.*

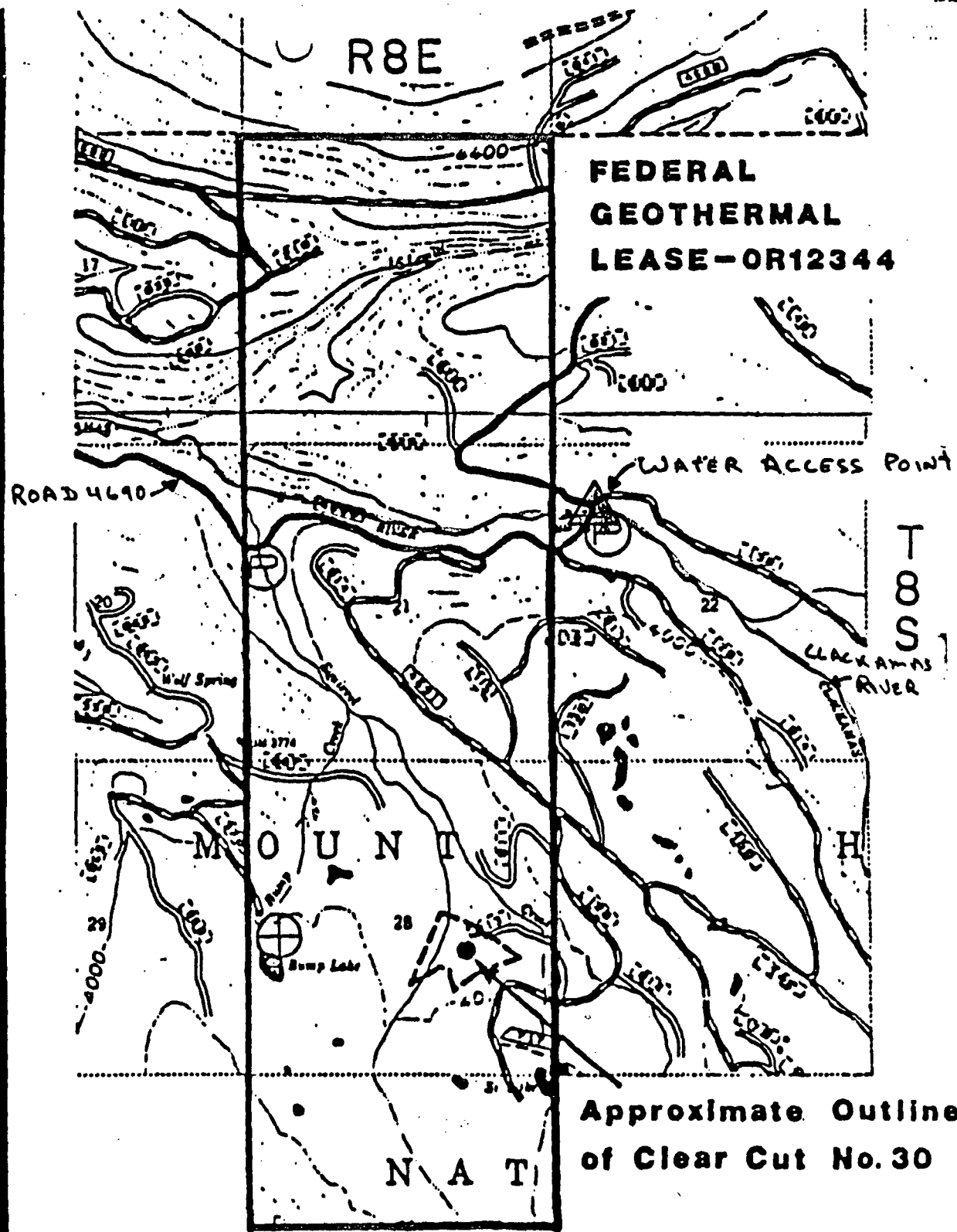
*The priority date of this permit is .....*

*Actual construction work shall begin on or before ..... and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 19.....*

*Complete application of the water to the proposed use shall be made on or before October 1, 19.....*

*WITNESS my hand this ..... day of ....., 19.....*

.....  
Water Resources Director



**LEGEND**

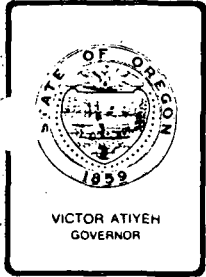
- -Drill site
- ▭ -Clear cut No. 30
- -Asphalt road
- ▨ -Maintained gravel
- ≡ -Light Improved road



**FIGURE 1**



**Diamond Shamrock**  
Thermal Energy



## Water Resources Department

3850 PORTLAND ROAD NE, SALEM, OREGON 97310

PHONE 378-3671

January 13, 1986

J. L. Iovenitti  
Diamond Shamrock  
Thermal Power Company  
3333 Mendocino Ave., Suite 120  
Santa Rosa, CA 95401

**RECEIVED**  
JAN 27 1986  
TPC - Santa Rosa

Dear Mr. Iovenitti,

Please excuse the delay in responding to your recent letter.

Changes in the law enacted by the 1985 Oregon Legislature resulted in the consolidation of responsibility in the Water Resources Commission. Those provisions became effective late last year. Our legal counsel has advised us that because of the statutory changes, procedures used in the past to address infrequent exceptional cases cannot now be employed.

We plan to propose new administrative rules to the Water Resources Commission in February to address this issue. Until new procedures are established, however, the Department will be unable to accept an application for the use proposed in your letter. In the meantime, the staff is reviewing the request on the assumption that it meets the criteria used in the past. If you have further questions, please contact Tom Kline of our staff at 378-3671.

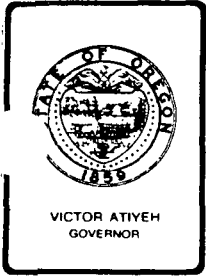
Sincerely,

*William H. Young*

WILLIAM H. YOUNG  
Director

WHY:jt

2076D



## Water Resources Department

3850 PORTLAND ROAD NE, SALEM, OREGON 97310

PHONE 378-3671

RECEIVED

FEB 20 1986

### MEMORANDUM

TO: Water Resources Commission

LEGAL DEPARTMENT

FROM: Director

SUBJECT: Agenda Item G, February 28, 1986, Water Resources Commission meeting

Temporary rule modifying the Lower Willamette Basin Program for limited-duration geothermal exploration projects

### BACKGROUND AND PROBLEM STATEMENT

Thermal Power Company of Santa Rosa, California, asked to apply for a water permit to use up to 0.039 cfs from the Clackamas River for geothermal exploration in the Mt. Hood National Forest. The department could not accept the application because the classification of the upper Clackamas subbasin does not permit industrial use. The allowed uses in the subbasin include domestic, livestock, municipal, power development, recreation, wildlife and fish life.

The department hoped to process the application as an exception according to past procedures established by the director. In an exception process, the Commission and other concerned agencies were notified of the application. If objections were filed, then a public hearing could be held.

Legal counsel advised the department that the 1985 amendments to water law eliminated the legal basis for the exception process by merging the authorities of the Water Policy Review Board and the Director.

The Commission is in the process of drafting proposed administrative rules for making public interest determinations in regards to water right applications. At that time, a procedure will be established to consider minor uses that may not be covered by current water use classifications.



However, Thermal Power Company has asked for a response in early March to begin hiring subcontractors. The rules will not be in place in time to meet the company's schedule.

The company has received necessary permits and approvals from other state and federal agencies. The appropriation will be of limited duration and appears to be within the criteria the Commission has approved in the past for non-conforming uses.

The Commission can allow the department to process the application with a temporary rule. The rule would amend the basin program to allow the issuance of permits for limited-duration geothermal exploration in the upper Clackamas subbasin.

#### EVALUATION

The company has been granted a geothermal lease from the U.S. Department of the Interior, Bureau of Land Management. The lease allows the company to drill a 5,000-foot geothermal gradient hole in the Mt. Hood National Forest near Breitenbush. The activity is part of a U.S. Department of Energy program to explore the geothermal resources of the Cascades. Work is scheduled to be completed between June and August 1986.

Water is the primary drilling fluid for the equipment used. Water will be hauled to the drill site in a tank truck. The drill site is a recent clearcut and is not directly adjacent to any streams. According to the U.S. Forest Service, there is a nearby ramp along the headwaters of the Clackamas River where water trucks (presumably for logging) obtain water. The Forest Service recommended that Thermal Power Company use that site.

The water requirements are modest, requiring 4,000 gallons per day in the beginning and up to 25,000 gallons per day over the summer. According to the applicant, the drill fluid is a non-toxic mixture of water, chemicals and solids. The applicant has contingency plans for spills of drill fluid or geothermal fluid and plans for disposing of fluid material.

The Oregon Department of Fish and Wildlife Department does not have any concern about the temporary diversion and use of water from the river. ODFW is mainly concerned that chemicals, mud and drilled material not reach the surface water.

The Department of Environmental Quality has an agreement with Thermal Power Company that drilling fluid will be disposed of in a sump, and geothermal fluid will be tested for temperature and chemicals before land or surface water disposal is allowed. The tests will determine the ultimate disposal method.

Approval of a temporary rule modifying the classification of the upper Clackamas would allow acceptance of an application for use of water for geothermal exploration. The application would then be subject to normal processing procedures within the 180-day period allowed by the temporary rule.

In order to approve a temporary rule, the Commission must find that failure to act promptly will result in serious prejudice to the public interest or to the interest of the parties concerned.

#### DIRECTOR'S RECOMMENDATION

The staff recommends approval of the attached temporary rule and required statement. The rule would temporarily amend the Lower Willamette Basin Program classification to allow "industrial use for geothermal drilling." The classification will revert to the originally designated uses following expiration of the 180 day period.

- ATTACHMENTS:
- 1) Draft temporary rule
  - 2) Statement of findings
  - 3) Application for water permit
  - 4) Letter from Thermal Power Company & plan for exploration

Becky Kreag:jt  
378-3671  
February 14, 1986

2581D

DRAFT  
BEFORE THE WATER RESOURCES COMMISSION  
OF THE  
STATE OF OREGON

In the Matter of Formulating an	)	
Integrated, Coordinated Program for	)	TEMPORARY
the Use and Control of the Water	)	MODIFICATION OF
Resources of the Lower Willamette	)	THE CLASSIFICATION
River Basin	)	FOR THE UPPER
	)	CLACKAMAS SUBBASIN

- A. The maximum economic development of this state, the attainment of the highest and best use of the waters of the upper reaches of the streams listed below, and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters as follows:

NOW, THEREFORE, BE IT RESOLVED that this Board hereby adopts the following program in accordance with ORS 536.300(2) pertaining to the water resources of the Tualatin, Clackamas, Columbia, and the Sandy Subbasins of the Lower Willamette Basin:

- A. The maximum economic development of this state, the attainment of the highest and best use of the waters of the Lower Willamette Basin, and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters as follows:

In the UPPER CLACKAMAS SUBBASIN (CLACKAMAS RIVER AND TRIBUTARIES ABOVE RIVER MILL DAM)

Only for domestic, livestock, municipal, power development, limited duration geothermal exploration, recreation, wildlife and fish life uses;

- 2. The maximum economic development of this state, the attainment of the highest and best use of the waters of the upper reaches of the streams listed below, and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, irrigation of lawn or non-commercial garden not to exceed one-half acre in area, power

BEFORE THE WATER RESOURCES COMMISSION

OF THE

STATE OF OREGON

In the Matter of Formulating an	)	
Integrated, Coordinated Program for	)	STATEMENT OF FINDINGS,
the Use and Control of the Water	)	STATUTORY AUTHORITY,
Resources of the Lower Willamette	)	STATEMENT OF NEED AND
River Basin	)	PRINCIPAL DOCUMENTS RELIED
	)	UPON

A. Statement of Findings:

1. The Thermal Power Company of Santa Rosa, California, has permission from the U.S. Forest Service, Bureau of Land Mangement and Department of Energy to drill a 5,000-foot geothermal hole in the upper Clackamas Basin.
2. The drilling process requires small amounts of water as a drilling fluid. The need will range from 4,000 to 25,000 gallons per day.
3. Thermal Power Company has an agreement with the Oregon Department of Environmental Quality for disposal of drilling and geothermal fluids.
4. The scheduled work is to be completed between June 1 and August 1, 1986.
5. The water use program for the Lower Willamette Basin does not allow use of water for industrial purposes in the upper Clackamas Basin.
6. There are no known objections to the short-term use of water for the drilling program and adequate provisions have been made to manage emergencies and waste disposal.
7. There are no alternative water sources near the project area.
8. Failure to adopt a temporary rule to allow application for use of water on a short-term basis for geothermal exploration would seriously prejudice the public interest in obtaining maximum beneficial use of the waters of the state and would seriously hamper Thermal Power Company's ability to complete the drilling within the specified time frame.

Application No.....

Permit No.....

STATE OF OREGON WATER RESOURCES DEPARTMENT

Application for Permit to Appropriate Surface Water

RECEIVED

DEC 19 1985

WATER RESOURCES DEPT. SALEM, OREGON

I, Thermal Power Company (Name of Applicant)

of 3333 Mendocino Avenue, Suite 120, Santa Rosa (Mailing Address) (City)

State of California, 95401 (Zip Code) Phone No. 707/576-7232 do hereby

make application for a permit to appropriate the following described waters of the State of Oregon:

1. The source of the proposed appropriation is Clackamas River, a tributary of N/A

2. The point of access is to be located 1200 ft. S and 333 ft. E from the NN corner of Section 22, T8S, R8E, see Figure 1 (Public Land Survey Corner)

(If there is more than one point of diversion, each must be described)

being within the NW 1/4 of the NW 1/4 of Sec. 22, Tp. 8S, R. E, W. M., in the county of

3. Location of area to be irrigated, or place of use if other than irrigation.

Table with 5 columns: Township, Range, Section, List 1/4 1/4 of Section, List use and/or number of acres to be irrigated. Row 1: 8S, 8E, 28, NW 1/4, SE 1/4, Geothermal drilling fluid

4. The amount of water which the applicant intends to apply to beneficial use is 0.0062 - 0.0388

cubic feet per second. from approximately 1 June to 1 August 1986

(If water is to be used from more than one source, give quantity from each)

5. The use to which the water is to be applied is for the drilling and completion of a

5000-foot thermal gradient hole.

6.

**DESCRIPTION OF WORKS**

*Include dimensions and type of construction of diversion dam and headgate, length and dimensions of supply ditch or pipeline, size and type of pump and motor, type of irrigation system to adequately describe the proposed distribution system.*

The detailed water requirements for the drilling and completion operation for the

Clackamas 5000-foot thermal gradient hole are described in the attached Plan of

Exploration. A water truck will be used to access the water from the Clackamas

River (Figure 1) and a nominal 10,000 gallon storage tank would be on the drillsite.

If for domestic use state number of families to be supplied N/A

The hole is estimated to

1 June 1986

7. ~~Construction work will begin on or before~~

The hole is estimated to

1 August 1986

8. ~~Construction work will be completed on or before~~

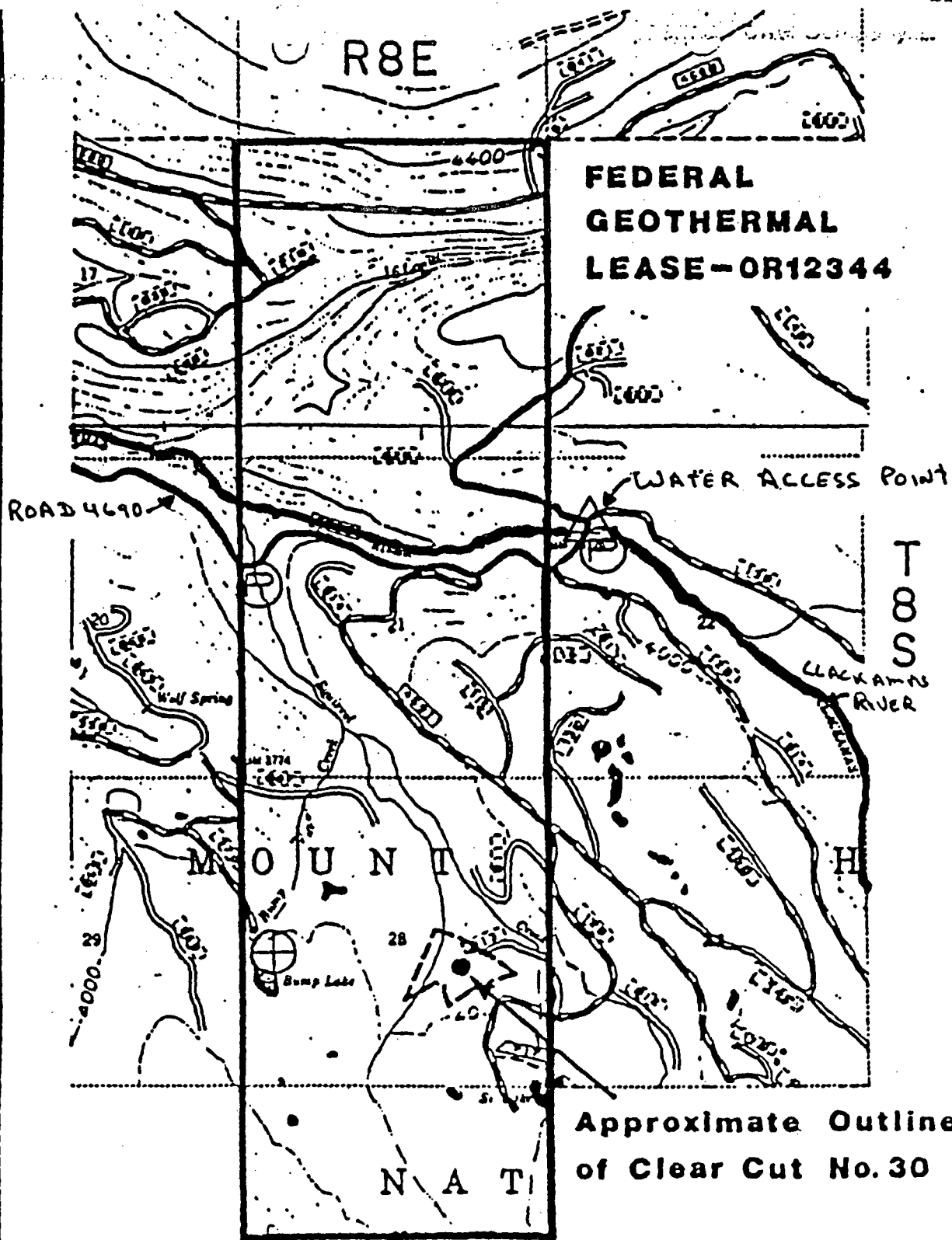
9. The water will be completely applied to the proposed use on or before 1 October 1986

STATE OF OREGON  
DIVISION OF WATER RESOURCES  
DEPT. OF AGRICULTURE  
DEC 1 8 1986

**RECEIVED**

Application No. \_\_\_\_\_

Permit No. \_\_\_\_\_



**LEGEND**

- -Drill site
- ▭ -Clear cut No. 30
- -Asphalt road
- ▬ -Maintained gravel
- -Light improved road



**FIGURE I**

Remarks: It is the opinion of the U. S. Forest Service, Clackamas Ranger District and Thermal Power Company that no other viable nor safer alternative exists to obtaining water from the Upper Clackamas River for this short duration project involving relatively minor amounts of water.

This permit, when issued, is for the beneficial use of water. By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan. It is possible that the land use you propose may not be allowed if it is not in keeping with the goals and the acknowledged plan. Your city or county planning agency can advise you about the land-use plan in your area.

Signature of Applicant

W. L. D'Olier, Vice President, Geothermal Exploration

This is to certify that I have examined the foregoing application, together with the accompanying maps and data, and return the same for

In order to retain its priority, this application must be returned to the Water Resources Director with corrections on or before , 19

WITNESS my hand this day of , 19

Water Resources Director

By

This instrument was first received in the office of the Water Resources Director at Salem, Oregon, on the day of , 19, at o'clock M.

Application No.

Permit No.



Application No. ....

Permit No. ....

### Permit to appropriate the Public Waters of the State of Oregon

*This is to certify that I have examined the foregoing application and do hereby grant the same SUBJECT TO EXISTING RIGHTS INCLUDING THE EXISTING FLOW POLICIES ESTABLISHED BY THE WATER POLICY REVIEW BOARD and the following limitations and conditions:*

*The right herein granted is limited to the amount of water which can be applied to beneficial use and shall not exceed ..... cubic feet per second measured at the point of diversion from the stream, or its equivalent in case of rotation with other water users, from .....*

*The use to which this water is to be applied is .....*

*If for irrigation, this appropriation shall be limited to ..... of one cubic foot per second or its equivalent for each acre irrigated .....*

*and shall be subject to such reasonable rotation system as may be ordered by the proper state officer.*

*The priority date of this permit is .....*

*Actual construction work shall begin on or before ..... and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 19.....*

*Complete application of the water to the proposed use shall be made on or before October 1, 19.....*

*WITNESS my hand this ..... day of ....., 19.....*



**Diamond Shamrock**  
Thermal Power Company

December 16, 1985

State of Oregon  
Oregon Department of Environmental Quality  
Water Quality Division  
P. O. Box 1760  
Portland, Oregon 97207

Attention: Kent Ashbaker

Subject: **GEOHERMAL FLUID DISCHARGE PERMIT**

Gentlemen:

Submitted herewith is a request for a permit to discharge geothermal fluid from a 5000-foot thermal gradient hole to be drilled/cored in the Mt. Hood National Forest on Cascade Federal geothermal lease, OR12344 in the NW 1/4, SE 1/4, Section 28, T8S, R8E, Willamette Meridian, Marion County, Oregon. This activity will be conducted as part of the U. S. DOE Cascades Thermal Gradient Drilling Program commencing in June 1986.

Upon completion of the drilling, estimated to be in August, 1986, a short-term (1-2 day) flow test will be conducted at total depth (5000'), and possibly at an intermediate depth for the collection of uncontaminated geothermal formation fluids. The produced geothermal fluids will be flowed to a large portable steel tank (e.g., Baker Tank). The drilling sump will be used for back-up containment. The total amount of formation fluids produced from this hole is considered to be very minor given the short-duration of the test and the small diameter of the wellbore (see enclosed documents). At completion, the fluids in the tank and sump will be chemically analyzed. If no hazardous constituents are encountered, the fluids will be sprayed along existing logging roads as directed by the Surface Manager (U. S. Forest Service). However, if any hazardous levels of constituents are detected, Thermal Power Company will jointly formulate a recommendation on disposal with the Oregon Department of Environmental Quality and present it to the Bureau of Land Management, Forest Service, and Department of Energy for approval prior to implementation.

**Thermal Power Company**

A subsidiary of Diamond Shamrock, 3333 Mendocino Avenue, Suite 120, Santa Rosa, California 95401  
Phone 707 576-7022

Page - 2 -  
Oregon Dept. of Environmental Quality  
December 16, 1986

Also enclosed are the Plan of Exploration and Application for Geothermal Drilling Permit previously submitted to the BLM-Portland and Oregon Department of Geology and Mineral Industries to provide additional information on the intended operation. Included within these documents are discussions of the prevention and control measures for surface and groundwater pollution, public health and safety, damage to fish, wildlife and natural resources, monitoring of liquids, and an Emergency Contingency Plan. We believe that these provide sufficient supporting documentation necessary for approval of our request.

Please contact the undersigned at 707/576-7232 for additional comments, explanation and information which you may require in considering this request for a permit to discharge geothermal fluid. Your attention to this matter is greatly appreciated.

Sincerely yours,

*Joe J. Iovenitti*

J. L. Iovenitti  
Senior Geologist

JLI/ma

enclosures



# Department of Environmental Quality

522 S.W. FIFTH AVENUE, BOX 1760, PORTLAND, OREGON 97207 PHONE: (503) 229-5696

February 10, 1986

**RECEIVED**  
FEB 13 1986  
TPC - Santa Rosa

Mr. J. L. Lovenitti  
Senior Geologist  
Diamond Shamrock  
Thermal Power Company  
3333 Mendocino Ave., Suite 120  
Santa Rosa, CA 95401

Re: Special Permit  
Lease OR 12344  
Marion County

Dear Mr. Lovenitti:

We have reviewed your plan for disposal of geothermal fluids and excess drilling mud and cuttings from your proposed thermal gradient hole in the Mt. Hood National Forest, and find it acceptable to this agency. Therefore, you are permitted to dispose of the mud and excess fluids on adjacent forest lands provided the method and area of disposal are approved by the Mt. Hood National Forest, they can be spread in such a way which would preclude them entering any waterway, and the water or mud contains no constituents in concentrations hazardous to the flora or fauna of the disposal area.

Prior to disposal, the mud and fluids shall be analyzed for constituents which may be hazardous to the flora or fauna and a copy of the analysis shall be sent to the Department for approval prior to disposal.

If it is determined that disposal as proposed may damage the flora or fauna at the disposal site or may enter public waters, the permittee shall propose to the Department an acceptable alternative method of disposal.

If you have any questions, please contact us.

Sincerely,

Fred Hansen  
Director

CKA:l  
WL14

cc: Department of Geology and Mineral Industries  
U.S. Forest Service Clackamas Ranger District  
Willamette Valley Region, DEQ  
Becky Creag, Department of Water Resources



**Diamond Shamrock**  
Thermal Power Company

September 26, 1985

U. S. Department of the Interior  
Bureau of Land Management  
Division of Mineral Resources  
P. O. Box 2965  
Portland, Oregon 97201

Attention: Mr. Robert Fujimoto

Re: Plan of Exploration  
Clackamas 5000-Foot  
Thermal Gradient Hole

Gentlemen:

Enclosed please find five copies of the Plan of Exploration for a 5000-foot thermal gradient hole on the issued Federal geothermal lease, OR12344 in the Clackamas region of the Mt. Hood National Forest. At your direction, the Plan of Exploration has been prepared in accordance with draft (August, 1980) GRO Order No. 5. The associated application for a Geothermal Drilling Permit will be forthcoming. The Plan of Exploration is being submitted separately to facilitate the initiation of site-related activities required for approval of this plan prior to the onset of adverse weather. This would hopefully allow commencement of drilling activities on 1 June 1986, weather permitting. Federal geothermal lease, OR12344 is presently held by Chevron USA, Inc. In a letter to the BLM and Surface Manager dated 22 July 1985, Chevron indicated that Thermal Power Company would act as operator for this hole.

We respectfully request an early approval of this Plan. Please contact me at 707/576-7232 if I can be of assistance.

Sincerely,

*Joe Jovenitti*

J. L. Jovenitti  
Senior Geologist

JLI/ma

**Thermal Power Company**

A subsidiary of Diamond Shamrock, 3333 Mendocino Avenue, Suite 120, Santa Rosa, California 95401  
Phone 707 576-7022

**PLAN OF EXPLORATION**  
**Clackamas 5000-Foot Thermal Gradient Hole**

Submittal Date: 30 September 1985

**Federal Geothermal Lease:** OR12344

**Hole Location:** Sec. 28, T8S, R8E, Willamette Meridian  
Marion County, Oregon

**Operator:** Thermal Power Company  
3333 Mendocino Avenue, Suite 120  
Santa Rosa, California 95401  
707/576-7022

**Drilling Contractor:** Not designated at this time.

**Field Representative:** Not designated at this time.

**Office Representative:** W. L. D'Olier, Vice President - Geothermal Exploration

**Proposed Operation and Objectives:** Prepare a drillsite and drill/core a 5000-foot thermal gradient hole. The principal objective of this operation is to determine whether or not a geothermal system exists in the Olallie Butte region. The hole would be rotary drilled from surface to 500 feet and cored from 500-5000 feet, total depth. Drilling and completion of the hole is expected to take sixty (60) days. A short-term flow test (1 - 2 days) may be conducted to obtain fluid samples and surface flow measurements. A full array of borehole data, including geophysical wireline logs, would be obtained. Following completion, the hole and drillsite would be made available to DOE for scientific purposes for a 12-month period. Access to the drillsite would not be maintained during periods of winter snows and/or heavy rains.

All operations, associated with the drilling and completion of this thermal gradient hole, would be conducted in accordance with the governing State and Federal rules and regulations. This operation is designed to minimize the impact on the environment while maximizing data collection at acceptable costs.

**Estimated Spud Date:** 1 June 1986

**Estimated Completion Date:** 1 August 1986

## **DRILLSITE LOCATION**

The drillsite is located within the issued Federal Geothermal Lease OR12344 in the NW¼, SE¼, Section 28, T8S, R8E, WM. It is sited on clear cut No. 30 within the Mt. Hood National Forest, Marion County (Figure 1). The drillsite lies within the Clackamas Geothermal Block which had an Environmental Assessment Report done by the Mt. Hood National Forest in 1981.

## **PLANNED ACCESS ROADS AND DRILLSITE PREPARATION**

The drillsite is immediate to an existing access road (Figure 1). No roadwork is planned. Figure 2 illustrates a typical rig facility layout for the intended operation. The drillsite, approximately 160' by 200', will be located on relatively fairly level ground. Other than actual drillsite clearing, minimal surface disturbance is expected during site preparation. Care will be exercised to minimize any impact on ground, second growth trees and drainage changes in the existing land surface. No significant cut and fill activities will occur. Since no significant terrain modification will take place during drillsite preparation, a detailed engineering plan and profile drawing is not presented. Drillsite preparation will be coordinated with the Forest Service.

## **WATER REQUIREMENTS**

Water supply for the drilling and completion operation will be trucked from existing stream access sites utilized by the Forest Service. It is expected that the proposed operation will require about 4,000 gallons per day. Under severe lost circulation conditions, 25,000 gallons per day may be utilized. All water withdrawal will be coordinated with the Surface Manager (U. S. Forest Service) who has already been informed of the projected requirements. The Surface Manager has suggested a potential tanker fill location where Road 4690 crosses the Clackamas River (Figure 1). Forest Service suggests that a load of gravel may be needed to allow the tanker truck greater proximity to the river at the indicated access point. A water appropriation permit will be obtained from the Oregon Department of Water Resources.

## **SUPPORT FACILITIES**

No support facilities are planned at the drillsite, other than two small trailers to house the wellsite geologist and drilling supervisor, a supply parts van and a portable chemical toilet (Figure 2). Off-duty drilling crews will be responsible for their own lodging. Two 3-man drilling crews are expected for this operation. It is anticipated that they would either reside in the town of Detroit or camp at a convenient location designated by the Surface Manager during the drilling and completion operation. Upon completion of the hole, all planned support facilities will be removed.

## **PREVENTION/CONTROL MEASURES**

### Fire

The drilling and completion operation will adhere to all Forest Service guidelines regarding fire prevention and control. These fire prevention methods will include, but not be limited to, the appropriate fire extinguishers, water and hand tools on location (with site personnel instructed in their use), spark arrestors, and an adequate fire break cleared around the drillsite.

### Soil Erosion

As indicated above, minimal surface topographic modification will take place. Careful grading and the use of an earthen berm will prevent accelerated erosion or gulying. Forest Service erosion control guidelines will be followed. Site reclamation will follow Surface Manager directives when the borehole is abandoned.

### Pollution of Surface and Groundwater

During the intended drilling operation, all drilling fluids will be contained in an excavated sump. The sump will be constructed and lined (most likely with plastic) to prevent leakage of its contents. Geothermal fluids, if produced from the well, will be flowed into a large portable steel tank (Baker Tank) and into the sump (back-up). At completion, these fluids will be analyzed to determine the presence of hazardous\* constituents. If none are present, the fluids will be sprayed along the existing logging roads as directed by the Surface Manager. If hazardous constituents are indicated, a joint recommendation by Oregon Department of Environmental Quality and Thermal Power Company will be formulated. This recommendation will be presented to the Bureau of Land Management, Forest Service, and Department of Energy for joint approval. The overall risk of surface and/or groundwater pollution is considered minor, given the minimal duration (expectedly, 1-2 days) of the short-term flow test, the low total flow volumes which are anticipated, and the intended containment of all fluids. Waste disposal from sanitary facilities and miscellaneous rubbish is discussed below.

### Air and Noise Pollution

All equipment used in this drilling operation will be muffled and maintained to minimize noise pollution and comply with existing requirements designated by the Surface Manager or other appropriate Federal and State agencies. As discussed below, the flow test will be immediately terminated if any toxic gases are produced. Air pollution is not significant in the drilling operation or during the flow test.

### Public Health and Safety

The drillsite is remote from any area of human activity and/or population center. Operations will be conducted on a continuous 24-hour per day basis with only authorized individuals allowed on-site. All non-operational people will be restricted from the location. Upon completion of the operation, the earthen sump will be backfilled, compacted and leveled to the drillsite elevation. The wellhead will be chained and locked to prevent unauthorized opening.

### Damage to Fish, Wildlife and Natural Resources

The short-term, transient nature of the intended drilling and completion operation significantly minimizes any potential negative impacts that may occur to fish, wildlife and natural resources. Contingency plans are provided below to prevent and/or control any foreseeable emergency.

\*Defined as a chemical constituent whose concentration is at or exceeds State or EPA standards.



## Waste Disposal

The drill cuttings and fluids produced in this operation will be treated as discussed above. If indicated to be non-hazardous, drill cuttings, mud and fluids will be spread in a thin layer over the ground. Otherwise, the drill cuttings, mud, and/or fluid will be trucked to an appropriate waste disposal site. Sanitary facilities will be treated in a fashion consistent with State and Federal guidelines and regulations. Miscellaneous rubbish will be taken off-site and disposed of in disposal sites designated by the Surface Manager.

## Monitoring Air Quality, Noise and Drilling Mediums

For the type and short-term nature of the drilling and completion operation planned (60 days), air and noise quality are not considered a concern. Hydrogen sulfide generally is the only gas produced in geothermal fluids which requires close monitoring. H<sub>2</sub>S monitoring equipment will be utilized during the drilling and testing phases. The drilling medium will be monitored by temperature gauges to keep the operation in compliance with safe geothermal drilling practices. The drilling fluid itself consists of water and mud additives which are non-toxic.

## Monitoring Solids, Liquids and Gases

The solids (rocks) produced will be logged and described by the wellsite geologist. The temperature, pH and fluid conductivity of the geothermal liquid produced will be measured. At completion of the activities, the fluids will be chemically analyzed as discussed above. Also as indicated above, H<sub>2</sub>S will be monitored.

## Drillsite Personnel Facilities

As indicated, no on-site housing facilities are planned for the drilling personnel. They are responsible for their own accommodations. It is expected that they will be either housed in the town of Detroit or will camp in an area designated by the Surface Manager.

## Drillsite Abandonment

When the drillsite is abandoned, the procedure will be in accordance with the BLM regulations for hole abandonment and Forest Service requirements for replanting and contour restoration as appropriate.

## **EMERGENCY CONTINGENCY PLAN**

Activities related to the intended 5000-foot thermal gradient slim hole are divided into two separate phases. These are: Phase 1: Drilling and Completion, and Phase 2: Post Completion - Pre-Abandonment. The Emergency Contingency Plan will vary with the phase of activity.

### Phase 1: Drilling and Completion

During this phase, the drilling crew (3 individuals), TPC drilling supervisor and/or wellsite geologist will be on-site continuously, 24 hours per day. Additional

personnel present on a transient basis are TPC project geologist and engineer, geophysical logging crew (2 individuals), and appropriate State and Federal agency personnel involved with this operation. The TPC drilling supervisor is responsible for all on-going site activities and will direct any emergency plan. In his absence, the senior TPC individual on-site is responsible. Two-way radio/telephone communication is planned with the drillsite. If an emergency situation does arise, priority is given to resolving the emergency. As soon as operationally feasible, notification will be provided by the TPC Vice President of Geothermal Exploration (see Table 2) to all regulatory agencies concerned with this operation including, but not limited to, the USFS, BLM and DOGAMI. Written documentation of any significant emergency will be provided to the appropriate State and Federal agencies as soon as possible, after the event.

The types of emergency situations that may occur in Phase I are fire, injury, drilling fluid spill, geothermal fluid spill, toxic H<sub>2</sub>S discharge, and uncontrolled blowout. The following scenarios will be followed in case of an emergency on the drillsite.

### Fire

All on-site fire extinguishing equipment, including the available water, will be utilized to secure the situation. Depending on the severity of the situation, the Mt. Hood National Forest, Clackamas Ranger District (CRD) office will be notified. If a fire cannot be contained by on-site personnel, the CRD will be alerted immediately. Rapid notification of the Forest Service will maximize the safeguard of on-site personnel and the environment.

### Injury

The following two step approach will be followed in the case of injury: (1) treat with on-site first aid supplies, (2) call for medical assistance and/or provide immediate transportation to a medical facility, as appropriate. This latter action will be coordinated with the CRD and/or the Marion County Sheriff, as needed. Once notified, the Marion County Sheriff Department will direct emergency medical assistance.

### Drilling Fluid Spill

Drilling fluid is a mixture of water, chemicals and solid particulates, and is non-toxic. The actual amount of drilling fluid expected to be utilized in the intended operation is relatively small. The specific drillsite is not located near any perennial stream. Any drilling fluid spill resulting from sump leakage or any other discharge will be contained and cleaned up. If a spill is not easily contained or endangers a stream, all action necessary to control, curtail, and clean up the spill would proceed. This may involve contracting heavy equipment and/or vacuum trucks. Procedures to be followed, as appropriate, are (1) shut off all drilling fluid pumps, (2) construct dikes for containment, and (3) repair source of spill as quickly as possible. Depending on the severity of the spill and/or its impact on the environment, the Surface Manager would be notified. Clean up would proceed to Surface Manager's satisfaction.

### Geothermal Fluid Spill

Procedures to be followed in case of a geothermal fluid spill are identical to those utilized in a Drilling Fluid Spill.

### Toxic H<sub>2</sub>S Discharge

The flow test will be immediately terminated if H<sub>2</sub>S gas concentration produced during well discharge exceeds an ambient air measurement of 10 ppm taken within five (5) feet from the fluid discharge point. This level is one-half the value considered safe for eight (8) hours of exposure by the American Petroleum Institute. The H<sub>2</sub>S monitoring equipment utilized during the drilling phase will be used during testing.

### Uncontrolled Blowout

If well control mechanisms do not succeed in containing fluid flow from the well, the on-site TPC supervisor will initiate operational steps to deal with the emergency. The following procedure will be followed.

1. Secure all drillsite personnel.
2. Injuries, fire and fluid spill will be treated as discussed above.
3. Contact TPC's Vice President of Geothermal Exploration and advise of the emergency status. A detailed assessment of the situation will be provided per Table 1.
4. TPC's Vice President of Geothermal Exploration will contact all appropriate State and Federal agencies (Table 2).
5. Appropriate steps will be taken to contain the well in the following priority order: (1) attempt to control hole with drillsite personnel, (2) control fluid spills as described above, (3) construct and install required well control equipment as quickly as possible.
6. Provide written documentation of the event and its resolution to all appropriate State and Federal agencies within 30 days of the event.
7. Once contained, return the site to its normal condition prior to blowout.

### Phase 2: Post Completion - Pre-Abandonment

The wellhead gate will be chained and locked to prevent unauthorized borehole entry. A prominent sign at the end of access road 013 (Figure 1) will identify the borehole and drillsite, telephone number and party to contact if upset conditions occur. Periodic inspections of the hole site and access roads will be conducted except during periods of winter snows.

When TPC elects to abandon the hole, it will be conducted in accordance with BLM regulations and Forest Service stipulations.

## **ENVIRONMENTAL INFORMATION**

Since the BLM will conduct an Environmental Assessment Report for the intended operation, Thermal Power Company has only included the following environmental information: the certified statements for the cultural assessment report and sensitive plant survey, excerpts from the existing Environmental Assessment Report conducted by the Mt. Hood National Forest (MHNF) in 1981, and recent communications with the District Ranger of MHNF (Appendix I).

### Regional and Local Geology

The drillsite is situated in the High Cascades portion of the Cascade Range due north and west of the major, Quaternary stratovolcano Mt. Jefferson. This hole would evaluate the Clackamas geothermal prospect which lies in the northern portion of the heat flow anomaly which exceeds 100 milliwatts per meter square (Black et al, 1983). The drillsite lies in the Olallie Lake Plateau (OLP) which consists of the relatively uneroded composite cones of Olallie Butte, Sisi Butte and Pinhead Butte, and Campbell Butte, Pyramid Butte and Double Peaks. None of the rocks in this area exhibit reversed magnetism indicating that they are at least younger than the last magnetic reversal: 690,000 years ago. White (1982) reports the available petrochemical data for this area indicates OLP has geochemical trends similar to those seen in large, multi-genetic volcanos. This suggests that this region may be a growing stratovolcano. The stratigraphy and structure of the Clackamas geothermal prospect is taken from the investigations of White (1982) and Venkatakishnan et al (1980).

The Quaternary section, ranging in thickness between 0 to 150 feet, is underlain by a complex and heterogenous series of Tertiary rocks. Beneath it are 2000-3000 feet of Pliocene basalts of the Outerson Formation and Upper Miocene pyroclastic rocks of the Outerson and Elk Lake Formations. These rocks are underlain by a thick section of mid-Miocene pyroclastic and flow rocks of the Sardine Formation and Miocene-Oligocene pyroclastic rocks of the Breitenbush Formation. Eocene volcanics form the basement. Three principal fault directions have either been mapped or inferred (linear analysis) as offsetting Quaternary volcanic rocks. These directions consist of the N-S trending normal faults which define the Western Cascade/High Cascade boundary and are responsible for the alignment of the major volcanic cones; and a conjugate set of shears trending approximately N60°W and N50°E. These structures result from the present day N-S compression. The northeast trending faults have not been identified in the surface mapping. They are inferred on the basis of regional linear analysis. The most northwesterly trend is clearly the dominant failure plane direction. The Sardine and Breitenbush Formations were folded into an asymmetric anticline with the gentler east limb underlying the prospect area. The rocks dip at 10-15 degrees to the east.

Miocene-Oligocene pyroclastic rocks are considered potential geothermal reservoirs. Highly permeable fault zones and their associated zones of fracturing are additional potential producing features. Thermal waters originating at depth under the High Cascades are thought to migrate westward and updip to Austin and Breitenbush Hot Springs.

## Hydrology and Meteorology

The drillsite lies at approximately 3850 feet elevation within Squirrel Creek drainage area which is part of the Clackamas River Basin. Marion County has a temperate marine climate resulting from the westerly winds coming from the Pacific Ocean some 80 miles to the west. Average mean precipitation is about 100 inches per year in the drillsite area. About 60% falls from November through February and only 10% from June through September. Snow comprises approximately 50% of the precipitation at altitudes over 4000 feet. The prevailing winds that influence both temperature and precipitation are from the west and northwest in the summer, and south and southwest in the winter. Deviations in this pattern are easterly winds that bring continental extremes. In the summer, this means exceptionally hot, dry weather and cold, clear days in the winter. Mean annual temperature is about 42°F.

## Potential Geologic Hazards

Geologic risk in the area is considered minimal. No faults are known to be active. Significant landslides do not exist in this portion of the Cascade Range. The area has a low earthquake potential. There is always the possibility of volcanic risk given the young, active (volcanically) nature of the High Cascade. However, no active volcanism is known in this area in recent times and there is no evidence that this is a serious threat.

## Soil, Air, Noise and Visual Studies

The District Ranger indicates that a site specific soil study is required. He also reports that drillsite activities are expected to produce levels of noise and air pollution quantities similar to those of a logging operation. No significant air or noise degradation is expected. The drillsite located in an existing clear cut parcel within heavy timber stands, is in a visual quality objective (VQO) area identified as Modification. It is anticipated that the operation should meet the VQO, given the location of the drillsite and the short-term nature of the intended activity.

## Fauna and Flora

The proposed drillsite does not provide a significant habitat for threatened or endangered wildlife species. Riparian resources near Squirrel Creek, several hundred yards distant, could be damaged in the event of a very large overflow of the drilling sump. Damage would depend on the nature of the overflow. Since the amount of drilling fluid utilized in the intended drilling operation is minimal and there is no toxicity to the drilling mud, this concern is considered negligible. Nevertheless, an earthen berm would be constructed on the downslope side of the site. Emergency procedures have been designated to not only deal with but also minimize any sump overflow. A sensitive plant survey of the drillsite has been conducted and is provided in Appendix 2. No rare, endangered or sensitive plants exist on the intended drillsite.

## Current and Prospective Land Uses

The land is used for general forestry purposes. The area is managed for timber production, wildlife and recreation. The specific area of the drillsite was logged by the clear cut method approximately four to five years ago. No change in land use surrounding this drillsite is foreseen.

### Sites of Cultural, Historical or Archeological Value

A cultural, historical and archeological assessment of the drillsite has been conducted. It is provided in Appendix 3. No cultural, historical or Native American sites were located in this drillsite.

### Wildlife Migration Routes, Water Holes and Habitats

The drillsite will not disrupt any major migration routes. Spotted owls may visit the site but areas managed for their habitat are located a significant distance away. Elk use the area during the spring and fall as they move up to the high country from the Clackamas River and back again. No critical waterholes or riparian habitats should be affected since the site is dry during the summer.

JLI/ma

## TABLE 1: ASSESSMENT OF UNCONTROLLED BLOWOUT

1. General physical description of situation, location, and size.
2. Any personnel injuries.
3. Any fire on-site, off-site, cause (oil, brush, etc.)
4. Nature of fluid escaping: type, volume and direction of flow on the ground. General or localized release point.
5. Is any gas detected?
6. Is noise level too high to hear spoken words on site?
7. Can you see? Lights operational?
8. Rig or other equipment on site? Damaged?
9. Control procedures undertaken.
10. Estimate of time required to contain well and any geothermal fluid runoff.

**TABLE 2: EMERGENCY NOTIFICATION LIST**

Thermal Power Company Personnel

W. L. D'Olier Vice President Exploration	Office Home	707/576-7040 707/585-7677
R. C. Bowden Drilling Supervisor	Office and Home	505/327-6419

Regulatory Agencies

U.S. Dept. of Interior

Bureau of Land Management	Oregon State Office	503/231-6949
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U.S. Dept. of Agriculture

Mt. Hood Forest Service	Supervisor's Office Clackamas Ranger Dist. after office hours Steve Calish	503/666-0700 503/630-4256 or 503/834-2228 503/630-6884 (home)
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State of Oregon

Department of Geology & Mineral Industries	Portland Office Dennis L. Olmstead William L. King Donald A. Hull	503/229-5580 503/231-3835 (home) 503/64-9331 (home) 503/281-4895 (home)
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Dept. of Environmental Quality	Emergency Management Services Portland Office	1-800-452-0311 503/229-5325
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Emergency Services

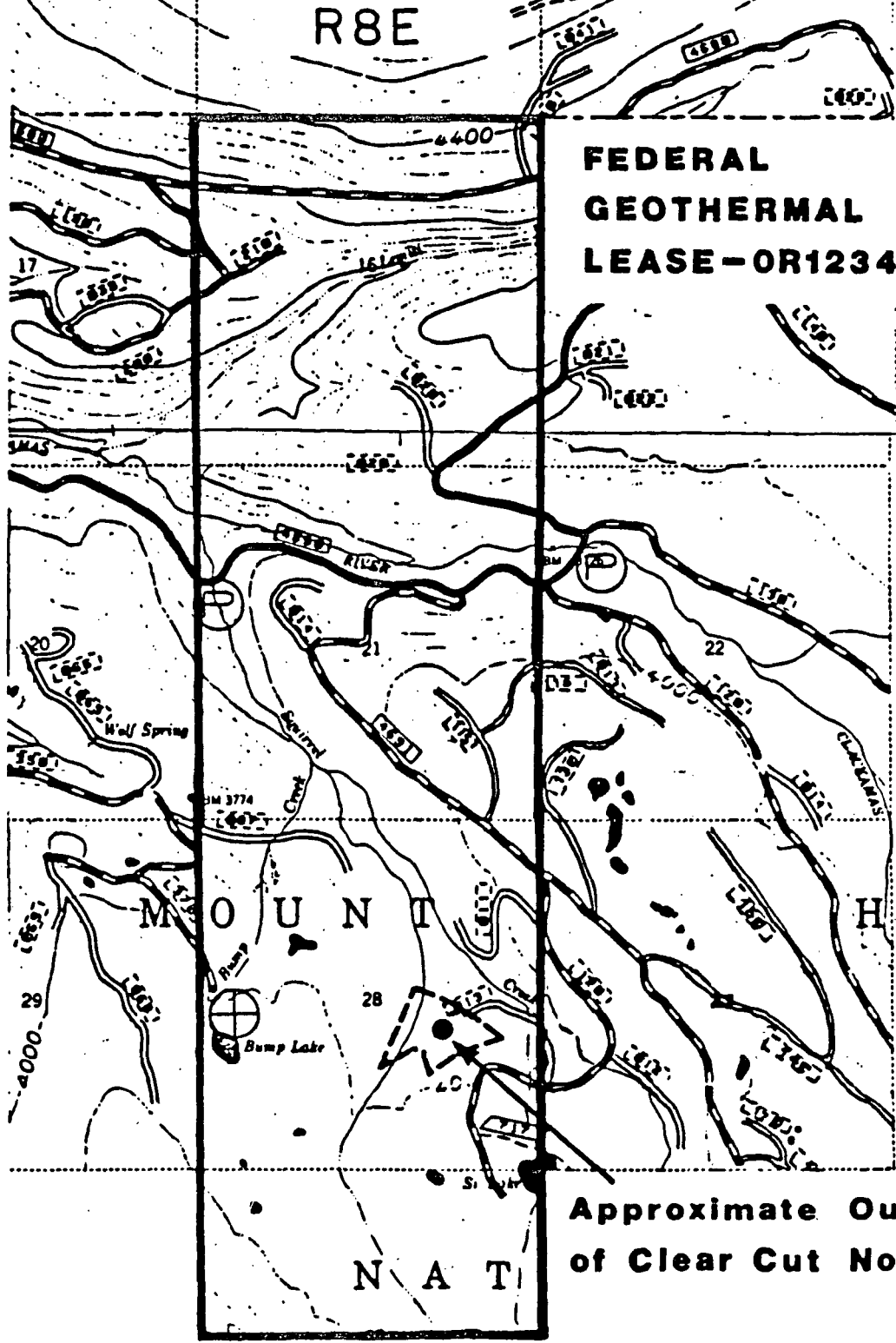
Marion County Sheriff		503/588-5032
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R8E

**FEDERAL  
GEOTHERMAL  
LEASE-OR12344**

T 8 S



**Approximate Outline  
of Clear Cut No. 30**

**LEGEND**

- -Drill site
- ▭ -Clear cut No. 30
- -Asphalt road
- ▨ -Maintained gravel
- -Light improved road

**FIGURE I**



**Diamond Shamrock**  
Thermal Power Company

SCALE  
FOOT

# CLACKAMAS 5000-FOOT THERMAL GRADIENT HOLE

## DRILLSITE LAYOUT

### EXPLANATION

1. Drill rig
2. Mixing tank
3. Mud tank
4. Sump
5. Pipe rack
6. Water storage tank
7. Mud supply storage
8. Supply parts van
9. Core & ramp
10. Drilling Supervisor trailer
11. Wellsite Geologist trailer
12. Fuel storage
13. Core storage
14. BOP controls
15. Chemical toilet

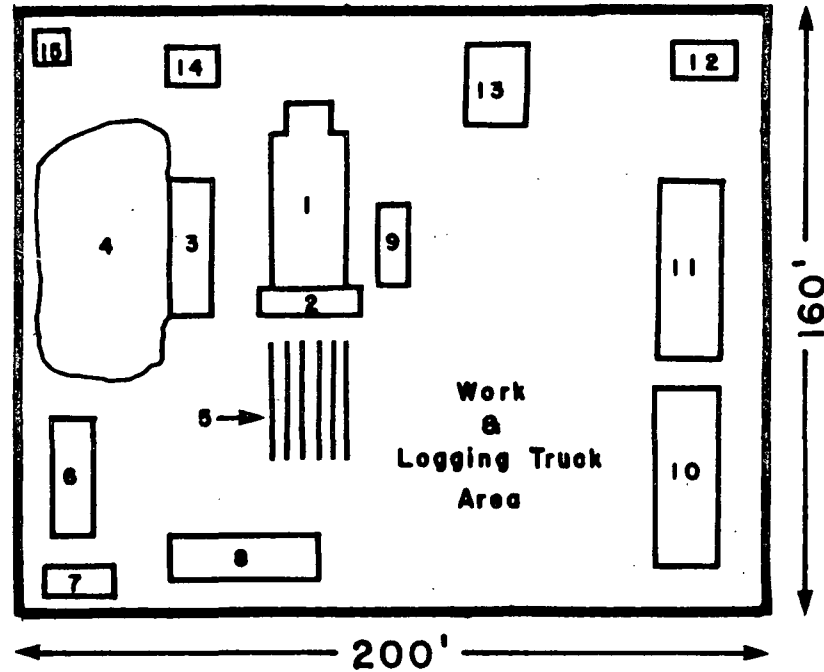


FIGURE 2



**Diamond Shamrock**  
Thermal Power Company

**APPENDIX I:** Relevant communications with Forest Service,  
Clackamas Ranger District

United States  
Department of  
Agriculture

Forest Service  
Clackamas Ranger District

61431 E. Hwy. 224  
Estacada, OR 97023

---

Reply to: 2820

Date: August 16, 1985

Joe Iovenitti  
Thermal Power Co.  
3333 Mendocino Ave., Suite 120  
Santa Rosa, CA 95401

Dear Mr. Iovenitti:

This letter answers questions raised during the August 8, 1985, visit to the proposed geothermal drill site at the end of the 013 spur off Road 4691120. Topics covered include the need for sensitive plant and cultural resource surveys, erosion control requirements, and available water sources.

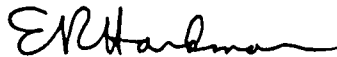
A sensitive plant survey will be required. A list of prospective bidders used by the District for similar contracts is enclosed, but any qualified botanist should prove acceptable. A cultural resource survey will be needed also.

The drill contractor will need to control soil erosion that could result from his operations. A copy of erosion control measures prescribed for timber sales is enclosed. Similar actions would be recommended to the drill contractor.

The nearest water source is a tanker fill located where Road 4690 crosses the Clackamas River, about four miles from the drill site. A load of gravel might be needed to allow the tanker truck to get close to the river, but the access ramp exists now.

Please contact Steve Callish if you need further information.

Sincerely,



E. R. HARDMAN  
District Ranger

enclosures

RECEIVED  
AUG 21 1985  
TPC - Santa Rosa

United States  
Department of  
Agriculture

Forest  
Service

Clackamas Ranger District

61431 E. Hwy. 224  
Estacada, OR 97023

Reply to: 2820

Date: August 26, 1985

RECEIVED

AUG 29 1985

TPC - Santa Rosa

Joe Iovenitti  
Thermal Power Co.  
3333 Mendocino Ave, Suite 120  
Santa Rosa, CA 95401

Dear Mr. Iovenitti:

This letter responds to your additional inquiries regarding the proposed geothermal drill site. Topics covered include: soils, visual management, air and noise pollution, wildlife migration routes, watering holes and habitats, fauna, and current and prospective land uses. Statements pertain to drilling activities only; the effects of geothermal development are not addressed.

The blanket environmental document on geothermal testing refers to soils data in the Mt. Hood Soil Resource Inventory (SRI). The SRI states specifically that it is intended for broad scale planning. Site specific planning will require a more detailed analysis of soil conditions.

The visual quality objective (VQO) for the proposed drill site is Modification. Under Modification, management activities may dominate the original characteristic landscape. Since the drill site is located in an existing clearcut, and since drilling should be brief, activities should meet the VQO.

The drill site is located in a remote area. The current level of air and noise pollution is extremely low. Drill activities are expected to produce noise and air pollution quantities similar to those experienced during a logging operation. Based on experience with logging shows, this level of air and water degradation is not expected to cause significant impairment of local air and water quality.

The proposed drill site does not provide significant habitat for threatened or endangered wildlife species. Spotted owls may visit the spot, but areas managed for their habitat are located a significant distance away. Elk use the area during spring and fall as they move up to the high country from the Clackamas River and back again, but the drill site is not located where it will disrupt a major migration route.

No critical watering hole or riparian habitat should be affected, since the site is dry during the summer. Riparian resources near Squirrel Creek, several hundred yards distant, could be damaged in the event of a very large overflow of the sump pond. Damage would depend on sump toxicity.

Currently, the land is used for general forestry purposes. The area is managed for timber production, wildlife, and recreation. No change is foreseen.

Sincerely,



 E. R. HARDMAN  
District Ranger

**APPENDIX 2: Sensitive Plant Survey Report**

SENSITIVE PLANT SURVEY REPORT  
CLACKAMAS 5000-FOOT THERMAL GRADIENT HOLE DRILLSITE  
MT. HOOD NATIONAL FOREST

Jean L. Siddall  
Lake Oswego, Oregon  
September 20, 1985

Data gathering meeting with the Forest Service On September 17, 1985, the contractor met with Steve Calish and Ron Auler of the Clackamas Ranger District, Mt. Hood National Forest to review the data available for the drillsite area. This data included: a list of the sensitive species known to occur on the Clackamas Ranger District, the District map on which all the known sites for sensitive species on the District have been plotted, the Siddall/Brown August 9-10, 1979 survey report for the Si Timber Sale in which the drillsite is located, and the Siddall 1980 "Plant List - Clackamas and Estacada Districts, Mt. Hood National Forest." They also requested that I complete the attached "Documentation of Biological Evaluation for Sensitive Plant Species," which is to be included with your report to the Forest Service.

Ground survey. On September 18, 1985, a ground survey of the flagged 160' x 200' drillsite was made by "wandering traverse." Surveys were also made of the adjacent areas of the harvest unit surrounding the drillsite, and of the standing timber east and north (downslope) of the harvest unit which seemed to offer the best potential habitat for sensitive species, especially Botrychium spp., Lycopodium spp. and Streptopus streptopoides. Lists of the plants seen in each area were made.

Survey report. No rare, endangered or sensitive plants were seen in the drillsite or in the surrounding harvest unit, nor would any be expected at another time of year. Much of the drillsite area is cobbly, bare ground regenerating to Pinus contorta and Picea engelmannii, with scattered Rhododendron macrophyllum, Spiraea densiflora, and Xerophyllum tenax. The Cornus canadensis and other herbaceous species are surviving in the shade of down logs.

The timbered area to the north, downslope from the drillsite, is more mesic, and looked like potential habitat for the sensitive species mentioned above, especially when Streptopus roseus, a common associate of Streptopus streptopoides, was found, but no sensitive species were seen here either.

A list of all species seen, both in the drillsite and in the harvest unit and timbered areas to the north and east of the project area, is attached as Appendix A. A sketch map of the route of survey is also attached.

APPENDIX A

LIST OF PLANT SEEN SEPTEMBER 18, 1985

CLACKAMAS 5000-FOOT THERMAL GRADIENT HOLE DRILLSITE, NW $\frac{1}{4}$  SE $\frac{1}{4}$  Sec. 28 T8S R8E  
CLACKAMAS RANGER DISTRICT, MT. HOOD NATIONAL FOREST

Jean L. Siddall  
Lake Oswego, Oregon

[Symbols used: r = regenerating only; L = local;  
++ = dominant; x = present; - = very few]

		Drillsite	Harvest unit adj. to site	Forest to north	Forest to east
<u>TREES</u>					
<i>Abies amabilis</i>	Pacific silver fir	r-	r	++	++
<i>Abies lasiocarpa</i>	subalpine fir	r	r		x
<i>Picea engelmannii</i>	Engelmann spruce	r++	r++		x
<i>Pinus contorta</i>	lodgepole pine	r++	r++	x	x
<i>Pinus monticola</i>	white pine	r	r	x	x
<i>Tsuga heterophylla</i>	western hemlock		r	x	x
<i>Tsuga mertensiana</i>	mountain hemlock	r	r		++

[There is an interesting lack of Douglas-fir and cedar in this area]

SHRUBS

<i>Alnus sinuata</i>	Sitka alder	x			
<i>Amelanchior alnifolia</i>	western serviceberry	x	x		
<i>Arctostaphylos nevadensis</i>	pine-mat manzanita	x	x		
<i>Berberis nervosa</i>	Cascade Oregongrape	x	x	x	
<i>Castanopsis chrysophylla</i>	golden chinquapin	-			x
<i>Ceanothus velutinus</i>	sticky laurel	x	x		
<i>Pachystima mysinites</i>	Oregon boxwood	++	x		
<i>Rhododendron macrophyllum</i>	Pacific rhododendron	L			
<i>Ribes lacustre</i>	prickly currant	x	x	x	
<i>Rosa gymnocarpa</i>	baldhip rose; little wild rose	x	x		
<i>Salix</i> sp.	willow	x	x		
<i>Spiraea densiflora</i> var. <i>densiflora</i>	subalpine spiraea	x	x	++	
<i>Vaccinium membranaceum</i>	thin-leaved huckleberry	++	x	++	++
<i>Vaccinium ovalifolium</i>	oval-leaf huckleberry			L++	

FERNS

<i>Polystichum munitum</i> var. <i>imbricans</i>	imbricated sword-fern	x			
<i>Pteridium aquilinum</i>	bracken	x			



HERBS

<i>Achlys triphylla</i>	vanillaleaf		x	++	
<i>Anaphalis margaritacea</i>	pearly everlasting	x	x		
<i>Anemone deltoidea</i>	windflower		x	x	
<i>Anemone oregana</i>	Oregon anemone	-	x	x	
cf. <i>Arnica</i> sp.	arnica	x	L++		
<i>Aster occidentalis</i>	western mountain aster	x	L++	x	
<i>Chimaphila umbellata</i>	prince's-pine	-			x
<i>Cirsium vulgare</i>	common thistle	x	x		
<i>Clintonia uniflora</i>	queenscup; beadlily	-	x	x	
<i>Cornus canadensis</i>	bunchberry; Canada dogwood	x	x	x	
<i>Epilobium angustifolium</i>	fireweed	x	x		
<i>Epilobium</i> cf. <i>glandulosum</i>	common willowherb		-		
<i>Fragaria vesca</i> var. <i>bracteata</i>	woods strawberry			x	
<i>Fragaria virginiana</i>	broad-petalled strawberry	x	x		
var. <i>platypetala</i>					
<i>Gaultheria ovatifolia</i>	Oregon wintergreen	x	x		x
<i>Gayophytum nuttallii</i>	spreading groundsmoke		x		
<i>Geum macrophyllum</i>	large-leaved avens		-		
<i>Gnaphalum macrocephalum</i>	slender cudweed	x	x		
<i>Hieracium albiflorum</i>	white hawkweed	x	x		
<i>Linnaea borealis</i>	twinflower	-		x	
<i>Lupinus</i> sp.	lupine	x	x		
<i>Mitella breweri</i>	Brewer's mitrewort			-	
<i>Mitella ovalis</i>	oval-leaved mitrewort			-	
<i>Penstemon cardwellii</i>	Cardwell's penstemon	L++	x		
<i>Polygonum</i> cf. <i>douglasii</i>	Douglas knotweed	L-			
<i>Potentilla drummondii</i>	Drummond's cinquefoil	L	x	x	
<i>Potentilla glandulosa</i>	glandular cinquefoil	-	-		
<i>Pyrola secunda</i>	one-sided wintergreen			-	
<i>Rubus lasiococcus</i>	three-leaf bramble	-		x	
<i>Rubus ursinus</i>	Pacific blackberry	x	x		
<i>Senecio triangularis</i>	arrowleaf groundsel		x	x	
<i>Smilacina stellata</i>	starry Solomon-seal	-	-	-	
<i>Streptopus roseus</i>	rosy twisted-stalk			x	
<i>Thalictrum</i> sp.	meadowrue			x	
<i>Tiarella unifoliata</i>	coolwort			x	
<i>Trillium ovatum</i>	trillium			-	
<i>Valeriana sitchensis</i>	Sitka valerian			-	
<i>Veratrum</i> sp.	false hellebore			-	
<i>Viola glabella</i>	Johnny jump-up	x		x	
<i>Viola sempervirens</i>	evergreen violet	x		x	
<i>Xerophyllum tenax</i>	beargrass	L++		x	

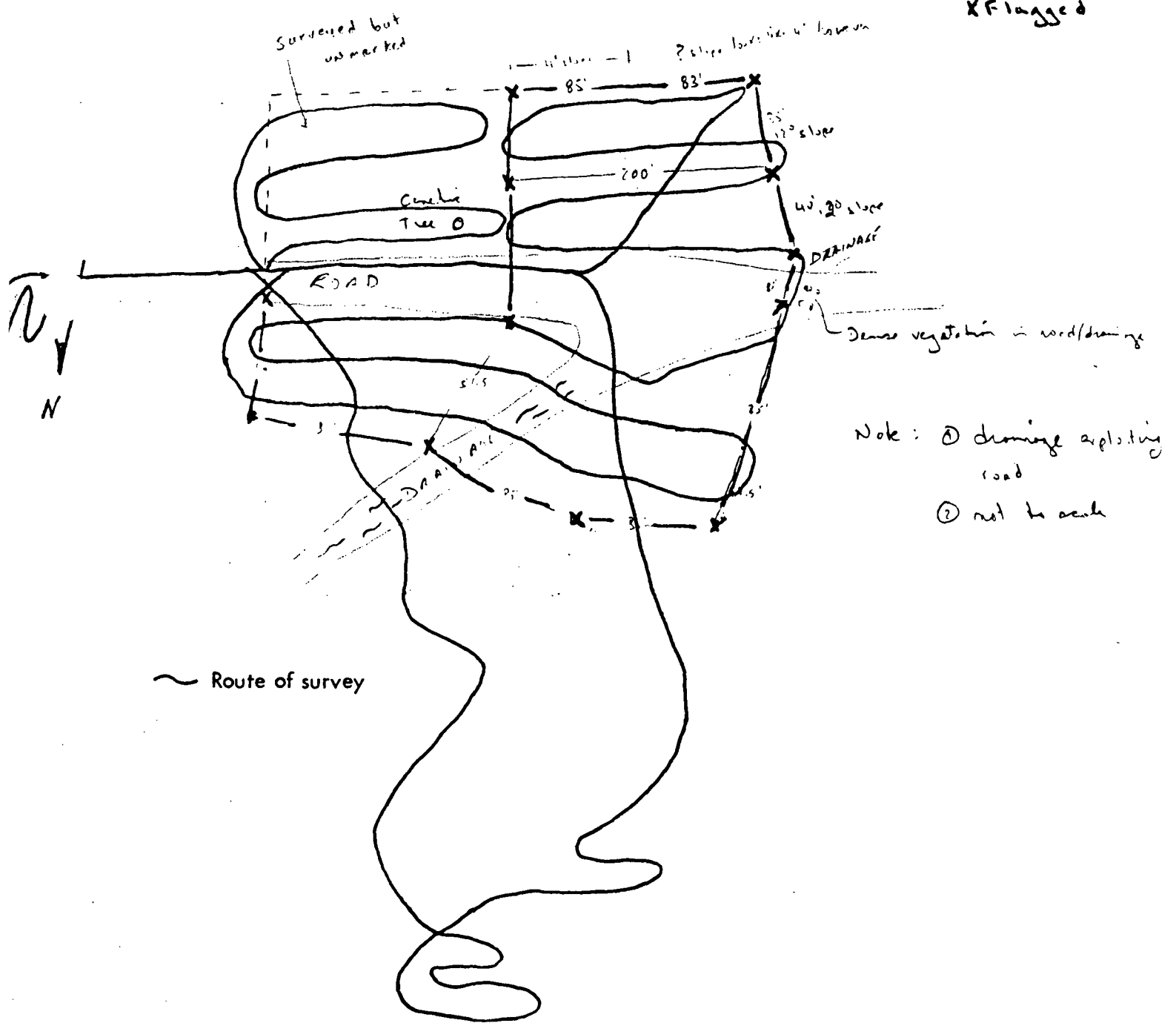
[No attempt was made to key out the Juncus sp., Carex sp. or grasses present; they are past the stage where positive identification is possible.]

PLANT SURVEY SKETCH MAP  
 CLACKAMAS 5000-FOOT THERMAL GRADIENT HOLE DRILLSITE  
 MT. HOOD NATIONAL FOREST

Jean L. Siddall  
 Lake Oswego, Oregon  
 September 18, 1985

NW $\frac{1}{4}$  SE $\frac{1}{4}$  Sec. 28 T8S R8E

X Flagged



DOCUMENTATION OF BIOLOGICAL EVALUATION FOR SENSITIVE PLANT SPECIES

EVALUATOR Jean L. Siddall

Clackamas 5000-foot

I. AREA IN QUESTION: Sale Name thermal gradient T 8S R 8E S's 28 NW<sup>1</sup> SE<sup>1</sup>  
hole drillsite (Si T.S.)  
TRI Compartment # and name 3211 Si Lake  
cell(s) \_\_\_\_\_ (for sensitive plant sites only)

II. IS THERE POSSIBLE HABITAT IN THE AREA?

Criteria: All springs, perennial or late running streams, lakes, bogs, meadows, generally wet areas, and open rocky outcrops are considered. Portions of such habitats may be deleted from consideration if after preliminary field searches, consultation with knowledgeable persons, or interpretation of photos the evaluator concludes that such portions do not warrant a search.

Sources consulted Ron Auler and Steve Calish

Results: Most of the habitat in the immediate drillsite area is cobbly and dry.

Species considered possible in the area are checked below:

- |                          |                           |
|--------------------------|---------------------------|
| Agoseris elata           | * Corydalis aquae-gelidae |
| Arabis furcata           | Draba aureola             |
| * Aster gormanii         | Erigeron cascadiensis     |
| Botrychium boreale       | * Lycopodium annotinum    |
| * Botrychium lanceolatum | Lycopodium complanatum    |
| * Botrychium lunaria     | Lycopodium inundatum      |
| * Botrychium simplex     | * Lycopodium selago       |
| Calmagrostis breweri     | Ophioglossum vulgatum     |
| Campanula scabrella      | Phlox hendersonii         |
| Corallorhiza trifida     |                           |

III. IF HABITAT IS PRESENT ARE THERE SENSITIVE PLANT SPECIES PRESENT?

Field search description: On September 18, 1985, a botanical survey was made of the drillsite, the harvest unit adjacent to the drillsite, and areas in the standing timber north and east of the site. The drill site area is dry and cobbly; the adjacent area of the harvest unit downslope supports a Carex-Aster occidentalis association; the area to the north under the trees is mesic with ephemeral drainage.

Results: No sensitive species were found either in the harvest unit or in the adjacent timbered areas surveyed. The more mesic area just north of the harvest unit looked like potential habitat for Streptopus streptopoides, and S. roseus, a common associate is there, but no S. streptopoides was seen. Of interest is the absence of Douglas-fir and cedar in the immediate area, and the presence of alpine species, subalpine fir, Spiraea desiflora and Valeriana sitchensis. This is indeed a cold pocket.

Signature Jean L. Siddall Date 9/20/85

\* Known to occur on District

**APPENDIX 3: Cultural Resource Survey Report**

CULTURAL RESOURCE SURVEY  
PROPOSED CLACKAMAS GEOTHERMAL DRILL SITE  
MT. HOOD NATIONAL FOREST

Introduction

At the request of Thermal Power Company, a cultural resource survey of the proposed Clackamas 5000-ft. thermal gradient hole drill site was accomplished on 18 September 1985 by Sandra L. Snyder, contract archaeologist. Prior to this field work, on 17 September 1985, an orientation meeting was held at the Mt. Hood National Forest Clackamas District (Ripplebrook) Ranger Station. In attendance were district personnel Steve Calish, ORA, and Ron Alder, botanist, who provided maps and background information on the project area to Jean Siddall, contract botanist, and Snyder. Don Palmer, district cultural resource technician, was unable to attend, however information relating to previous cultural surveys in the area was provided to the contract archaeologist at a later date.

Methodology

The proposed drill site is within an early 1970's clear cut located in the NW $\frac{1}{4}$  of the SE $\frac{1}{4}$  Section 28, T8S, R8E at an elevation of approximately 3700 ft. in the Squirrel Creek drainage. An area measuring roughly 250 x 300ft. within the relatively level northeast quadrant of the clear cut was designated the focal survey plot; a portion of that block was then staked and flagged by Thermal Power Company personnel to delimit actual drilling activities.

Following an informal surface reconnaissance within the clear cut unit as a whole, a more intensive examination of the project area was conducted. Walking transects spaced at 3-5 meters, surface soils were

inspected for chipped and ground stone artifacts, lithic debitage resulting from the production and maintenance of such tools, as well as signs of hunting blinds, rock cairns, and other prehistoric and historic cultural features which would potentially be preserved in an open, unprotected site.

Surface visibility ranged from good to fair, depending on location within the project area. On the gentle slopes of the southern half of the survey plot, slow regrowth, even of low herbaceous plants, permitted adequate soil exposure for survey purposes. Although charred logs remaining from earlier broadcast burning were scattered throughout, in only a few instances did they significantly prohibit examination of surface soils.

Much of the slope surface was littered with small gravels and cobbles, however none examined bore any sign of alteration through human use. Two large boulders resting near the survey plot's south corner were inspected for rock art, also with negative results. The base of the slope is truncated by a rock-filled drainage and road bed which provides access to the clear cut from forest roads. Examination of the resulting 30-70cm. cut bank was accomplished by shaving back 3-5cm. of soil with a trowel. No subsurface cultural materials or other indications of human occupational features were in evidence.

The northern portion of the project area is flat and probably quite boggy in spring after snowmelt. Visibility in this section was more restricted due to frequently heavy ground cover of moss, grasses, low vines, and a variety of herbaceous plants, interspersed with young conifers. As on the slope above, charred logs and stumps were present but proved only minor detriments to survey objectives. These restrictions were balanced by numerous mounds of loose soil around rodent

burrows, shallow dry gullies, and patches of exposed soil around the margins of the clear cut which may be remnants of a fire line, all of which provided excellent survey opportunities. In both sections of the survey plot, transects were supplemented by closed examination of exposed soils in order to compensate for spots of poor surface visibility.

### Results

Neither the informal inspection of the clear cut nor closer scrutiny of the project area proper yielded prehistoric or early historic cultural materials or features. The only signs of human activity in the area are clearly recent in origin.

Information gained during a telephone conversation with Don Palmer on 19 September 1985 indicated that there was no record of a cultural resource survey for this timber sale but that others in nearby areas conducted since 1977 have proven negative. Palmer's information was further supported by Dr. Leland Gilson, archaeologist for the State Historic Preservation Office. After checking site files and survey reports relevant to the project area, Gilson reported that while there are sites recorded for hot springs, creeks, and other locations within that part of the Clackamas district, no recorded sites, including those of Native American religious significance, fall within the immediate vicinity.

This seeming lack of cultural resources, while not the final statement on site distribution, may reflect what is known of prehistoric and historic exploitation of the Cascades. Data from the few excavated Cascade archaeological sites suggest at least seasonal forays into foothills and higher elevations of this mountain range since 8000 years B.P. (Before Present), well before the 6900 B.P. eruption of Mt. Mazama

blanketed much of the Cascades with ash.

Both the distribution of recorded Cascade sites and the nature of their cultural materials support land use patterns known from ethnographic times. In the late prehistoric/contact period of the late 18th century, a number of Native American groups populated western and central Oregon, many of whom traveled into the mountains for hunting, fishing, plant collecting, and individual spirit or vision quests. In what is now Mt. Hood National Forest, the groups known as Molalla and Clackamas were the most common occupants in the early 19th century, wintering at foothills village sites then moving back to a variety of higher elevation sites as floral and faunal resources became seasonally available. Because many resources were available for only a limited time and in limited quantities at any one location, these groups as well as others exploiting Cascade resources followed a carefully scheduled series of movements, coming together in groups of several families in order to harvest a brief but abundant resource such as fish runs or ripening berries, or splintering into single family groups to take advantage of more sparsely scattered resources. The resulting pattern of site distribution, then, has shown more frequent and intensive use of areas near lakes, rivers, marshes, and other areas of floral and faunal concentrations.

As might be expected, a web of trails facilitated movement throughout the Cascades, perhaps following routes which later became paved roads or foot paths still used today. Archaeological sites have been identified in areas which may have been adjacent to these trails as well as in areas removed from either likely major resource concentrations or travel routes. These sites are often quite small, suggesting only brief occupation or activities of a very few people. In many cases they



contain only lithic debitage produced in the manufacture or maintenance of stone tools and tools which are not culturally or chronologically diagnostic. These "lithic scatters" are found in a wide variety of settings, including sites which to modern eyes are of questionable purpose. It is this type of site which would have been the most likely encountered during this cultural resource survey.

Other categories of aboriginal sites found in the Cascades include rock cairns, usually located on a ridge line and associated with an individual's personal vision quest, and rock art on boulders and rock outcrops. The latter appear to be infrequent in the Cascades, particularly in comparison to their occurrence along the Columbia Gorge and in Central Oregon.

Ethnographic and historic records of traditional Native American lifeways, although sketchy due to drastically lowered population numbers and disruption of cultural patterns following the devastating malaria epidemic of 1829-30, provide some site-specific information relevant to the project area. Both before and after establishment of the Warm Springs Reservation in 1855, what is now the Olallie Lake Scenic Area (south of the project area) was a focal point for hunting and plant collecting by Molalla as well as Wasco, Tenino, and Paiute groups residing along the east slope of the Cascades. North of the project area, these and other groups harvested huckleberries which grew in abundance in the Upper Roaring and Salmon River drainages. Of course there were other foci outside these locations but apparently none of similar magnitude in or near the recent survey locale.

Significant incursions by EuroAmericans into the Upper Clackamas took place in the 1840's. The area's importance in the earlier fur trade and later mining activities seems to have been negligible

although the Upper Collawash River, several miles west of the project area, was explored for gold and silver deposits following successful ventures in the Upper Molalla River and Battle Ax district in the 1860's and 1870's. More recent activities by the Forest Service and Civilian Conservation Corp have focused on locations appropriate for fire lookouts, administrative centers, and development of hot springs, thus bypassing the area under study.

#### Conclusions and Recommendations

In sum, while both archaeological data and written documentation support a long and varied history of human exploitation of the Cascades, neither the literature and records reviewed nor the surface reconnaissance produced any physical evidence of significant prehistoric or historic activities within the project area. Neither is there any record of this locale figuring in Native American religious practices.

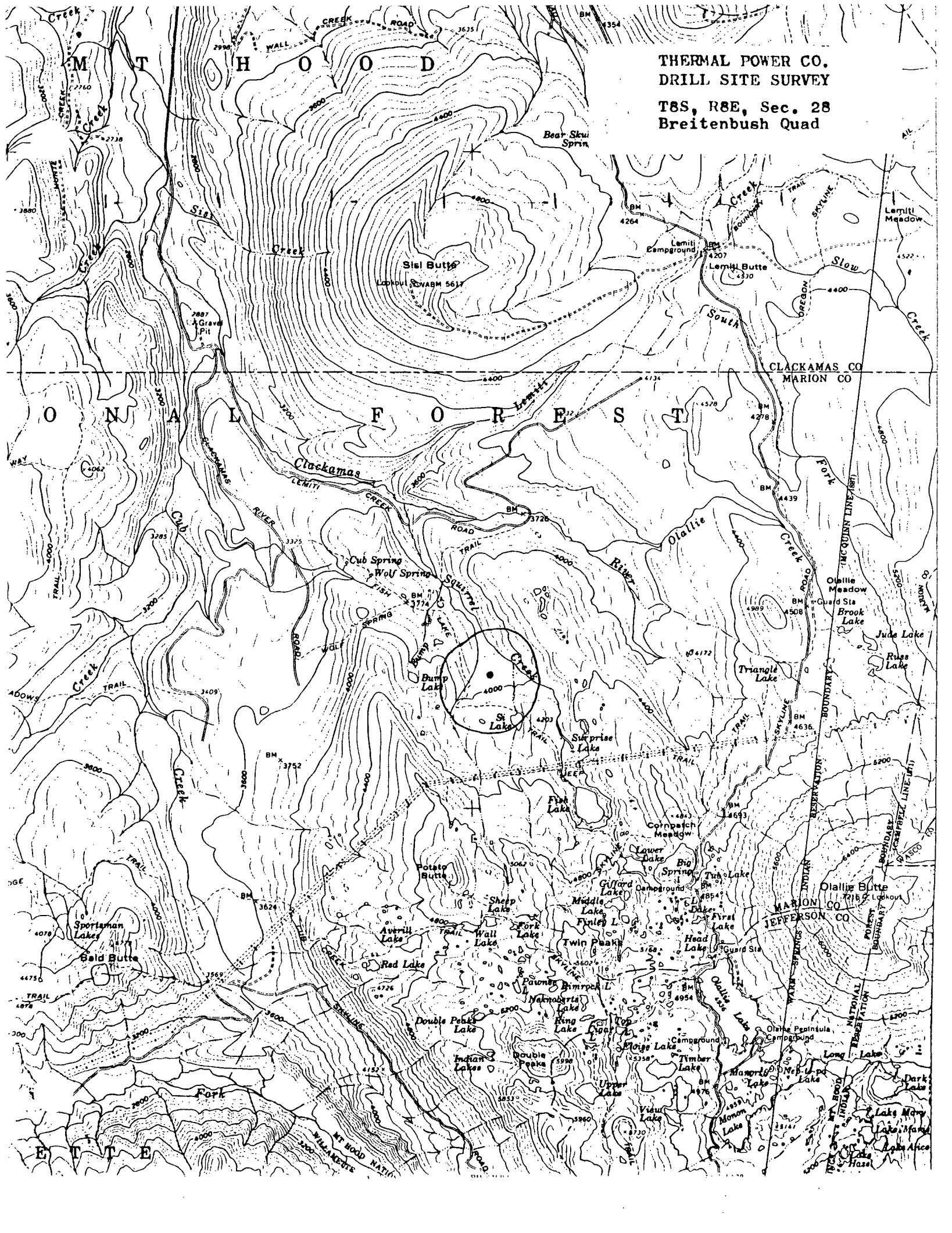
Given these results, it is suggested that the proposed geothermal drilling project will have no adverse impact on either prehistoric or historic cultural sites and should proceed as planned. If cultural materials are encountered during the course of the project, Don Palmer should be notified immediately and, with the assistance of Dr. Leland Gilson, assess site significance before work at the drill site continues.

## REFERENCES

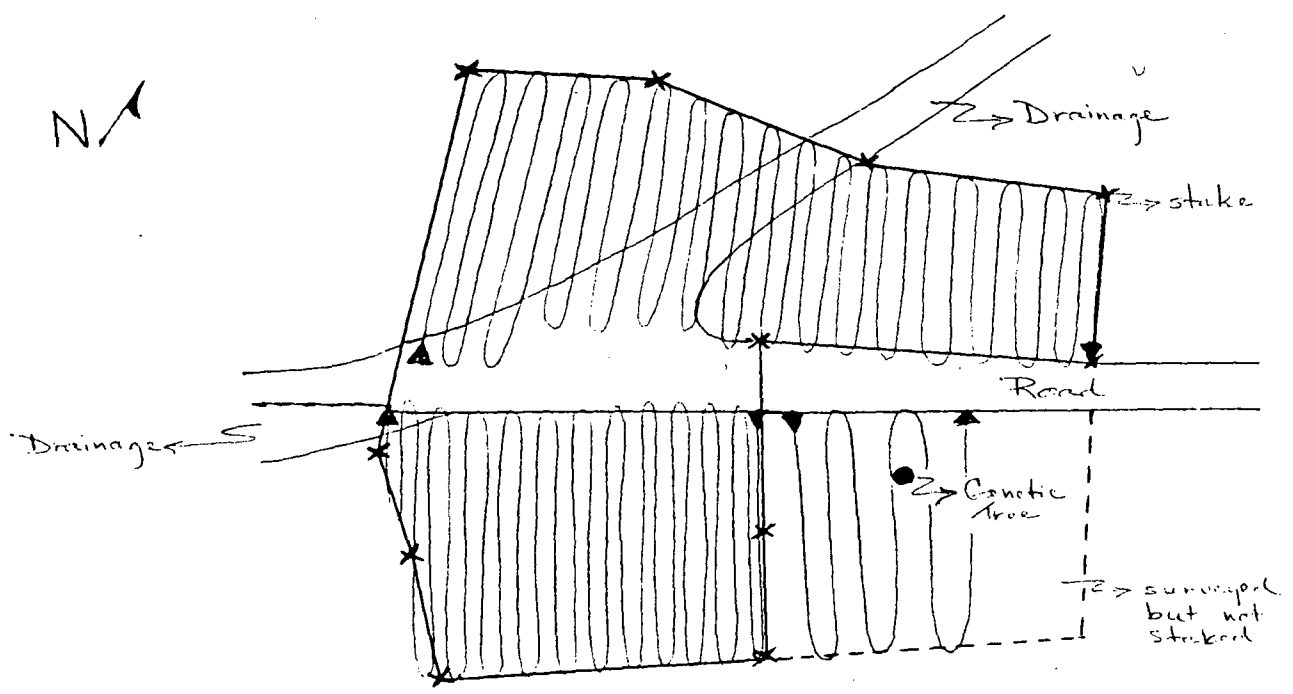
- Aikens, C. Melvin. Archaeology of Oregon. US Dept. of the Interior,  
1984 Bureau of Land Management. Oregon State Office, Portland.
- Aikens, C. Melvin, ed. Archaeological Studies in the Willamette  
1975 Valley, Oregon. University of Oregon Anthropological Papers,  
No. 8. Eugene.
- Anon. Cultural Resources Overview: Clackamas and Badger/Jordan  
1979 Planning Units, Mt. Hood National Forest, Oregon.
- Beckham, Stephen Dow, Kathryn Anne Toepel, and Rick Minor. Native  
1984 American Religious Practices and Uses in Western Oregon.  
University of Oregon Anthropological Papers, No. 31. Eugene.
- Bryant, Richard L., Leslie Conton, Robert E. Hurlbett, and John R. Nelson.  
1978 Cultural Resource Overview of the Mt. Hood National Forest,  
Oregon. Volume I. Pro-Lysts, Inc., Eugene.
- Gilsen, Leland. Personal communication, 19 September.  
1985
- Minor, Rick, Stephen Dow Beckham, Phyllis E. Lancefield-Steeves, and  
1980 Kathryn Anne Toepel. Cultural Resource Overview of the BLM  
Salem District, Northwest Oregon. University of Oregon  
Anthronological Papers, No. 20. Eugene.
- Palmer, Don. Personal communication, 19 September.  
1985
- Toepel, Kathryn Anne, William F. Willingham, and Rick Minor. Cultural  
1980 Resource Overview of BLM Lands in North-Central Oregon.  
University of Oregon Anthropological Papers, No. 17. Eugene.

THERMAL POWER CO.  
DRILL SITE SURVEY

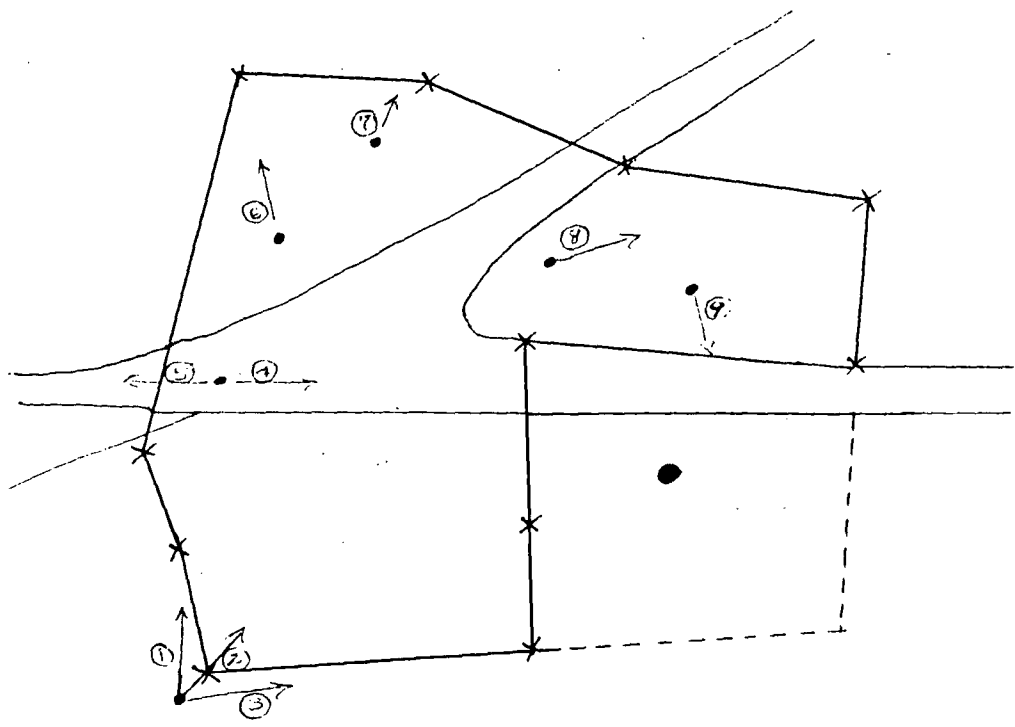
T8S, R8E, Sec. 28  
Breitenbush Quad



# Proposed Clackamas Geothermal Drill Site



Cultural Survey Transects



Photographic Key

Dimensions of survey plot approximately 250 x 300 ft.  
(Map not to scale)



ACTOR ATTYEH  
GOVERNOR

# Department of Geology and Mineral Industries

## ADMINISTRATIVE OFFICE

1005 STATE OFFICE BLDG., PORTLAND, OREGON 97201 PHONE (503) 229-5580

January 10, 1986

**RECEIVED**

JAN 13 1986

TPC - Santa Rosa

*M. 20 Jan 86*

W.L. D'Olier  
Vice President  
Geothermal Exploration  
Thermal Power Company  
3333 Mendocino Avenue, Suite 120  
Santa Rosa, CA 95401

Dear Mr. D'Olier:

Enclosed is Thermal Power Company's Permit 124 effective January 9, 1986 for the drilling of CTGH-1, Marion County. The January 1984 stipulations approved by the State Geologist are conditions of this permit.

Please call us approximately six hours before the surface casing pressure test is to be made as we will want to inspect the blow-out prevention equipment.

In reference to specifications listed in the Plan of Exploration and supporting materials, the "double control gate" of the BOP must consist of pipe and blind rams. In addition, the choke manifold must have a gauge and two valves, and there must be a drill string safety valve on the rig floor. Finally, the plugging program should list plug lengths as 100 ft. for shoe and lap plugs. Please notify us who the field supervisor will be and how to reach him when you move in.

If we can be of assistance, please let us know.

Sincerely,

*Dennis L. Olmstead*

Dennis L. Olmstead  
Petroleum Engineer

DLO:ak

Enclosure

*ORIGINAL to OR-CL-PL-02  
cc to: D'Olier  
Bowden*

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					TOP	BOTTOM	
14-3/4"	11-3/4"	28 lbs.	N/A	1/4" Wall	0	30	25 cu. ft.
10" or 9-7/8"	7"	26 lbs.	Buttress	K-55	0	500	266 cu. ft.
6" or 5-5/8"	4-1/2"	11.6 lbs.	Long	K-55	450	4000	605 cu. ft.

22. PROPOSED WORK SUMMARY

Prepare 160' x 200' drillsite pad and lined sump adjacent to existing access road into clear cut parcel 30. Move in truck mounted rig. Drill 14-3/4" hole to 30' depth, run 11-3/4" conductor to bottom and cement to surface. Drill 10" hole to 500' depth; run 7" K-55 26 pound Buttress casing to bottom and cement to surface. Install casing head on 7" casing, then BOPE consisting of a double control gate and Hydril. Test BOPE per BLM regulations. Diamond core with HQ heads to 5000'. Run geophysical borehole log suite to 5000'. Open HQ hole with 6" bit to 4000' or other selected depth; run 4-1/2" K-55 11.6 pound LT&C casing to 4000', cement solid from shoe to lap in 7" casing at 450'-500' depth. Briefly flow well to obtain expected geothermal fluid samples. Hang 2-7/8" J-55 tubing string to 5000'; fill same with water. Release rig; leave CTGH-1 shut-in awaiting DOE high precision temperature log.

This will be a vertical borehole; no directional drilling/coring practices will be applied. However, borehole directional surveys will be run with the geophysical logging suite.

This deep thermal gradient hole would be drilled under a Cooperative Agreement between Thermal Power Company and the U. S. Department of Energy as part of the DOE program to 1) gather data to characterize the deep hydrothermal resource of the Cascades volcanic region and 2) transfer this data to the public in order to stimulate further development of hydrothermal resources.

(Use additional space on reverse side of form)

23.

SIGNED *[Signature]* TITLE Vice President, Geothermal Exploration DATE 14 November 1985  
 (This space for Federal use)  
 APPROVED BY *[Signature]* TITLE Petroleum Engineer (DOGAMI) DATE \_\_\_\_\_

CONDITIONS OF APPROVAL, IF ANY. NOTE: This permit is valid only if land use approval is obtained from the county or city in which the drilling takes place, and provided these authorities make a determination of compliance with statewide goals. Issuance of this permit is not a finding of compliance with this permit is required by law (30 U.S.C. 1873); regulations: 30 CFR 270.71; Federal Geothermal Lease Terms and Stipulations and other regulatory requirements. The United States Criminal Code (18 U.S.C. 1001) makes it a criminal offense to make a willfully false statement or representation to any Department or agency of the United States as to any matter within its jurisdiction.

the Statewide Planning Goals or the acknowledged comprehensive plan. Permit expires 180 days from date of issue.

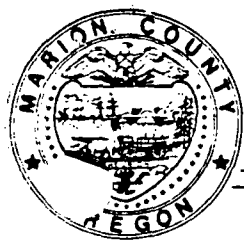
(See instructions on reverse side)

STIPULATIONS WHICH APPLY TO GEOTHERMAL DRILLING PERMITS

1. The operator of a geothermal well must keep a daily record of work, collect drill samples, and maintain a log of rock formations penetrated.
2. If redrilling, deepening, altering of casing, testing or plugging is planned, notice must be given to the Department on Form 5, "Miscellaneous Notices and Reports on Geothermal Wells." Approval or disapproval can be given by phone but work approved in this way must still be proposed in writing by the operator.
3. Well summary (Form 8), well history, representative drill samples and copies of borehole surveys must be submitted to the Department within 60 days after completion, abandonment, or suspension. These records will be kept confidential for a four-year period from date of completion, abandonment, or suspension.
4. In the event of an emergency or blow-out, a Department representative should be contacted as soon as possible:
 

Dennis L. Olmstead - Petroleum Engineer	(503) 229-5580 office (503) 231-3835 home
William L. King - Petroleum Geologist	(503) 229-5580 office (503) 644-9331 home
Donald A. Hull - State Geologist	(503) 229-5580 office (503) 281-4895 home
John D. Beaulieu - Deputy State Geologist	(503) 229-5580 office (503) 234-6323 home
5. Permission must be obtained from the State Department of Environmental Quality (DEQ) for any extraordinary offsite disposal of drilling mud or wastes or any other emergency that could affect adjoining properties.
6. No fluid shall be discharged unless a permit has been issued by the State DEQ.
7. Notice is to be given to the State Geologist or his representative:
  - a. Prior to construction of drill site and sump.
  - b. Prior to BOP tests after running casing strings.
  - c. Prior to performing work to complete or abandon a well.
  - d. Prior to pulling casing strings.
  - e. Prior to deviating a well from the vertical.
  - f. In the event of fire, spill of fluids, or serious accident.
8. Unless the surface owner wants the drilling pad to be left, the site is to be restored to as near original condition as is practical, including revegetation using native species. Recommended seed mixture can be obtained by calling the Department of Fish and Wildlife at (503) 229-5679.
9. This permit does not include land-use approval. A separate approval should be obtained from the county or city in which the drilling takes place.
10. The State Geologist or his representative may enter the site at any time to make inspections and/or witness work done.
11. Release of the bond will be granted following proper plugging of the hole, restoration of the drill site, and filing of the required records.





MARION COUNTY  
DEPT. OF ENVIRONMENTAL SERVICES

CRAIG O. LUEDEMAN  
Director  
Planning 588-5038  
Building Inspection 588-5147  
Risk Management 588-5294

Senator Building • 220 High Street NE • Second Floor • Salem, Oregon 97301-3670

January 27, 1986

W.L. D'Olier  
3333 Mendocino Avenue  
Suite 120  
Santa Rosa, California 95401

**RECEIVED**  
FEB 7 1986  
TPC - Santa Rosa

Dear Mr. D'Olier:

I am forwarding you a copy of our response to the request for review from the State Department of Geology and Minerals Industries. I hope this will meet your needs. If you need more information or want further clarification please contact me at (503) 588-5038.

Respectfully,

A handwritten signature in cursive script that reads "Norman Bickell".

Norman Bickell  
Assistant Planner

Enclosure

NB/dh



MARION COUNTY  
DEPT. OF ENVIRONMENTAL SERVICES

CRAIG O. LUEDEMAN  
Director  
Planning 588-5038  
Building Inspection 588-5147  
Risk Management 588-5294

Senator Building • 220 High Street NE • Second Floor • Salem, Oregon 97301-3670

December 26, 1985

Mr. William King  
Petroleum Geologist  
Department of Geology & Minerals Industries  
910 State Office Building  
Portland, Oregon 97201

Dear Mr. King:

Thank you for forwarding a copy of the application of Thermal Power Company to drill a geothermal test well in a portion of the Mt. Hood National Forest located in Marion County.

Because the site is federally owned land our Zoning Ordinance (Section 110.820 (a)) exempts this activity from the usual conditional use permit requirements. It stipulates however that the activity must be managed in a manner consistent with the intent of the County Comprehensive Plan and Zoning Ordinance and the Land Policy Management Act of 1976.

The issues we would address if the proposal were located on private land include: Fire hazard management, containment and disposal of drill spoils, removal of all equipment and structures, revegetation, erosion control at the site and along any new access, and prevention of public access to the site during and subsequent to drilling.

If, in issuing your permit, these factors are adequately addressed, we would have no objection to the issuance of the permit and it would comply with our ordinance requirements.

Thank you for the opportunity to comment.

Best Regards,

A handwritten signature in cursive script, appearing to read "Russell Nebon".

Russell Nebon  
Chief Planner

RN/dh



**Diamond Shamrock**  
Thermal Power Company

January 21, 1986

Mr. Norman Bickell  
Marion County Planning Department  
220 High Street NE  
Salem, Oregon 97301

Dear Mr. Bickell:

Thermal Power Company is planning to drill and complete a 5000-foot thermal gradient hole in the Mt. Hood National Forest on the issued Federal geothermal lease OR 12344 in the NW 1/4, SE 1/4 of Section 28, T8S, R8E, Willamette Meridian, Marion County, Oregon. The operation is estimated to be 60-days in duration beginning on 1 June 1986 and completing on 1 August 1986.

As we discussed, I am enclosing, for your information, a copy of the Plan of Exploration and Application for a Geothermal Drilling Permit submitted to the BLM Portland. These documents were also submitted to the Oregon Department of Geology and Mineral Industries for a State Geothermal Drilling Permit. The application for a Geothermal Fluid Discharge Permit submitted to the Oregon Department of Environmental Quality, and a request for an exception to the basin program for the Upper Clackamas River, as well as the application for Permit to Appropriate Surface Water submitted to the Water Resources Commission, are also provided.

If there are any questions regarding the intended operation, please do not hesitate to call me at 707/576-7232.

Sincerely,

J. L. Iovenitti  
Senior Geologist

JLI/ma

**Thermal Power Company**

A subsidiary of Diamond Shamrock, 3333 Mendocino Avenue, Suite 120, Santa Rosa, California 95401  
Phone 707 576-7022

NATIONWIDE-STATEWIDE GEOTHERMAL RESOURCES LEASE BOND

Act of December 24, 1970 (84 Stat. 1566)

Personal Bond  Corporate Surety Bond

This Bond Replaces Insurance Company of North America Bond #M 11 B7 61  
KNOW ALL MEN BY THESE PRESENTS, That  We  I, THERMAL POWER CO.  
601 California Street, San Francisco, California 94108

, as obligor

and NATIONAL FIRE INSURANCE COMPANY OF HARTFORD, as surety,  are  is  
held and firmly bound unto the United States, in the sum of ONE HUNDRED FIFTY THOUSAND AND NO/100  
(\$ 150,000.00 ) lawful money of the United States, to be paid to the United States, for the use and benefit  
of: (1) the United States; (2) any entryman, patentee, or surface owner of any portion of the lands covered by the lease  
bearing the above serial number who holds his lands subject to a reservation of the geothermal resources deposits  
the United States; and (3) any lessee, permittee, or contractor under a lease, permit, or resource sale contract issue  
or to be issued, by the United States covering the use of the surface, or the prospecting for, or development of, other  
mineral deposits in any portion of such lands. For such payment, well and truly to be made, we bind ourselves, as  
each of us, and each of our heirs, executors, administrators, successors, and assigns, jointly and severally, by these  
presents.

If the amount of this bond is \$150,000, or if it is raised by an attached rider to that amount, the coverage shall extend  
to all the obligor's holdings involving geothermal resources deposits in the United States, including Alaska, under the Act.

If the amount of this bond is less than \$150,000, its coverage extends only to the obligor's holdings involving geothermal  
resources deposits in the State or States named in Schedule A and to any other State or States that may be  
named in a rider attached hereto. Furthermore, such coverage is confined to the obligor's holdings under the Act.

SCHEDULE A

Names of State(s)

The conditions of the foregoing obligations are such that, whereas the said obligor, in one or more of the following ways, has an interest in geothermal resources leases issued under the Act:

1. as the lessee of such leases;
2. as the approved holder of operating rights in all or part of the lands covered by such leases under operating agreements with the lessees; and
3. as designated operator or agent under such leases pending approval of an assignment or operating agreement; and

WHEREAS the obligor is authorized to drill for, mine, extract, remove, and dispose of geothermal resources in or under the lands covered by the leases, operating agreements or designations, and is obligated to comply with certain covenants and agreements set forth in such instruments; and

WHEREAS the obligor agrees that the coverage of this bond, in addition to the present holdings of the obligor shall extend to and include:

1. Any geothermal resources lease hereafter issued to, or acquired by, the obligor affecting geothermal resources deposits in the State or States now named in Schedule A, or later named in a rider, the coverage to be confined in the obligor's holdings under the Act and to become effective immediately upon such issuance or upon departmental approval of a transfer in favor of the obligor.

2. Any operating agreement hereafter entered into or acquired by the obligor, affecting geothermal resources deposits in the States now named in Schedule A, or later named in a rider, relating to such leases issued under the Act. The coverage shall become effective immediately upon departmental approval of the agreement or of a transfer of an operating agreement to the obligor.

3. Any designation subsequent hereto of the obligor as operator or agent of a lessee under a lease issued pursuant to the Act and covering lands in a State named in Schedule A, either presently or by rider. This coverage shall become effective immediately upon the filing of such a designation under a lease.

4. Any extension of a lease covered by this bond, such coverage to continue without any interruption due to the expiration of the term set forth in the lease.

WHEREAS the obligor hereby agrees that notwithstanding the termination of any lease or leases, operating agreements or designations as operator or agent, covered by this bond, whether the termination is by operation of law or otherwise, the bond shall remain in full force and effect as to any remaining leases, operating agreements, or designations covered by the bond; and

WHEREAS the obligor as to any lease or part of a lease for lands as to which he has been designated as operator or agent, or approved as operator, in consideration of being permitted to furnish this bond in lieu of the lessees, agrees and by these presents does hereby bind himself to fulfill, on behalf of each lessee, all the obligations of each such lease for the entire leasehold in the same manner and to the same extent as though he were the lessee; and

WHEREAS the obligor agrees that notwithstanding any use of the security pledge herewith for the purpose for which it is pledged, the bond shall remain in full force and effect in the sum above set forth and that he will, whenever so required by the lessor, deposit additional security to bring the security up to the full amount; and

WHEREAS the obligor agrees that the neglect or forbearance of said lessor in enforcing, as against the lessees of such lessor, the payment of rentals or royalties or the performance of any other covenant, condition, or agreement of the leases, shall not, in any way, release the obligor from any liability under this bond; and

WHEREAS the obligor agrees that in the event of any default under the leases, the lessor may commence and prosecute any claim, suit, action, or other proceeding against the obligor without the necessity of joining the lessees.

faithfully comply with all of the provisions of the leases referred to hereinbefore, then the above obligations are to be void; otherwise to remain in full force and effect.

That said obligor, in order the more fully to secure the United States in the payment of the aforesaid sum, hereby pledges as security therefor negotiable bonds of the United States, of a par value equal to the amount specified, which said bonds are numbered serially and are in the denominations and amounts and are otherwise more particularly described in the attached schedule, which is made a part hereof, and which said bonds have been deposited with the Secretary of the Interior.

That the said obligor does hereby constitute and appoint the Secretary of the Interior as his attorney, for him and in his name to collect or sell, assign, and transfer the said United States bonds above described and deposited by the obligor, as aforesaid, pursuant to authority conferred by Section 1 of the Act of July 30, 1947 (61 Stat. 646; 6 U.S.C. 15) as security for the faithful performance of any and all of the conditions or stipulations as hereinbefore set out, and it is agreed that, in case of any default in the performance of the conditions and stipulations of such undertaking the said attorney shall have full power to collect said bonds or any part thereof, or to sell, assign, and transfer said bonds or any part thereof without notice, at public or private sale, free from any equity or redemption or without appraisalment or valuation, notice and right to redeem being waived, and to apply proceeds of such sale or collection to the full amount of the bond to the satisfaction of any damages, or deficiencies arising by reason of such default, as said attorney may deem best. The interest accruing upon said United States bonds deposited as above stated, in the absence of any default in the performance of any of the conditions or stipulations of the bond, shall be paid to said obligor. The said obligor hereby for himself, his heirs, executors, administrators, and successors, ratifies and confirms whatever his said attorney shall do by virtue of these presents.

Special Stipulations

This Bond shall become effective August 11, 1981.

Signed on this 29th day of May, 1981, in the presence of:

Karen Chambers  
Karen Chambers (Name of Witness)

601 California Street, San Francisco,  
(Address of Witness) Calif. 94108

Carol Grasso  
Carol Grasso (Name of Witness)

3200 Wilshire Boulevard  
Los Angeles, California 90010  
(Address of Witness)

THERMAL POWER CO.  
BY: [Signature]  
John H. Gault, (Signature of Obligor) Treasurer

601 California Street  
San Francisco, California 94108  
(Business Address of Obligor)

NATIONAL FIRE INSURANCE COMPANY  
OF HARTFORD  
BY: [Signature]  
(Signature of Surety)  
Pamela L. Jacobs, Attorney-in-Fact

600 South Commonwealth Avenue  
Los Angeles, California 90005  
(Business Address of Surety)

If this bond is executed by a corporation, it must bear the seal of such corporation

Offices/Chicago, Illinois

**POWER OF ATTORNEY APPOINTING INDIVIDUAL ATTORNEY-IN-FACT**

Now All Men by these Presents, That the NATIONAL FIRE INSURANCE COMPANY OF HARTFORD, a corporation duly organized and existing under the laws of the State of Connecticut, and having its general administrative office in the City of Chicago, and State of Illinois, does hereby make, constitute and appoint Pamela L. Jacobs, C. G. Grasso, Stanley C. Lynn, Maria Chavarria, Individually

Los Angeles, California

and lawful Attorney-in-Fact with full power and authority hereby conferred to sign, seal and execute in its behalf bonds, under and other obligatory instruments of similar nature as follows:

Without Limitations

and to bind the NATIONAL FIRE INSURANCE COMPANY OF HARTFORD thereby as fully and to the same extent as if such instruments were signed by the duly authorized officers of NATIONAL FIRE INSURANCE COMPANY OF HARTFORD and all the acts of said Attorney, pursuant to the authority hereby given are hereby ratified and confirmed.

This Power of Attorney is made and executed pursuant to and by authority of the following Resolution duly adopted on February 21, 1955 by the Board of Directors of the Company.

RESOLVED: That the President, an Executive Vice President or any Vice President of the Corporation may, from time to time, appoint, by written certificates, Attorneys-in-Fact to act in behalf of the Corporation in the execution of policies of insurance, bonds, undertakings and other obligatory instruments of like nature. Such Attorneys-in-Fact, subject to the limitations set forth in their respective certificates of authority, shall have full power to bind the Corporation by their signature and execution of any such instrument and to attach the seal of the Corporation thereto. The President, an Executive Vice President, any Vice President or the Board of Directors may at any time revoke all power and authority previously given to any Attorney-in-Fact.

This Power of Attorney is signed and sealed by facsimile under and by the authority of the following Resolution adopted by the Board of Directors of the Company at a meeting duly called and held on the 14th day of May, 1964.

RESOLVED: That the signature of the President, an Executive Vice President or a Vice President and the seal of the Corporation may be affixed by facsimile on any power of attorney granted pursuant to the Resolution adopted by this Board of Directors on February 21, 1955 and the signature of a Secretary or an Assistant Secretary and the seal of the Corporation may be affixed by facsimile to any certificate of any such power and any such power or certificate bearing such facsimile signature and seal shall be valid and binding on the Corporation. Any such power so executed and sealed and certified by certificate so executed and sealed, shall, with respect to any bond or undertaking to which it is attached, continue to be valid and binding on the Corporation.

In Witness Whereof, the NATIONAL FIRE INSURANCE COMPANY OF HARTFORD has caused these presents to be signed by its

Vice President and its corporate seal to be hereto affixed this 19th day of March, 19 79.



NATIONAL FIRE INSURANCE COMPANY OF HARTFORD

*R. J. Wall*  
R. J. Wall

Vice President.

State of Illinois, County of Cook, ss:

On this 19th day of March, 19 79 before me personally came

R. J. Wall to me known, who, being by me duly sworn, did depose and say: that he resides in the Village of Western Springs, State of Illinois; that he is a Vice-President of the NATIONAL FIRE INSURANCE COMPANY OF HARTFORD, the corporation described in and which executed the above instrument; that he knows the seal of said Corporation; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of said corporation and that he signed his name thereto pursuant to like authority, and acknowledges same to be the act and deed of said corporation.



*Irene Bieniewski*  
Irene Bieniewski

Notary Public.

My Commission Expires October 10, 1982

**CERTIFICATE**

T. F. Doyle

I, T. F. Doyle, Assistant Secretary of the NATIONAL FIRE INSURANCE COMPANY OF HARTFORD, do hereby certify that the Power of Attorney herein above set forth is still in force, and further certify that the Resolutions of the Board of Directors, set forth in said Power of Attorney are still in force. In testimony whereof I have hereunto subscribed by name and affixed the seal of the said Company this 29th day of May, 19 81



*T. F. Doyle*  
T. F. Doyle

Assistant Secretary.

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

Bond No. 567 7793  
Premium: \$100.00

**GEOHERMAL RESOURCES EXPLORATION OPERATION BOND**  
(43 CFR Subpart 3209)

KNOW ALL MEN BY THESE PRESENTS, That we Thermal Power Company  
of 601 California Street, San Francisco, California, as principal,  
and NATIONAL FIRE INSURANCE COMPANY OF HARTFORD, a Connecticut Corporation  
of 600 South Commonwealth Avenue, Los Angeles, California 90005, as surety,  
are held and firmly bound unto the United States of America in the sum of FIFTY THOUSAND AND NO/100  
dollars (\$50,000.00), lawful money of the United States, to be paid to the United States, which sum may  
be increased or decreased by a rider hereto executed in the same manner as this bond, for the use and benefit of (1)  
the United States; (2) any entryman, patentee, or surface owner of, or the holder of any interests in, any lands in  
which the geothermal resources are reserved to the United States and upon which exploration operations will be con-  
ducted; and (3) any lessee under a lease issued or to be issued by the United States for lands on which the geothermal  
resources exploration operations will be conducted. For such payment, well and truly to be made, we bind ourselves,  
and each of our heirs, executors, administrators, successors and assigns, jointly and severally by these presents.

SCHEDULE A

STATE OR STATES

SCHEDULE B

TOWNSHIP(S) AND RANGE(S)	APPROXIMATE DATE(S) OF COMMENCEMENT AND COMPLETION OF OPERATIONS

(Continued on reverse)

If the amount of this bond is \$50,000, or if it increased to that amount, the coverage shall extend to all of the principal's geothermal resources exploration operations in the United States, including Alaska.

If the amount of this bond is \$ \_\_\_\_\_, its coverage shall extend only to the principal's single geothermal resources exploration operations in the township(s) and range(s) set forth in Schedule B.

If the amount of this bond is \$25,000, its coverage extends only to the principal's geothermal resources exploration operations in the State named in Schedule A.

The conditions of the foregoing obligations are such that, whereas the said principal has filed a *Notice of Intent*, for approval with the Authorized Officer for the District wherein such operations are to be conducted, and

WHEREAS, the principal is obligated to comply with the covenants and conditions set forth in such *Notice of Intent*.

NOW, THEREFORE, If said principal shall in all respects faithfully comply with all of the terms and conditions of the *Notice of Intent* and such other corrective measures to rehabilitate the land as may be required by the Authorized Officer, the surety shall incur no liability but, if the principal should fail to do so, the surety shall be liable to the extent provided in this bond.

Signed on this 18th day of March, 1981, in the presence of:

This Bond shall become effective April 27, 1981.

NAMES AND ADDRESSES OF WITNESSES

*Linda G. Chute*

Linda G. Chute  
61 California Street  
San Francisco, CA 94108

*Karen K. Chambers*

Karen K. Chambers  
601 California Street  
San Francisco, CA 94108

*Carol Grasso*

Carol Grasso  
3200 Wilshire Boulevard  
Los Angeles, California 90010

*Patricia Escudero*

Patricia Escudero  
3200 Wilshire Boulevard  
Los Angeles, California 90010

THERMAL POWER COMPANY

(Principal)

BY: *L. E. Dohsee*

L. E. Dohsee, Secretary  
601 California Street  
San Francisco, California 94108

(Business Address)

NATIONAL FIRE INSURANCE COMPANY  
OF HARTFORD

(Surety)

BY: *Pamela L. Jacobs*

Pamela L. Jacobs, Attorney-in-Fact  
600 South Commonwealth Avenue  
Los Angeles, California 90005

(Business Address)



Offices/Chicago, Illinois

**POWER OF ATTORNEY APPOINTING INDIVIDUAL ATTORNEY-IN-FACT**

Know All Men by these Presents, That the NATIONAL FIRE INSURANCE COMPANY OF HARTFORD, a corporation duly organized and existing under the laws of the State of Connecticut, and having its general administrative office in the City of Chicago, and State of Illinois, does hereby make, constitute and appoint Pamela L. Jacobs, C. G. Grasso, Stanley C. Lynn, Maria Chavarria, Individually

of Los Angeles, California its true and lawful Attorney-in-Fact with full power and authority hereby conferred to sign, seal and execute in its behalf bonds, undertakings and other obligatory instruments of similar nature as follows:

Without Limitations

and to bind the NATIONAL FIRE INSURANCE COMPANY OF HARTFORD thereby as fully and to the same extent as if such instruments were signed by the duly authorized officers of NATIONAL FIRE INSURANCE COMPANY OF HARTFORD and all the acts of said Attorney, pursuant to the authority hereby given are hereby ratified and confirmed.

This Power of Attorney is made and executed pursuant to and by authority of the following Resolution duly adopted on February 21, 1955 by the Board of Directors of the Company.

**RESOLVED:** That the President, an Executive Vice President or any Vice President of the Corporation may, from time to time, appoint, by written certificates, Attorneys-in-Fact to act in behalf of the Corporation in the execution of policies of insurance, bonds, undertakings and other obligatory instruments of like nature. Such Attorneys-in-Fact, subject to the limitations set forth in their respective certificates of authority, shall have full power to bind the Corporation by their signature and execution of any such instrument and to attach the seal of the Corporation thereto. The President, an Executive Vice President, any Vice President or the Board of Directors may at any time revoke all power and authority previously given to any Attorney-in-Fact.

This Power of Attorney is signed and sealed by facsimile under and by the authority of the following Resolution adopted by the Board of Directors of the Company at a meeting duly called and held on the 14th day of May, 1964.

**RESOLVED:** That the signature of the President, an Executive Vice President or a Vice President and the seal of the Corporation may be affixed by facsimile on any power of attorney granted pursuant to the Resolution adopted by this Board of Directors on February 21, 1955 and the signature of a Secretary or an Assistant Secretary and the seal of the Corporation may be affixed by facsimile to any certificate of any such power and any such power or certificate bearing such facsimile signature and seal shall be valid and binding on the Corporation. Any such power so executed and sealed and certified by certificate so executed and sealed, shall, with respect to any bond or undertaking to which it is attached, continue to be valid and binding on the Corporation.

In Witness Whereof, the NATIONAL FIRE INSURANCE COMPANY OF HARTFORD has caused these presents to be signed by its Vice President and its corporate seal to be hereto affixed this 19th day of March, 1979.



NATIONAL FIRE INSURANCE COMPANY OF HARTFORD

*R. J. Wall*  
R. J. Wall

Vice President.

State of Illinois, County of Cook, ss:

On this 19th day of March, 1979, before me personally came R. J. Wall to me known, who, being by me duly sworn, did depose and say: that he resides in the Village of Western Springs, State of Illinois; that he is a Vice-President of the NATIONAL FIRE INSURANCE COMPANY OF HARTFORD, the corporation described in and which executed the above instrument; that he knows the seal of said Corporation; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of the Corporation and that he signed his name thereto pursuant to like authority, and acknowledges same to be the act and deed of said corporation.



*Irene Bieniewski*  
Irene Bieniewski

Notary Public.

My Commission Expires October 10, 1982

**CERTIFICATE**

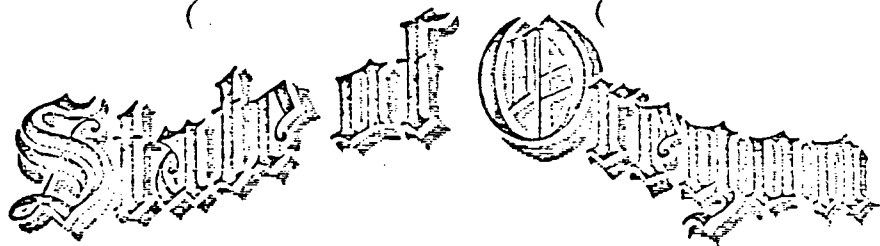
T. F. Doyle

I, T. F. Doyle, Assistant Secretary of the NATIONAL FIRE INSURANCE COMPANY OF HARTFORD, do hereby certify that the Power of Attorney herein above set forth is still in force, and further certify that the Resolutions of the Board of Directors, set forth in said Power of Attorney are still in force. In testimony whereof I have hereunto subscribed by name and affixed the seal of the said Company this 18th day of March, 1981.



*T. F. Doyle*  
T. F. Doyle

Assistant Secretary.



Department of Commerce  
Corporation Division

Certificate of Authority

OF

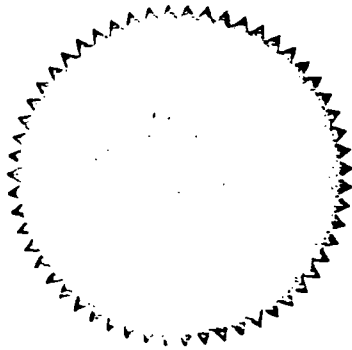
THERMAL POWER COMPANY

The undersigned, as Corporation Commissioner of the State of Oregon, hereby certifies that duplicate originals of an Application for a Certificate of Authority to transact business in this State, duly signed and verified pursuant to the provisions of the Oregon Business Corporation Act, have been received in this office and found to conform to law.

Accordingly, the undersigned, as such Corporation Commissioner, and by virtue of the authority vested in him by law, hereby issues this Certificate of Authority to the corporation named above to transact business in this State under the name of  
THERMAL POWER COMPANY

....., and attaches hereto a duplicate original of the Application for such Certificate.

In Testimony Whereof, I have hereunto set my hand and affixed hereto the seal of the Corporation Division of the Department of Commerce of the State of Oregon this  
8th day of August, 19 75.



Frank J. Healy  
Corporation Commissioner

By Hellie Fitch

Name  
Dan A. McMillan, Jr.  
.....  
(President)

Address  
601 California Street  
.....  
(Street and Number)  
San Francisco, California 94108  
.....  
(City, State and Zip Code)

Dean B. Lewis  
.....  
(Secretary)

601 California Street  
.....  
(Street and Number)  
San Francisco, California 94108  
.....  
(City, State and Zip Code)

28. This application is accompanied by a certificate of the public officer of the state, territory or country having custody of the original articles of incorporation or of the Act creating that corporation, or by a public officer authorized by the law of that state, territory or country to make such a certificate, to the effect that the corporation is an existing corporation in good standing in the state, territory or country of its incorporation.

We, the undersigned officers, declare under penalties of perjury that we have examined the foregoing and to the best of our knowledge and belief, it is true, correct and complete.

THERMAL POWER COMPANY  
.....

By John C. Roberts  
.....  
Executive Vice President

John C. Roberts

and Vernon A. Harris  
.....  
Assistant Secretary

Vernon A. Harris

Dated July 31, 1975

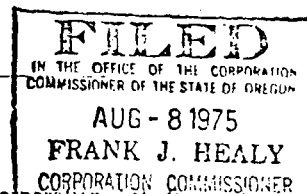
Notes: 29 If the name of the corporation does not contain the word "corporation", "company", "incorporated", or "limited", or any abbreviation of one of such words, insert the name of the corporation with the word or abbreviation which it elects to thereto add for use in this state.

30 Duplicate originals of this application must be accompanied by a Certificate of Good Standing, forwarded to the Department of Commerce, Corporation Division, Commerce Building, 159 12th Street N.E., Salem, Oregon 97310, and must be accompanied by a filing fee of \$50.00 plus the annual license fee in the sum of \$200.00.

# Application for Certificate of Authority

of

THERMAL POWER COMPANY



To the Corporation Commissioner  
of the State of Oregon:

Pursuant to the provisions of ORS 57.075 of the Oregon Business Code, this corporation hereby applies for a certificate of authority to transact business in the State of Oregon, and for that purpose submits the following statement:

1. The name of the corporation is THERMAL POWER COMPANY
  
2. It was incorporated under the laws of California on the 6th day of December, 1956 and is in good standing in its home state.
  
3. The name which it elects to use in the State of Oregon is THERMAL POWER COMPANY
  
4. The address (including street and number, if any) of its principal office in the state or country under the laws of which it is incorporated is 601 California Street, San Francisco 94108 (Zip Code)
  
5. The address (including street and number, if any) of its registered office in the State of Oregon is 800 Pacific Building, Portland, Oregon 97204 (Zip Code) and the name of its registered agent in the State of Oregon at that address is C. T. CORPORATION SYSTEM
  
6. A brief statement of the character of business which it proposes to pursue in the transaction of business in the State of Oregon is:

Exploration for and production of geothermal resources.

SECTION V  
Attachment H  
ENVIRONMENTAL EVALUATION REPORT

Project Name: Cascade Deep Thermal Gradient Drilling

Project Number: DE-FC07-85ID12614

Project Custodian:

Name	W. L. D'Olier
Title	Vice President - Geothermal Exploration
Organization	Thermal Power Company 3333 Mendocino Avenue Santa Rosa, California 95401

I. Introduction

Thermal Power Company (TPC) is planning to drill and complete a 5000-foot thermal gradient hole in the Mt. Hood National Forest on the issued Federal lease OR12344 in the NW 1/4, SE 1/4 of Section 28, T8S, R8E, Willamette Meridian, Marion County, Oregon. The operation is estimated to be 60 days in duration beginning June 1, 1986 and completed August 1, 1986.

This deep thermal gradient hole would be drilled under a Cooperative Agreement between Thermal Power Company and the U.S. Department of Energy as part of the DOE program to gather data to characterize the deep hydrothermal resource of the Cascades volcanic region and to transfer this data to the public in order to stimulate further development of hydrothermal resources.

II. Description of the Proposed Action

TPC will prepare the drillsite and drill/core a 5000-foot thermal gradient hole to determine whether a geothermal system exists in the Olallie Butte region. The hole will be rotary drilled from surface to 500 feet and cored from 500-5000 feet, total depth. Drilling and completion of the hole is expected to take sixty (60) days. A short-term flow test of 1-2 days may be conducted to obtain fluid samples and surface flow measurements. A full array of borehole data, including geophysical wirelines logs, would be obtained. Following completion, the hole and drillsite would be made available to DOE for scientific purposes for a 12-month period. Access to the drillsite will not be maintained during periods of winter snows and/or heavy rains.

All operations associated with the drilling and completion of this thermal gradient hole would be conducted in accordance with the appropriate State and Federal rules and regulations. This operation is designed to minimize the impact on the environment while maximizing data collection at acceptable costs.

### III. Description of the Existing Environment

The vicinity of the drillsite is an area of timber production, wildlife and recreational activities. The drillsite lies within the Clackamas Geothermal Block which had an Environmental Assessment Report done by the Mt. Hood National Forest in 1981. The specific drillsite area was logged by the clear cut method approximately 4-5 years ago and is located on relatively level ground, immediate to an existing access road.

The drillsite lies approximately 3850 feet elevation within Squirrel Creek drainage area which is part of the Clackamas River Basin. Marion County has a temperate marine climate with average mean precipitation of about 100 inches per year in the drillsite vicinity. About 60% of the precipitation occurs between November and February, and only 10% from June through September. Snow accounts for approximately 50% of the precipitation at altitudes over 4000 feet. The prevailing winds influencing temperature and precipitation are from the west and northwest in the summer, and south and southwest in the winter. Easterly winds deviate from this pattern, bringing continental extremes. In the summer, this can mean exceptionally hot, dry weather and cold, clear days in the winter. The mean annual temperature is about 42°F.

### IV. Potential Environmental Effects

#### A. Geologic Hazards

Geologic risks in the area are minimal since there are no known active faults, no significant landslides exist in this portion of the Cascade Range, and the area has a low earthquake potential. However, there is a possibility of volcanic risk given the young, volcanically active nature of the High Cascade; this is considered insignificant since no volcanic activity has occurred in this area in recent times.

#### B. Soil, Air, Noise, and Visual Effects

In discussions with the District Ranger, the Forest Service views TPC's drillsite activities as analogous to a logging operation in its level of noise and air pollution. The District Ranger also advised that a site specific soil study is required. TPC's activities are expected to have a minimal effect on aesthetics, based on criteria in the 1981 Environmental Assessment of the Clackamas Geothermal Block. In addition, the drillsite was selected to minimize environmental impacts and is located in an existing clear cut parcel within heavy timber stands. No significant air or noise degradation is anticipated. Drilling activities are expected to meet appropriate visual quality objective (VQO) standards of this area due to the short duration of the project and the location of the drillsite.

#### C. Fauna and Flora

A sensitive plant survey of the drillsite was conducted and no rare, endangered nor sensitive plants exist on the intended drillsite.

### III. Description of the Existing Environment

The vicinity of the drillsite is an area of timber production, wildlife and recreational activities. The drillsite lies within the Clackamas Geothermal Block which had an Environmental Assessment Report done by the Mt. Hood National Forest in 1981. The specific drillsite area was logged by the clear cut method approximately 4-5 years ago and is located on relatively level ground, immediate to an existing access road.

The drillsite lies approximately 3850 feet elevation within Squirrel Creek drainage area which is part of the Clackamas River Basin. Marion County has a temperate marine climate with average mean precipitation of about 100 inches per year in the drillsite vicinity. About 60% of the precipitation occurs between November and February, and only 10% from June through September. Snow accounts for approximately 50% of the precipitation at altitudes over 4000 feet. The prevailing winds influencing temperature and precipitation are from the west and northwest in the summer, and south and southwest in the winter. Easterly winds deviate from this pattern, bringing continental extremes. In the summer, this can mean exceptionally hot, dry weather and cold, clear days in the winter. The mean annual temperature is about 42°F.

### IV. Potential Environmental Effects

#### A. Geologic Hazards

Geologic risks in the area are minimal since there are no known active faults, no significant landslides exist in this portion of the Cascade Range, and the area has a low earthquake potential. However, there is a possibility of volcanic risk given the young, volcanically active nature of the High Cascade; this is considered insignificant since no volcanic activity has occurred in this area in recent times.

#### B. Soil, Air, Noise, and Visual Effects

In discussions with the District Ranger, the Forest Service views TPC's drillsite activities as analogous to a logging operation in its level of noise and air pollution. The District Ranger also advised that a site specific soil study is required. TPC's activities are expected to have a minimal effect on aesthetics, based on criteria in the 1981 Environmental Assessment of the Clackamas Geothermal Block. In addition, the drillsite was selected to minimize environmental impacts and is located in an existing clear cut parcel within heavy timber stands. No significant air or noise degradation is anticipated. Drilling activities are expected to meet appropriate visual quality objective (VQO) standards of this area due to the short duration of the project and the location of the drillsite.

#### C. Fauna and Flora

A sensitive plant survey of the drillsite was conducted and no rare, endangered nor sensitive plants exist on the intended drillsite.

Although an area of 160' x 200' will be temporarily disturbed, the proposed drillsite does not provide a significant habitat for threatened or endangered wildlife species. In the event of a very large overflow of the drilling sump, riparian resources near Squirrel Creek could be damaged. However, the drilling mud is non-toxic and the amount to be utilized in the intended drilling operation is minimal. Safety precautions include an earthen berm to be constructed on the downslope side of the site to handle any sump overflow. Other than actual drillsite clearing, minimal surface disturbance is expected during site preparation, and no significant cut and fill activities will occur. No significant impact is expected.

When the drillsite is abandoned, procedure will conform to BLM regulations for hole abandonment and Forest Service requirements for replanting and contour restoration.

D. Sites of Cultural, Historical or Archeological Value

A cultural, historical and archeological assessment of the drillsite has been conducted. No cultural, historical or Native American sites were located in the vicinity of the drillsite. If any cultural, historical or archeological items are discovered during drilling activities, their significance will be assessed prior to continuing with the drilling activities.

E. Wildlife Migration Routes, Water Holes and Habitates

The drillsite will not disrupt any major migration routes. Spotted owls may visit the site but areas managed for their habitat are located at a significant distance from the drillsite. Elk use the area during the spring and fall as they move up to the high country from the Clackamas River and back again. However, no critical waterholes nor riparian habitats should be affected, since the site is dry during the summer. Experience in The Geysers in California has shown that geothermal activity, properly managed, does not have a detrimental effect on wildlife.

F. Other

The drillsite is located approximately 1/2 mile north of Bonneville Power Administration high voltage lines. Drilling operations will not interfere with these lines, nor pose any safety threat during transportation of the drilling equipment to and from the site. No helicopter activity is anticipated with the project.

V. Environmental Measurements and Monitoring

A. Prevention and Control Measures

As detailed in the Plan of Exploration, Thermal Power Company will adhere to the following guidelines to monitor and minimize any environmental effects resulting from the project:



1. Fire

All Forest Service guidelines regarding fire prevention and control will be adhered to, including, use of appropriate fire extinguishers, water and hand tools, spark arrestors, and an adequate fire break cleared around the drillsite. Site personnel will be instructed in the use of the above-mentioned equipment.

2. Pollution of Surface and Groundwater

During the intended drilling operation, all drilling fluids will be contained in an excavated sump. The sump will be constructed and lined to prevent leakage of its contents. Geothermal fluids, if produced from the well, will be flowed into a large portable steel tank and into the sump. At completion, these fluids will be chemically analyzed to determine if any hazardous constituents are present. If none are present, the fluids will be sprayed along the existing logging roads as directed by the Surface Manager. If any hazardous constituents (i.e. whose concentration equals or exceeds State or EPA standards) are indicated, a joint recommendation will be formulated by the Oregon Department of Environmental Quality and Thermal Power Company prior to implementation. The overall risk of surface and/or groundwater pollution is minimal given the short duration of the flow test, the low total flow volumes anticipated, and the intended containment of all fluids.

3. Air and Noise Pollution

All equipment used in this drilling operation will be muffled and maintained to minimize noise pollution and comply with existing requirements designated by the Surface Manager or other appropriate Federal and State agencies. The flow test will be immediately terminated if any toxic gases are produced. H<sub>2</sub>S levels during drilling operations and flow testing are insignificant but will be monitored nevertheless.

4. Public Health and Safety

Operations will be conducted on a continuous 24-hour per day basis and only authorized personnel will be allowed on-site. The drillsite is remote from any area of human activity and/or population center, which reduces the possibility of non-operational personnel gaining access to the site. Contingency plans, as required in the event of an emergency, are shown in Attachment 1.

5. Waste Disposal

If drill cutting and fluids are determined to be hazardous, the contents of the lined sump will be trucked to an appropriate waste disposal site. Otherwise, it will be treated as discussed above. Sanitary facilities will be provided consistent with State and Federal guidelines and regulations. Miscellaneous rubbish will be taken off-site and disposed of in disposal sites designated by the Surface Manager.

6. Monitoring Solids, Liquids and Gases

The solids (e.g., rocks) produced will be logged and described by the wellsite geologist. The temperature, pH and fluid conductivity of the geothermal liquid produced will be measured. At completion of the activities, the fluids will be chemically analyzed as described previously and H<sub>2</sub>S will be monitored as required by law.

7. Drillsite Personnel Facilities

No on-site housing facilities are planned for the drilling personnel. TPC staff and other personnel will be housed in the town of Detroit or camp in an area designated by the Surface Manager.

VI. Environmental Regulations and Standards

DOE must ensure that the project is environmentally acceptable after reviewing the participant's Environmental Evaluation. In addition, all federal action which may have a significant effect on the environment require some environmental analysis to be performed in accordance with the National Environmental Policy Act (NEPA) and the National Historic Preservation Act of 1966.

The BLM has advised TPC that a Categorical Exclusion Review (CER) will be the appropriate environmental review necessary for intended drilling activities, and that geothermal activities will not significantly affect the environment. Therefore, an Environmental Impact Statement will not be required. A copy of the CER will be sent to TPC shortly, a copy of which will be forwarded to DOE.

VII. Alternatives

A. No Project - no disturbance to surface but no opportunity to assess the geothermal resource and make data public.

B. Reduced Size - if gradient hole is less than 5,000 feet and specifically designed to provide minimal disturbance, may not be deep enough to assess geothermal resource. DOE funding would not be available, therefore data would not become public.

C. Larger Size - (e.g., more than one gradient hole) - not necessary at this time; one gradient hole was expected to accurately assess the existence of resource.

Attachment 1 - Environmental Evaluation Report**EMERGENCY CONTINGENCY PLAN**

Activities related to the intended 5000-foot thermal gradient slim hole are divided into two separate phases. These are: Phase 1: Drilling and Completion, and Phase 2: Post Completion - Pre-Abandonment. The Emergency Contingency Plan will vary with the phase of activity.

**Phase 1: Drilling and Completion**

During this phase, the drilling crew (3 individuals), TPC drilling supervisor and/or wellsite geologist will be on-site continuously, 24 hours per day. Additional personnel present on a transient basis are TPC project geologist and engineer, geophysical logging crew (2 individuals), and appropriate State and Federal agency personnel involved with this operation. The TPC drilling supervisor is responsible for all on-going site activities and will direct any emergency plan. In his absence, the senior TPC individual on-site is responsible. Two-way radio/telephone communication is planned with the drillsite. If an emergency situation does arise, priority is given to resolving the emergency. As soon as operationally feasible, notification will be provided by the TPC Vice President of Geothermal Exploration (see Table 2) to all regulatory agencies concerned with this operation including, but not limited to, the USFS, BLM and DOGAMI. Written documentation of any significant emergency will be provided to the appropriate State and Federal agencies as soon as possible, after the event.

The types of emergency situations that may occur in Phase 1 are fire, injury, drilling fluid spill, geothermal fluid spill, toxic H<sub>2</sub>S discharge, and uncontrolled blowout. The following scenarios will be followed in case of an emergency on the drillsite.

**Fire**

All on-site fire extinguishing equipment, including the available water, will be utilized to secure the situation. Depending on the severity of the situation, the Mt. Hood National Forest, Clackamas Ranger District (CRD) office will be notified. If a fire cannot be contained by on-site personnel, the CRD will be alerted immediately. Rapid notification of the Forest Service will maximize the safeguard of on-site personnel and the environment.

**Injury**

The following two step approach will be followed in the case of injury: (1) treat with on-site first aid supplies, (2) call for medical assistance and/or provide immediate transportation to a medical facility, as appropriate. This latter action will be coordinated with the CRD and/or the Marion County Sheriff, as needed. Once notified, the Marion County Sheriff Department will direct emergency medical assistance.

Drilling fluid is a mixture of water, chemicals and solid particulates, and is non-toxic. The actual amount of drilling fluid expected to be utilized in the intended operation is relatively small. The specific drillsite is not located near any perennial stream. Any drilling fluid spill resulting from sump leakage or any other discharge will be contained and cleaned up. If a spill is not easily contained or endangers a stream, all action necessary to control, curtail, and clean up the spill would proceed. This may involve contracting heavy equipment and/or vacuum trucks. Procedures to be followed, as appropriate, are (1) shut off all drilling fluid pumps, (2) construct dikes for containment, and (3) repair source of spill as quickly as possible. Depending on the severity of the spill and/or its impact on the environment, the Surface Manager would be notified. Clean up would proceed to Surface Manager's satisfaction.

### Geothermal Fluid Spill

Procedures to be followed in case of a geothermal fluid spill are identical to those utilized in a Drilling Fluid Spill.

### Toxic H<sub>2</sub>S Discharge

The flow test will be immediately terminated if H<sub>2</sub>S gas concentration produced during well discharge exceeds an ambient air measurement of 10 ppm taken within five (5) feet from the fluid discharge point. This level is one-half the value considered safe for eight (8) hours of exposure by the American Petroleum Institute. The H<sub>2</sub>S monitoring equipment utilized during the drilling phase will be used during testing.

### Uncontrolled Blowout

If well control mechanisms do not succeed in containing fluid flow from the well, the on-site TPC supervisor will initiate operational steps to deal with the emergency. The following procedure will be followed.

1. Secure all drillsite personnel.
2. Injuries, fire and fluid spill will be treated as discussed above.
3. Contact TPC's Vice President of Geothermal Exploration and advise of the emergency status. A detailed assessment of the situation will be provided per Table 1.
4. TPC's Vice President of Geothermal Exploration will contact all appropriate State and Federal agencies (Table 2).
5. Appropriate steps will be taken to contain the well in the following priority order: (1) attempt to control hole with drillsite personnel, (2) control fluid spills as described above, (3) construct and install required well control equipment as quickly as possible.
6. Provide written documentation of the event and its resolution to all appropriate State and Federal agencies within 30 days of the event.
7. Once contained, return the site to its normal condition prior to blowout.

**Phase 2: Post Completion - Pre-Abandonment**

The wellhead gate will be chained and locked to prevent unauthorized borehole entry. A prominent sign at the end of access road 013 (Figure 1) will identify the borehole and drillsite, telephone number and party to contact if upset conditions occur. Periodic inspections of the hole site and access roads will be conducted except during periods of winter snows.

**TABLE 1**  
**Names and Addresses**  
**of Governmental Agencies**

United States Department of Agriculture  
Forest Service  
Clackamas Ranger District  
61431 E. Hwy 224  
Estacada, Oregon 97023  
Attn: E. R. Hardman, District Ranger

Department of Geology and Mineral Industries  
Administrative Office  
1005 State Office Building  
Portland, Oregon 97201  
Attn: Dennis L. Olmstead, Petroleum Engineer

State of Oregon  
Oregon Department of Environmental Quality  
Water Quality Division  
P.O. Box 1760  
Portland, Oregon 97207  
Attn: Kent Ashbaker

Water Resources Commission  
Water Resources Department  
3850 Portland Road N.W.  
Salem, Oregon 97310  
Attn: T. E. Kline, L. Jebousek

Mt. Hood National Forest  
2955 N. W. Division Street  
Gresham, Oregon 97030  
Attn: Forest Supervisor

Bureau of Land Management  
Division of Mineral Resources  
P.O. Box 2965  
Portland, Oregon 97201  
Attn: R. Fujimoto

Marion County Planning Department  
220 High Street NE  
Salem, Oregon 97301  
Attn: Mr. Norman Bickell

U.S. DOE, Idaho Operations Office  
785 DOE Place  
Idaho Falls, Idaho 83402  
Attn: Susan Prestwich, DOE Project Officer

**TABLE 2**  
**Schedule of Permits, Plans and Reports**

<u>Description</u>	<u>Submitted To</u>	<u>Submittal Date</u>	<u>Approval Date</u>	<u>Remarks</u>
<b><u>PLANS</u></b>				
Management Plan	U.S. DOE, Idaho Falls, Idaho	10-30-85	by 03-31-86	
Plan of Exploration	U.S. Dept. of Interior Bureau of Land Mgmt. & U.S. Forest Service	09-30-85	by 03-31-86	
Institutional Plan	U.S. DOE, Idaho Falls, Idaho	02-05-86	by 05-01-86	
Environmental Evaluation Report (EER)	U. S. DOE, Idaho Falls, Idaho	02-28-86	by 05-01-86	
<b><u>STUDIES</u></b>				
Sensitive Plant Survey	DOGAMI	09-30-85	by 03-31-86	Appendix 2 to Plan of Exploration
Cultural Resources Survey	DOGAMI	09-30-85	by 03-31-86	Appendix 3 to Plan of Exploration

**TABLE 2**  
Schedule of Permits, Plans and Reports  
 (continued)

<u>Description</u>	<u>Submitted To</u>	<u>Submittal Date</u>	<u>Approval Date</u>	<u>Remarks</u>
<b>PERMITS</b>				
Water Appropriation Permit	State of Oregon Water Resources Dept.	12-16-85	02-28-86	
Geothermal Fluid Discharge Permit	State of Oregon Dept. of Environmental Quality	12-16-85	02-10-86	
Geothermal Drilling Permit	U.S. Dept. of Interior Bureau of Land Mgmt. DOGAMI	11-14-85	by 03-31-86 01-09-86*	Expires 180 days after issuance; *will need extension
Approval of County	Marion County Planning Department	01-21-86	02-07-86	To validate drilling permit

**DOE REPORTS****DUE DATE**

Daily Drilling Status Reports	07-31-86
Restoration Confirmation Reports	09-15-87
Federal Assistance Milestone Plan	10-30-85
Federal Assistance Management Summary Report	12-31-85 & quarterly
Federal Assistance Program/ Project Status Report	12-31-85 & quarterly
Financial Status Report	12-30-86 & final
Notice of Energy RD&D	10-30-85 & 10-30-86
Topical Report	As necessary within 5 days of event
Final Technical Report	Upon completion (est. 9-30-87)