

GLO2041

APR 19 1978



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY  
Area Geothermal Supervisor's Office  
Conservation Division, MS 92  
345 Middlefield Road  
Menlo Park, CA 94025

APR 17 1978

Memorandum

To: Interested Parties

From: Area Geothermal Supervisor

Subject: Revisions to Phillip's POO for Rye Patch, NV (EA#106-8)

Phillips Petroleum Company has submitted two revisions to their POO for six geothermal test wells in the Rye Patch Reservoir area, Nevada. The revisions are enclosed with this letter for your review.

Revision one is to relocate and rename proposed well 45-16. The new location is a little northeast of the original position, and it will be known as well 64-16.

The second revision is to increase the size of a typical drill pad from 210 ft. x 250 ft. to 350 ft. x 350 ft.

All comments concerning these revisions must be received no later than April 28, 1978. Please send any comments you may have to:

Area Geothermal Supervisor  
Conservation Division  
U.S. Geological Survey  
345 Middlefield Rd., MS-92  
Menlo Park, CA 94025

*Reid Stone*

UNIVERSITY OF UTAH  
RESEARCH INSTITUTE  
EARTH SCIENCE LAB.

FC  
USGS  
AGSO  
Memo 4  
NV  
Pershing Co.  
4/17/78



PHILLIPS PETROLEUM COMPANY  
ENERGY MINERALS DIVISION  
P. O. BOX 10566  
RENO, NEVADA 89510

March 22, 1978

Mr. Barry Boudreau  
Area Geothermal Supervisor  
USGS Conservation Division  
345 Middlefield Road  
Mail Stop 92  
Menlo Park, California 94025

Dear Mr. Boudreau:

On February 14, 1978 a Plan of Operations was submitted to drill geothermal wells on Federal leases N-10864, N-10865, and N-16688 near Humboldt House.

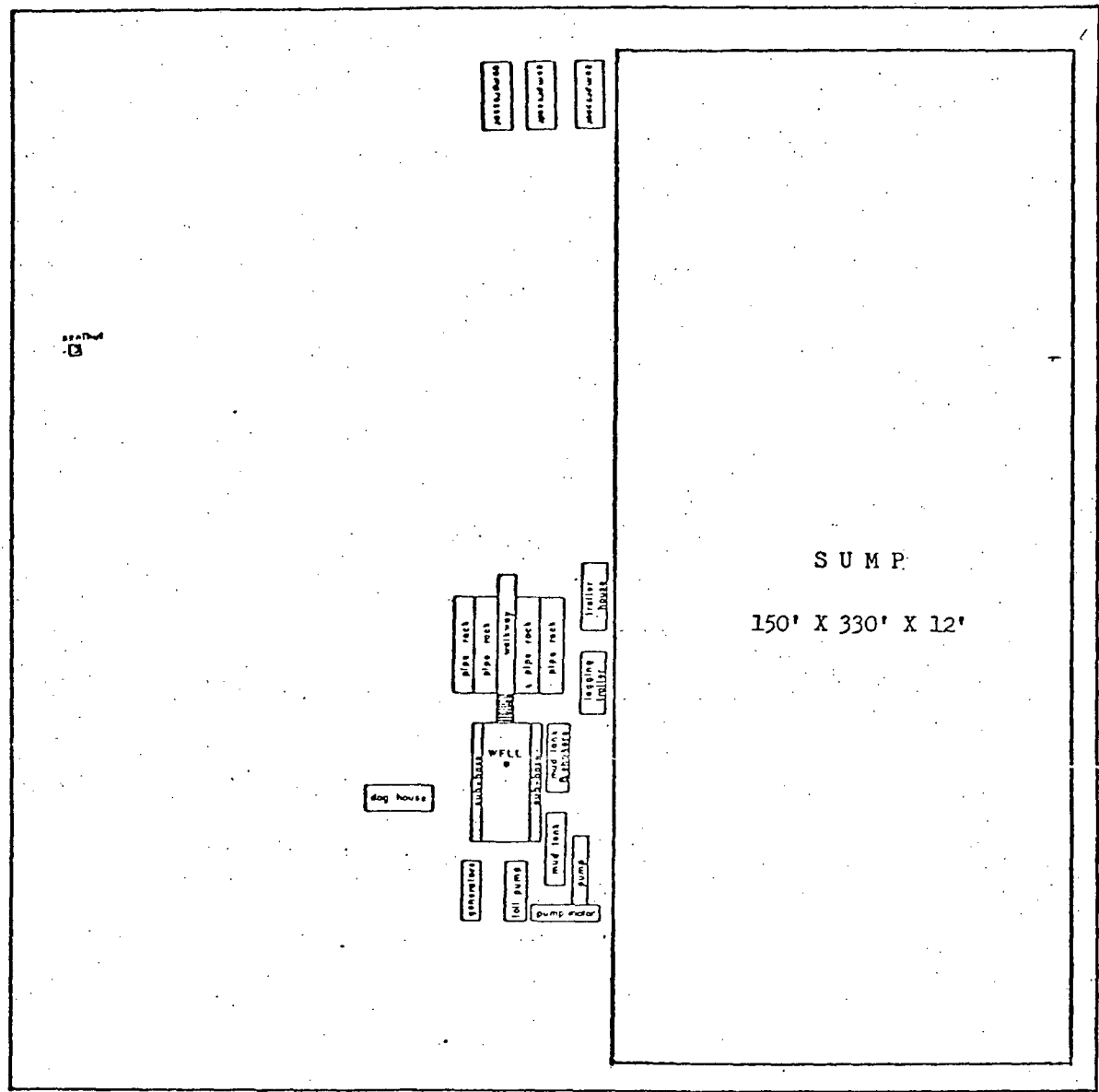
Since all water produced from the wells must be impounded it was decided during the field inspection trip that the "Typical Rig Layout" should be amended to provide for a larger location and larger reserve pit. Enclosed is an amended "Exhibit B" which would provide for a larger location and a larger reserve pit.

Very truly yours,

  
R. T. Forest

RTF:df  
Enc.

RECEIVED  
MARCH 23 1978  
AREA GEOTHERMAL SUPERVISOR'S OFFICE  
CONSERVATION DIVISION  
U.S. GEOLOGICAL SURVEY  
MENLO PARK, CALIFORNIA



location = 350' x 350'

scale: 1" ≈ 57'

TYPICAL RIG LAYOUT



PHILLIPS PETROLEUM COMPANY  
ENERGY MINERALS DIVISION  
P. O. BOX 10566  
RENO, NEVADA 89510

RECEIVED  
APR 10 1978  
AREA GEOTHERMAL SUPERVISOR'S OFFICE  
CONSERVATION DIVISION  
U.S. GEOLOGICAL SURVEY  
MENO PARK, CALIFORNIA

April 6, 1978

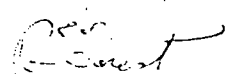
Mr. Barry Boudreau  
Area Geothermal Supervisor  
USGS Conservation Division  
345 Middlefield Road  
Mail Stop 92  
Menlo Park, California 94025

Dear Mr. Boudreau:

On February 14, 1978 a Plan of Operations was submitted to drill geothermal wells on Federal leases N-10864, N-10865, and N-16688 near Humboldt House.

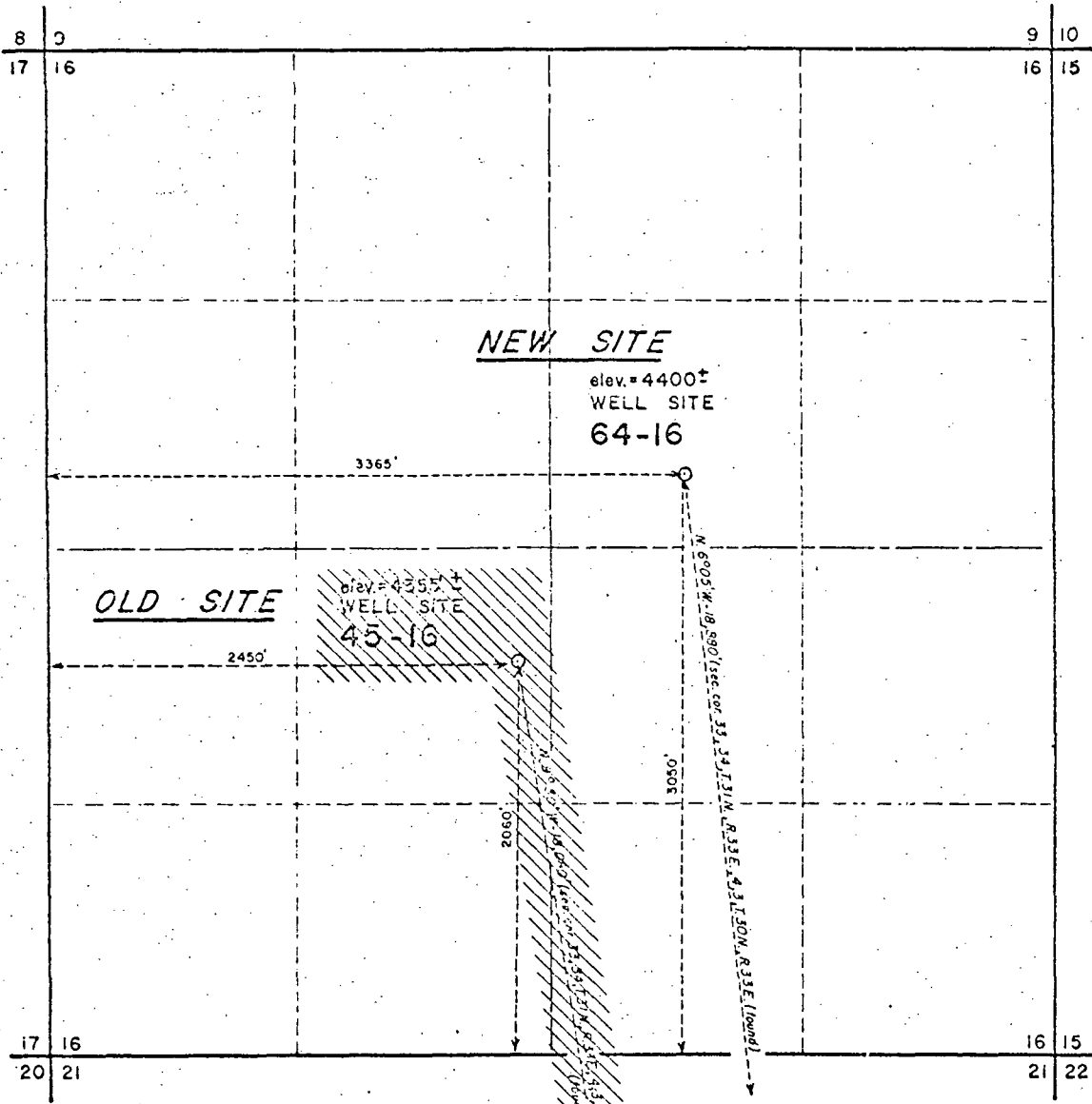
During the field inspection trip it was decided that proposed well no. 45-16 probably should be moved to the northeast because of its proximity to the access road and the telephone line. A new location was picked and surveyed. Enclosed are three prints and a sepia of a location map for proposed well 64-16 to replace 45-16.

Very truly yours,

  
R. T. Forest

RTF:df  
Enc.

cc: G. Crosby



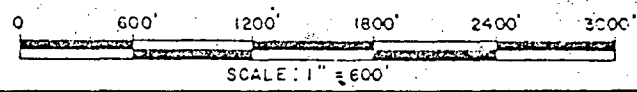
SURVEYOR Donald B. Hartley, R.L.S. 535

DATE 2/10/78

AMENDED Donald B. Hartley, R.L.S. 535

AMENDED  
EXHIBIT A-4

PHILLIPS PETROLEUM COMPANY  
AREA HUMBOLDT HOUSE  
STATE NEVADA COUNTY PERSHING  
T. 31 N., R. 33 E. SECTION 16



Note: No corners found

Section 16  
T. 31 N., R. 33 E., M. D. B. & M.



UNITED STATES  
DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY  
Area Geothermal Supervisor's Office  
Conservation Division, MS 92  
345 Middlefield Road  
Menlo Park, CA 94025

Fc  
USGS  
AGSD  
Memo 4  
NV  
Pershing Co.  
3/1/78

MAR 1 1978

Memorandum

To: INTERESTED PARTIES

From: Area Geothermal Supervisor

Subject: Plan of Operation, Phillips Petroleum Co., Federal Leases N-10864, N-10865, and N-16688, Rye Patch Reservoir Area, Pershing County, NV. Ref: 1760 N-10864 (POO EA#106-8)

Phillips Petroleum Co. has submitted a Plan of Operation in accordance with 30 CFR 270.34 to drill six geothermal wells to a depth of 2438 m (8000')<sup>±</sup> on the above Federal leases in the Rye Patch Reservoir area. A copy of the Plan of Operation is attached for your review, comment, and files.

An Environmental Analysis (EA#106-8) will be prepared by the Office of the Area Geothermal Supervisor for the proposed action. You are invited to participate in a lease inspection scheduled for March 16, 1978. Participants are asked to meet at 10:00 a.m. at Jax Restaurant, Lovelock, NV. Mr. Bernie Moroz, District Geothermal Supervisor, U.S. Geological Survey, 63, Keystone Ave., Suite 102, Reno, NV, will coordinate the inspection (Tel: FTS 8-470-5676, Comm. (702) 784-5676).

All comments concerning the proposed action must be received not later than March 31, 1978, by:

Area Geothermal Supervisor  
Conservation Division  
U.S. Geological Survey  
345 Middlefield Road, MS 92  
Menlo Park, CA 94025  
Tel: (415) 323-8111, Ext. 2848

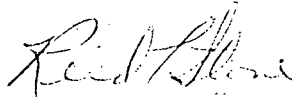
We urge you to send written commentary and will appreciate hearing from you even if you are of the opinion that the existing regulations, lease terms, and operational orders provide adequate environmental protection.

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RESEARCH INSTITUTE  
EARTH SCIENCE LAB.

Further, we solicit your comments and suggestions on the proposed action even though you may not be able to participate in the inspection. All comments will be given serious consideration in the preparation of the Environmental Analysis and any subsequent conditions of approval thereafter.

The Area Geothermal Supervisor will send a draft Environmental Analysis (EA#106-8) of the proposed action to interested parties for comment and review. Further, the Geothermal Environmental Advisory Panel (GEAP) will have a formal review of the USGS EA#106-8 and will hold a public hearing on the proposed action, in which all interested parties are invited to participate. Interested parties will be notified of the time, date, and place of GEAP's public review two weeks prior to the date of subject meeting.

Certain parties, such as the surface managing agency, the lessee, GEAP, and Bureau of Reclamation will receive a copy of the final EA. Other interested parties will not receive a copy of the final EA unless such parties comment on the proposed action in writing or request a copy of the particular EA pursuant to the Freedom of Information Act. Copies of this Environmental Analysis will be available for inspection during normal business hours at the Area Geothermal Supervisor's Office, the Reno District Geothermal Supervisor's Office, and the Bureau of Land Management, Winnemucca District Office.



INTERESTED PARTIES for EA#106-8  
PHILLIP'S PETROLEUM CO.  
6 - Well Program  
Federal Leases N-10864, N-10865, and N-16688  
Rye Patch Reservoir  
Imlay (Pershing County), Nevada

USGS-Conservation Division  
District Geothermal Supervisor  
Attn: Bernie Moroz  
63 Keystone Ave., Suite 102  
Reno, NV 89503  
(702) 784-5676  
FTS: 470-5676

USGS-Conservation Division  
Conservation Manager, Western Region  
Attn: Environmental Staff  
345 Middlefield Rd., MS 80  
Menlo Park, CA 94025  
(415) 323-8111, Ext. 2093

USGS-Conservation Division  
Area Geologist, Pacific Area  
Attn: Henry Cullins  
345 Middlefield Rd., MS 80  
Menlo Park, CA 94025  
(415) 323-8111, Ext. 2053  
FTS: 467-2053

Geothermal Environmental Advisory Panel  
Attn: Max Crittenden  
345 Middlefield Rd., MS 75  
Menlo Park, CA 94025  
(415) 323-8111, Ext. 2317  
FTS: 467-2317

U.S. Bureau of Land Management  
Nevada State Director  
Federal Bldg., Rm. 3008  
300 Booth St.  
Reno, NV 89502  
(702) 784-5451  
FTS: 598-5451

U.S. Bureau of Land Management  
Winnemucca District Manager  
Attn: Chester Conard  
P.O. Box 71  
Winnemucca, NV 89445  
(702) 623-3676  
FTS: 470-5423

U.S. Bureau of Land Management  
Geothermal Specialist  
Attn: Ted Holland  
Denver Federal Center, Bldg. 50  
(303) 234-5098  
FTS: 234-5098

U.S. Fish and Wildlife Service  
Office of Biological Services  
Geothermal Advisor, Region 1  
Attn: L.A. Mehrhoff  
4620 Overland Rd., Rm. 210  
Boise, ID 83705  
(208) 834-1931  
FTS: 554-1931

U.S. Fish and Wildlife Service  
Attn: Felix Smith  
2800 Cottage Way, Rm. E-2727  
Sacramento, CA 95825  
(916) 484-4731  
FTS: 468-4731

U.S. Bureau of Reclamation  
Attn: Lloyd Osborne  
P.O. Box 640  
Carson City, NV 89701  
(702) 882-3436

U.S. Department of Energy  
Nevada Operations Office  
Attn: J.O. Cummings  
P.O. Box 14100  
Las Vegas, NV 89114  
(702) 734-3591  
FTS: 598-3591

U.S. Department of Energy  
Div. of Geothermal Energy, 3rd Floor  
Attn: Bert Barnes  
20 Massachusetts Ave. NW  
Washington, D.C. 20545  
(202) 376-4902  
FTS: 376-4902



INTERESTED PARTIES for PHILLIP'S PETROLEUM CO., EA#106-8

U.S. Environmental Protection Agency  
Environmental Monitoring and Support  
Attn: Michael O'Connell  
P.O. Box 15027  
Las Vegas, NV 89114  
(702) 736-2969  
FTS: 595-2969

State of Nevada  
Department of Energy  
1050 E. William, Suite 405  
Carson City, NV 89701  
(702) 885-5157

State of Nevada  
Department of Human Resources  
Capitol Complex  
1209 Johnson St.  
Carson City, NV 89710  
(702) 885-4730

State of Nevada  
Division of Water Resources  
Attn: Roland Westergard  
201 S. Fall St., Capitol Complex  
Carson City, NV 89710  
(702) 885-4380

State of Nevada  
Division of State Lands  
201 S. Fall St., Capitol Complex  
Room 338  
Carson City, NV 89710  
(702) 885-4363

State of Nevada  
Environmental Protection Services  
Attn: Wendell McCurry/Vern Ross  
201 S. Fall St., Capitol Complex  
Carson City, NV 89710  
(702) 885-4670

State of Nevada  
Nevada Dept. of Fish and Game  
Attn: Dale Lockhard  
P.O. Box 10678  
Reno, NV 89510  
(702) 784-6214

State of Nevada  
Nevada Dept. of Fish and Game  
Attn: Ray Corlett  
380 West B St.  
Fallon, NV 89406  
(702) 423-3171

State of Nevada  
Nevada State Museum  
Attn: Mary Rusco  
600 N. Carson St.  
Carson City, NV 89701  
(702) 885-4810

State of Nevada  
Div. of Historic Preserv. and Archeology  
Attn: Kimberly Wood  
201 S. Fall St., Capitol Complex  
Carson City, NV 89701  
(702) 885-5138

Planning Director, Pershing County  
Attn: E.L. Spencer  
Rt. 1, Box 71 D  
Lovelock NV 89419  
(702) 273-2636

Phillips Petroleum Company  
Energy Minerals Division  
Attn: R.T. Forest  
P.O. Box 10566  
Reno, NV 89510  
(702) 786-2273

Phillips Petroleum Company  
Attn: R.L. Wright  
P.O. Box 752  
Del Mar, CA 92014  
(714) 755-0131

Hydro-Search, Inc.  
Attn: Virgil Wilhite  
333 Flint St.  
Reno, NV 89501  
(702) 322-4173

INTERESTED PARTIES for PHILLIP'S PETROLEUM CO., EA#106-8

Mr. Jack McNamera  
Law Center, Rm. 422  
University of Southern Calif.  
Los Angeles, CA 90007  
(213) 741-7569

Magma Power Company  
Attn: Richard Foss  
631 S. Witmer St.  
Los Angeles, CA 90017  
(213) 483-2285

San Diego Gas and Electric Co.  
Attn: Larry Grogan/J.M. Nugent  
P.O. Box 1831  
San Diego, CA 92112  
(714) 232-4252, Ext. 1715/1903

Sunoco Energy Development Co.  
Attn: C.T. Clark, Jr.  
12700 Park Central Pl., Suite 1500  
Dallas, TX 75251  
(214) 233-2600, Ext. 515

Shell Oil Company  
Attn: F.W. Nantker  
196 S. Fir St.  
Ventura, CA 93001  
(805) 648-2751

California Energy Company  
Attn: Paul Storm  
P.O. Box 3909  
Santa Rosa, CA 95402  
(707) 526-1000

Lawrence Livermore Laboratory  
Attn: Dave Snoeberger  
Box 808, Mail Code L-523  
Livermore, CA 94550  
(415) 447-1100  
FTS: 457-5501

Mr. Clyde E. Kuhn  
2207 Carroll St., Apt. 3  
Oakland, CA 94606  
(415) 451-3714

GeothermEx, Inc.  
Attn: James B. Koenig  
901 Mendocino Ave.  
Berkeley, CA 94707  
(415) 524-9242

Getty Oil Company  
Attn: Dan W. Sparks  
P.O. Box 5237  
Bakersfield, CA 93308  
(805) 399-2961

Chevron USA, Inc.  
Attn: J.G. Turner/Pat Smith  
P.O. Box 3722  
San Francisco, CA 94119  
(415) 894-2726

Gulf Mineral Resources Company  
Attn: E.W. Westrick  
Exploration Department  
1720 S. Bellaire St.  
Denver, CO 80222  
(303) 758-1700

Republic Geothermal, Inc.  
Attn: Dwight Carey  
P.O. Box 3388  
Santa Fe Springs, CA 90670  
(213) 945-3661

Republic Geothermal, Inc.  
Attn: Jim Sheidenberger  
2544 Cleveland Ave.  
Santa Rosa, CA 95401  
(707) 527-7755

Exploration Geologists of Nevada  
Attn: Ralph D. Mulhollen  
P.O. Box 3043  
Reno, NV 89505  
(702) 972-6791

Geothermal Power Corporation  
Attn: Frank G. Metcalfe  
P.O. Box 1186  
Novato, CA 94947  
(415) 897-7833

INTERESTED PARTIES for PHILLIP'S PETROLEUM CO., EA#106-8

ICF, Inc.  
Attn: Doug Fried  
1990 M St., NW  
Washington, D.C. 20036  
(202) 785-3440

G. Martin Booth III  
4275 Hackamore Dr.  
Reno, NV 89509  
(702) 747-3463

Union Oil Company of Calif.  
Geothermal Division  
Attn: Neil J. Stefanides  
Union Oil Center, Box 7600  
Los Angeles, CA 90051  
(213) 486-7740

Dresser Industries  
MAGCOBAR Division  
Attn: Jim Fox  
475 17th St., Suite 1600  
Denver CO 80202  
(303) 893-2780

Occidental Geothermal, Inc.  
Attn: B.J. Wyant  
5000 Stockdale Highway  
Bakersfield, CA 93309  
(805) 327-7351

AMAX Exploration  
Attn: Larry Hall  
4704 Harlan St.  
Denver, CO 80212  
(303) 433-6151

Thermal Power Company  
Attn: K.R. Davis  
601 California St.  
San Francisco, CA 94108  
(415) 981-5700

Univ. of Utah Research Institute  
Attn: Phillip Wright  
391 Chipeta Way  
Salt Lake City, UT 84108  
(801) 581-5226

Anadarko Production Company  
Attn: John Syptak  
P.O. Box 1330  
Houston, TX 77001  
(713) 526-5421

bcc: Subj. file 1760 N-10864 (POO for  
EA#106-8)  
OPE (3)  
ENG  
ENV  
Reading File 101-02

PROPOSED PLAN OF OPERATIONS  
TO DRILL GEOTHERMAL TEST WELLS  
ON UNITED STATES GEOTHERMAL LEASES  
N-10864, N-10865, N-16688

SECTIONS 10, 16, 20, 22, 28, and 32, T31N-R33E  
PERSHING COUNTY, NEVADA

RECEIVED  
FEB 16 1978  
AREA GEOTHERMAL SUPERVISOR'S OFFICE  
CONSERVATION DIVISION  
U.S. GEOLOGICAL SURVEY  
YREKA PARK, CALIFORNIA

Proposed operations: Drill from one to six geothermal wells.  
Objective: To determine the existence and commercial potential of geothermal resources  
Estimated starting date: June 1978  
Estimated completion date: December 1982

Phillips Petroleum Company  
Geothermal Operations  
P. O. Box 10566  
Reno, Nevada 89510  
Telephone: (702) 786-2273

Contractor Not known  
Field Supervisors:  
R. T. Forest (702) 786-2273  
W. L. Desormier (702) 786-2273  
A. Cobb (702) 867-3080  
O. C. Rolls (714) 755-0131  
P. O. Box 752  
Del Mar, California 92014

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ATTACHMENTS

Exhibit A	Topographic Map . . . . .	Map Pocket
<del>Exhibit A-1</del>	<del>through A-6 Well Site Location Maps . . . . .</del>	<del>Map Pocket</del>
Exhibit B	Well Site Equipment Location Plat . . . . .	4-A
Exhibit C	Archaeological Survey . . . . .	10
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Exhibit E	Typical Well Test Procedure for a Liquid-Dominated Reservoir . . . . .	19
<del>Exhibit F</del>	<del>Geologic Map of the Inlay Quadrangle, USGS CG 666 . . . . .</del>	<del>Map Pocket</del>
<del>Exhibit G</del>	<del>Ground Water Reconnaissance Report 5: Ground Water Appraisal of the Inlay Area, Humboldt River Basin, Pershing County, Nevada. . . . .</del>	<del>Follows page 19</del>

### Introduction

Phillips Petroleum Company proposes to drill up to six geothermal test wells to 8000 feet or less on leased public lands in the vicinity of Humboldt House, Nevada. In accordance with 30 CFR 270.34 this Plan of Operations, together with attached exhibits, is submitted for approval to undertake the proposed work.

All of the proposed geothermal wells are within a transportation and utility corridor which includes a transmission line, a telephone line, a gas pipeline, the main line of the Southern Pacific Railroad, and a fenced controlled-access four-lane divided highway (I-80). In addition, there are numerous other roads in the area such as frontage roads and access roads.

Except for four houses at Humboldt House the area of the proposed wells is uninhabited. Of the six proposed wells, none are closer than two miles to a house.

## I. Well Locations

The well locations are shown on map Exhibit "A" which depicts topography of the leased land and surrounding land, drainage patterns, existing roads and trails, and tract locations. Exhibit "A" was prepared from the Imlay 15-minute USGS topographic quadrangle map, the Rye Patch Reservoir South and Rye Patch Reservoir North 7 $\frac{1}{2}$ -minute USGS topographic quadrangle maps at a scale of approximately 1:48000. The wells are to be drilled as vertical holes with only minor deviations to projected depths of 8000 feet, or less. The locations are listed below:

### Lease N-10864

#### Well location #65-20 - Exhibit A-1

T31N-R33E, Section 20. The location is approximately 1740 feet west of the east line and 2200 feet north of the south line of section 20.

#### Well location #44-28 - Exhibit A-2

T31N-R33E, Section 28. The location is approximately 2500 feet east of the west line and 2750 feet north of the south line of section 28.

### Lease N-10865

#### Well location #52-10 - Exhibit A-3

T31N-R33E, Section 10. The location is approximately 2400 feet west of the east line and 1180 feet south of the north line of section 10.

#### Well location #45-16 - Exhibit A-4

T31N-R33E, Section 16. The location is approximately 2450 feet east of the west line and 2060 feet north of the south line of section 16.

#### Well location #55-22 - Exhibit A-5

T31N-R33E, Section 22. The location is approximately 2540 feet west of the east line and 2450 feet north of the south line of section 22.

Lease N-16688

Well location #65-32 - Exhibit A-6

T31N-R33E, Section 32. The location is approximately 1770 feet west of the east line and 2380 feet north of the south line of section 32.

Drilling will probably commence in 1978, conditional on obtaining the following: (1) Approval by the Area Geothermal Supervisor of the Plan of Operation and the Application for Permit to Drill, (2) construction or improvement as necessary of access roads, lateral roads, and drill site locations, and (3) availability of drilling equipment and auxiliary equipment and services.

The first well drilled will probably be 52-10.

II. Existing and Planned Access and Lateral Roads

The road net with proposed well locations is shown on Exhibit "A". Existing roads will be used when possible for access to the wells, however, some new construction will be necessary to complete access from the nearest existing roads. Road building will be minimized to avoid any unnecessary surface disturbance. Initial road construction will be limited to the initial well-location access road. Additional road construction required for the other proposed locations will be delayed until required. Local operators and equipment will be engaged to do this work.

The proposed new road routes have been flagged.

Access roads have been classified into two types:

- a. Existing roads or trails. Many of these are in poor condition as a result of summer thunderstorms and will probably require some degree of improvement for utilization as access roads. These are colored orange for ease of identification.
- b. New access roads. These are colored green.



### III. Cultural Resources Preservation

As required under GRO-4, an approved archeologist has been retained to examine the areas of potential disturbance involved in this Plan of Operations. The Nevada Archeological Survey, University of Nevada, Reno, Nevada has been retained to make the survey. They operate under Federal Antiquities Permit No. 76-NV-097 with an expiration date of September 30, 1980. Their report is included as Exhibit "C".

### IV. Location and Source of Water Supply and Road Building Material

Water for construction and all associated operations will be purchased from Mrs. Clifford Campbell of Humboldt House, Nevada and trucked to the drilling sites. The water source will be an irrigation well located in the SE $\frac{1}{4}$  section 28, T32N-R33E. The well water is of superior quality to the geothermal waters encountered to date in the Humboldt House area and will not result in degradation of the ground water in the vicinity of the proposed wells.

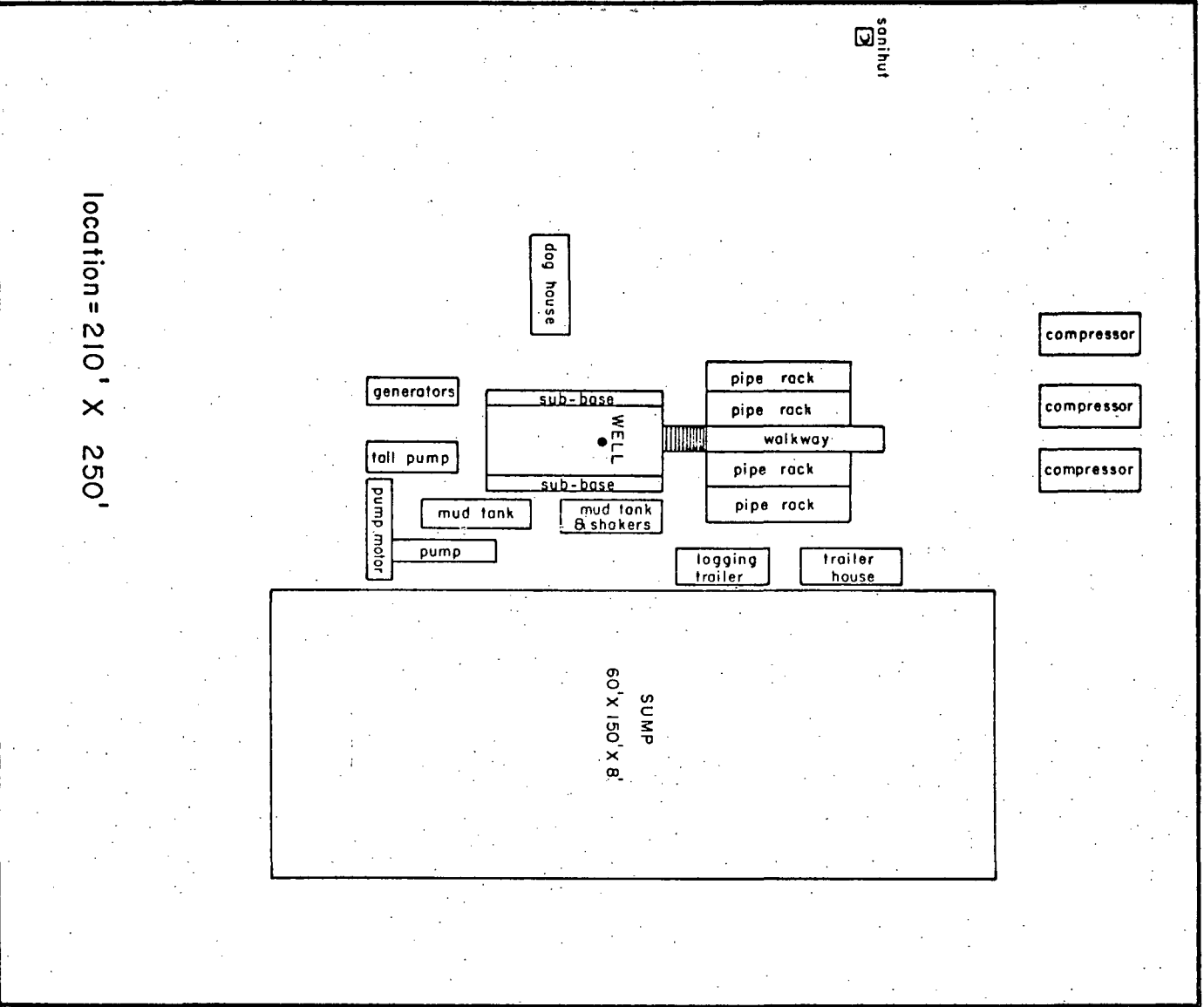
It is expected that gravel suitable for road surfacing will be encountered on most, if not all, of the proposed drill sites. This gravel can be used for road improvements and for new road construction.

### V. Location of Camp Sites, Air Strips and Other Supporting Facilities

There is no need for campsites, air strips, or other supporting facilities, and none are contemplated. Drilling supplies, pipe and equipment will be stored at the well site and in Fallon, Nevada as required.

### VI. Other Areas of Potential Surface Disturbance

Road improvements and drill-pad preparation will require surface dis-



TYPICAL RIG LAYOUT

turbance. Areas of potential surface disturbance are:

- 1) Drainages located down slope from the drilling sites and the immediate area surrounding each drill pad. In the unlikely event of a blowout, and if the reservoir is of the water-dominated type, earthen dikes will be built to contain the fluids. Dams may be built across drainages down slope from the blowout.
- 2) Narrow corridors of land connecting drilled wells which will serve as pipeline routes. The pipelines will be temporary and will be used only for reservoir testing.
- 3) Service roads as are necessary to support testing facilities.
- 4) Sites for one or more pilot plants in the vicinity of production and, if needed, injection wells.

#### VII. The Topographic Features of the Land and the Drainage Patterns

Topographic features and drainage patterns are depicted on Exhibit "A", a composite map made from three USGS topographic maps.

#### VIII. Methods of Disposing of Waste Material

Reserve pits will be located adjacent to each drill pad for containment of all fluids. If a multiple-well drilling program is carried out drilling mud will probably be salvaged from the reserve pits of the first wells for use in drilling subsequent wells.

At those wells which are completed as producing wells the reserve pits will be left intact for future use during testing, workovers, or deepening.

At those wells which are not completed as producing wells the reserve pits will be evaporated to dryness and then reclaimed by filling and grading.

Effluents produced during testing operations will be confined in the reserve pits. Any steam which is flashed during testing will be vented to the atmosphere. The duration of testing will be limited to the capacity of the reserve pits.

A burn pit will be used at each drill site for the disposal of flammable waste materials such as mud sacks and rags. Solid waste such as cans and bottles will be placed in a pit which will be covered over with dirt after the drill rig has been removed from the location.

A "sanihut" will be provided for the use of the drilling crews and other personnel working on the drilling operation.

#### IX. Protection of the Environment

All of the proposed wells are within a transportation and utility corridor which includes a transmission line, a telephone line, a gas pipeline, the main line of the Southern Pacific Railroad, and a fenced controlled-access four-lane divided highway (I-80). In addition, there are numerous other roads in the area such as frontage roads and access roads to, and along, the utility lines.

Except for four houses at Humboldt House the area of the proposed wells is uninhabited. Of the six wells, none are closer than two miles to a house. Since the area is uninhabited except for the small population at Humboldt House, noise would not be a nuisance factor.

This section describes the measures proposed to effectively minimize environmental damage and conduct operations in a manner consistent with rules and regulations and specific actions required by the Authorized Officer regarding prevention and control of:

##### 1. Fire

- a. Water and fire extinguishers will be kept available at all times at each location.
- b. Every reasonable effort will be made to prevent fires. In the event a fire should occur on or near lands occupied by Phillips initial attack action will be made by making available such construction equipment and maintenance forces that are available.

2. Soil Erosion and Subsidence

- a. Due care will be exercised to avoid unnecessary scarring or removal of ground vegetative cover.
- b. Vehicular travel will be confined to roads and trails.
- c. New road right-of-ways have been laid out along routes selected to minimize soil erosion.
- d. Work requiring the use of wheeled or tracked vehicles will be conducted in such a manner as to minimize surface damage.

3. Pollution of Surface and Groundwaters

- a. The well will be cased to prevent contamination of the principal groundwater aquifers.
- b. During short-term production testing, all produced fluids will be confined in reserve pits.

4. Damage to Fish and Wildlife

- a. Unattended reserve pits containing fluids will be fenced to keep out livestock and wildlife.
- b. Surface disturbance will be kept to a minimum to limit destruction of wildlife habitat.
- c. Well discharge lines will be directed away from nearby vegetation to prevent injury or contamination.

5. Air and Noise Pollution

- a. Mufflers will be used on rig engines and compressors as standard equipment.

6. Hazards to Public Health and Safety

Phillips will regulate access in those areas where unrestricted access would unduly interfere with operations under the lease, or would constitute a hazard to health and safety.

X. Crew Size and Housing

The drilling contractor will not be known until after this Plan of Operations is approved. It is estimated that the drilling crew will number approximately 25 persons. The crew will be housed in available housing in

Lovelock and/or Winnemucca, Nevada.

Construction personnel will be local contractors from Winnemucca, Lovelock, Fallon, or Fernley, Nevada. It is expected that they will work from their homes.

#### XI. Regional and Local Geology

The area of the proposed geothermal wells is underlain by alluvial fan deposits and lake beds of Quaternary and Tertiary age. The eastern edge of the prospect area is shown on the west side of the geologic map of Imlay Quadrangle which is included as Exhibit "F".

The proposed wells would probably be drilled through the Quaternary and Tertiary lake sediments into underlying Mesozoic sedimentary, volcanic, and metamorphic rocks.

#### XII. Regional and Local Hydrology

The hydrology of the area of the proposed geothermal wells is not well understood because of the lack of ground-water information in the area. To date only one geothermal well has been drilled in the area. There are two other wells at Humboldt House, one which was drilled for irrigation in the SE $\frac{1}{4}$  Section 28, T32N-R33E, and one which was drilled by the Nevada Highway Department in the NW $\frac{1}{4}$  Section 34, T32N-R33E to furnish water for a rest stop being developed.

Some test holes drilled in sections 32 and 33, T32N-R33E encountered hot water under artesian head at depths of about 150 feet. It is believed that these drill holes tapped an aquifer which is being charged by hot water rising along the fault zone at the base of the Humboldt Range.

A copy of a ground-water report published by the State of Nevada Department of Conservation and Natural Resources entitled Ground-Water Appraisal of

the Imlay Area, Humboldt River Basin, Pershing County, Nevada by Thomas E.

Eakin is included as Exhibit "G".

EXHIBIT C

ARCHEOLOGICAL SURVEY/ANTHROPOLOGY DEPARTMENT  
UNIVERSITY OF NEVADA  
RENO, NEVADA 89557  
February 3, 1978

Cultural Resources Reconnaissance Short Report  
by Alan Leventhal and Robert Elston

Project : Preliminary Reconnaissance of six drill sites (200 ft. radius from center). The sites are located between the Rye Patch Reservoir and the western foothills of the Humboldt Mountain Range, approximately 27-29 miles north of Lovelock, Nevada, in the vicinity of Humboldt House. Contractor: Phillips Petroleum Company, P.O. Box 10566, Reno, Nevada 89510.

Project Personnel : Robert Elston, Project Director ;  
Alan Leventhal, Field Supervisor;  
John Madsen, Field Assistant.

Federal Antiquities Permit : # 76-NV-097.

State Antiquities Permit : # 073-NV-76-178

Dates of Field Examination : January 24, 25 and 30, 1978

Map References : Rye Patch Reservoir, South Quad, 7.5 minute USGS and Phillips Petroleum Co. Humboldt House Geothermal Prospect Map, BLM Protraction, 1"=4000'.

Legal Description of Drill Site Locations :

All drill site locations were given temporary field designations which were referred to as PP# \_ \_ .  
All legal descriptions inferred from BLM Protraction Map 1"=4000'.



Site PP # 1

NE1/4 of NW1/4 of SE1/4, Sec. 20, T31N, R33E, contour elevation 4260', approximately 3000 ft. SW of Valery site.

Site PP # 2

NE1/4 of NW1/4 of SE1/4, Sec. 32, T31N, R33E, contour elevation 4268', approximately 2 miles south of PP # 1 on east side of railroad tracks.

Site PP # 3

SW1/4 of NW1/4 of NE1/4, Sec. 10, T31N, R33E, contour elevation 4530', approximately 1 mile from I-80 up Johnson Canyon dirt road.

Site PP # 4

NE1/4 of NE1/4 of SW1/4, Sec. 16, T31N, R33E, contour elevation 4345', approximately 50 ft. east of old Highway 40.

Site PP # 5

NE1/4 of NE1/4 of SW1/4, Sec. 22, T31N, R33E, contour elevation 4800', approximately 1 1/2 miles east of I-80, up dirt road that forks into Antelope and Eldorado Canyons.

Site PP # 6

SE1/4 of SE1/4 of NW1/4, Sec. 28, T31N, R33E, contour elevation 4443', approximately 1200 ft. east of I-80 near telephone pole line road.

Area and Environment

All drill sites are located near dirt roads and jeep trails. Three of the sites, PP # 3, PP # 5, and PP # 6 are situated well above the ancient high stand of Lake Lahontan of about 4380 ft. (Morrison and Frye 1965). The three other sites, PP # 1, PP # 2 and PP # 4 are located below this contour, thus suggesting that the soil of these sites are in part derived from Lahontan sediments. Those sites above the high stand contour are of alluvium and aeolian material. Sagebrush (Artemisia), Bromus, and Spiny Hop Sage (Grazia spinosa) are the dominant vegetation.

Research Design

Inventory and evaluation of cultural resources within areas subject to adverse impact by the proposed development of geothermal wells.

## Methods

One hundred percent of each proposed drill site and non-developed dirt roads were carefully examined by on foot inspection; traversing the area in a zig-zag fashion, up to 250' away from the drill site center. All sites encountered were recorded on standard NAS site survey forms. An archive search was made to determine any previous work in the area, and attempts were made to locate previous recorded sites.

## Results of Archive Search

According to the archeological site files of the Archeological Survey at the University of Nevada, and the Nevada State Museum, the area between the Rye Patch Reservoir and the Humboldt Mountain Range is a known archeological locality containing many sites.

Donald R. Tuohy conducted an archeological reconnaissance along a gas pipeline paralleling the railroad tracks on the east side of the Reservoir (Tuohy 1963: 25). Mary Rusco also conducted an intensive archeological investigation around the Rye Patch Reservoir and identified 83 prehistoric sites and 2 historic sites. Of these sites, seven have been nominated to the National Register of Historic Places (Rusco, et al 1977).

From our NAS site files only one site (26PE119) was recorded between Antelope and Eldorado canyons (McLane 1972).

None of the proposed drill sites however, appear to contain any previously recorded archeological remains.

## Results of Field Examination

One prehistoric archeological site (26PE128) was identified at PP # 5. The site is located approximately 30-40 feet southwest of the drill site center, and extends over an area of about 10 x 10 meters. The site consists of an obsidian scatter containing reduced nodules, utilized and modified flakes, waste flakes and one possible hammerstone. Two isolated utilized flakes were observed about 40-50 ft. northeast of the drill site center. One possible feature, a circular stone alignment, was observed about 100 ft. due east of the drill site center and approximately 10' from the undeveloped dirt trail. No other archeological manifestations were observed within a 250 ft. radius of the drill site center.

None of the other sites (PP # 1, PP # 2, PP # 3, PP # 4, and PP # 6) contained observable prehistoric material within a

ft(250) radius around their centers. However, late twentieth century historical refuse was observed in and around most of these sites. These historical artifacts include aluminum beer cans, bottle glass, a flattened rusted stove pipe section, rusted cans, and a cable.

### Recommendations

On January 26, 1978 we contacted Mr. Robert Forest, Manager, Reno District Geothermal Operations, and informed him of the presence of an archeological site at PP # 5. As an alternative to mitigation, Mr. Forest requested that we go back to PP # 5 and relocate the drill site center to avoid any archeological materials.

On January 30, 1978, Alan Leventhal returned to PP # 5, resurveyed the area from the existing N-S oriented jeep trail, west to the eastern boundary of site 26PE128, and between the two drainages (see map). The easternmost boundary of site 26PE128 was staked and flagged with a wooden lathe, and labeled with a cautionary note "not to develop beyond this point". A new drill site center was established, staked and flagged with three wooden lathes approximately 300 ft. east-northeast of the original drill site center. This new area had no observable cultural resources upon it.

It appears that with the establishment of the new drill site center, and the development of the geothermal well, there will be no adverse affects on any of the archeological manifestations originally recorded as 26PE128, so long as there is no development west of the staked eastern boundary of site 26PE128.

All other sites will have no negative impacts on prehistoric or early historic resources except for the late twentieth century artifacts described above.

\*\*\*\*\*  
This report was drafted, edited and printed on a Diablo 1620 computer terminal. The text of this report is now in permanent tape storage in the UNR Computer Center and carbon ribbon copies can be reprinted at any time for a nominal fee.

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1972 Site Record (26PE119) on file, Archeological Survey, Anthropology Department, University of Nevada. Reno.

Morrison, R.

1965 and John C. Frye  
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1977 Evelyn Seelinger  
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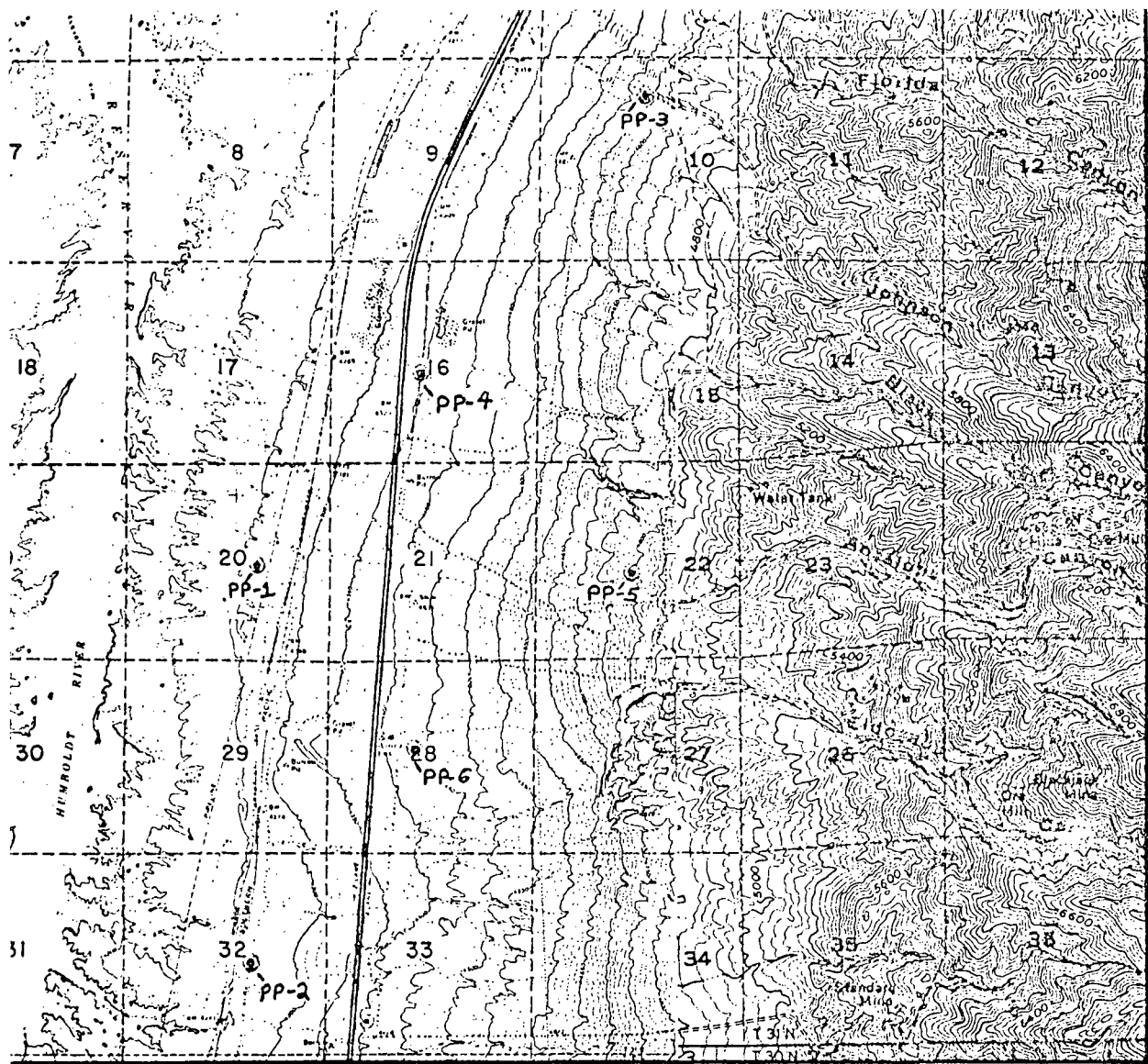
Tuohy, Donald R.

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## NEVADA ARCHEOLOGICAL SURVEY

## SITE SURVEY RECORD

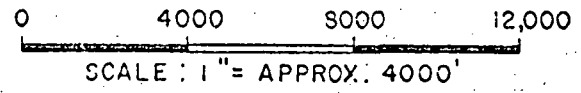
1. Site no.: 26PE128 2. County: Pershing 3. Name of site: PP#5  
 4. Type of site: Hunting task site, obsidian lithic scatter  
 5.  $\frac{NE}{4}$  of  $\frac{NE}{4}$  of  $\frac{SW}{4}$  Sec. 22 T. 31N R. 33E 6. Map: BLM Protraction  
 7. Location: Up dirt road which forks into Antelope and (Phillips Pat. 1"=4000  
Eldorado canyons, left fork to 1st N-S oriented jeep trail, then 1,000 feet  
west off of jeep trail (see map), then 30 ft. SW of old drill site center.  
 8. Aspect: North facing, gentle slope 9. Contour Elev.: 4800'  
 10. Owner: BLM  
 11. Address: Winnemucca District  
 12. Previous owners, dates: -  
 13. Tenant: -  
 14. Informants: none  
 15. Attitude toward excav.: none  
 16. Site description: Lithic scatter of reduced obsidian nodules includes,  
utilized and worked flakes.  
 17. Area: 10 x 10 m Depth: unknown 19. Height: -  
 20. Major zonal vegetation: Artemisia, Bromus, Spiny Hop Sage (Grayia Spinosa)  
 21. Site is in a (climax)(seral)(ecotonal) community described as follows: seral  
 22. Nearest water (distance and direction): Humboldt River/Rye Patch Res. west 2 miles  
 23. Type of water: fresh flowing 24. Soil of site: alluvium  
 25. Surrounding soil: same 26. Previous excavation: none known  
 27. Cultivation, erosion, etc.: drainages nearby N & S of site  
 28. Buildings, roads, fences, etc.: new jeep trail to drill site center  
 29. Possibility of destruction: maximum if drill site is developed  
 30. Archeological features: circular rock ring (cluster)  
 31. Artifacts reported and owned: none  
 32. Artifacts seen or collected: utilized flakes, worked flakes, 1 possible  
hammerstone  
 33. Recommendations: collect and test if necessary  
 34. Pub. references: -  
 35. Cat. numbers: - 36. Photo numbers: -  
 37. Recorded by: A. Leventhal Date: January 25, 1978



# PHILLIPS PETROLEUM COMP

HUMBOLDT HOUSE GEOTHERMAL PROSP  
Pershing County, Nevada

R. 33 E.



## EXHIBIT D

### OPTIONAL DRILLING AND TESTING ACTIVITIES

Conditions encountered in the hole during the course of drilling may indicate the necessity and feasibility of undertaking any of several activities to aid in further understanding the resource in the ground and the ability to extract it safely and economically. Downhole conditions which may prompt such activities include high temperatures, presence of fractures, presence of formation fluids, alteration, secondary mineralization, and presence of geothermal gases.

Activities that may be desirable or necessary include:

1. Obtaining cores
2. Running liners to stabilize the bore walls or case off relatively cold water zones
3. Perforating
4. Side tracking
5. Short-term flow tests through manifold and bleed line with the rig on location to determine flow characteristics of the well
6. Short-term flow tests with the rig off to determine flow characteristics of the well and pressure draw down and build up phenomena in the reservoir
7. Plugging back
8. Deepening
9. Plugging and abandoning
10. Making casing tests
11. Redrilling
12. Repairing
13. Short-term injection tests

#### Testing Activities

1. Formation Testing

In the event drilling data and evaluation criteria indicate that a potentially commercial geothermal reservoir has been penetrated, a steam control head will be installed on the Master Gate. The

assembly consisting of access port, kill line, and flow choke or other approved assembly will be tested to contain maximum well-head pressure of a fully developed flow based on drill pressure confinement with suitable safety allowance for maximum anticipated steam temperatures. Formations to be tested will be opened to the well bore. Minimum flow to characterize formation and well installation will be produced to surface reserve pits.

A typical testing program is included as Exhibit "E".

## 2. Resource Characterization

A program for characterizing the resource includes determining geothermal gradients and the sampling and analysis of geothermal resources.

- a. Geothermal gradients - A wire-line temperature survey, or surveys, are run in the well to obtain data necessary to calculate geothermal gradients.
- b. Sampling and analysis of geothermal resources - A typical sampling program is included in Exhibit "E". Fluid samples are submitted to commercial laboratories and to Phillips Petroleum Company R & D for analysis. Samples are routinely analyzed for boron, calcium, magnesium, potassium, sodium, ammonium, chloride, combined nitrate and nitrite, silica, sulfate, combined carbonate and bicarbonate, pH and conductivity. Selected waters are analyzed for all of the above, plus lithium, strontium, arsenic, fluoride, barium, iron, hydroxide, carbonate and bicarbonate.

Emission spectrographic qualitative analysis may be run on a limited bases for the elements Ba, B, P, Fe, Mn, Mg, Pb, Cr, Si, Al, Mo, Sn, V, Li, Cd, Cu, Na, Zn, Ti, Zr, Ni, Co, Sr, Ca, As.



## EXHIBIT E

### TYPICAL WELL TEST PROCEDURE FOR A LIQUID-DOMINATED RESERVOIR

1. Determine status of fluid column in adjacent wells. Prepare to measure and record pressures at the wellhead and in the flow line while the testing of the well is under way.
2. Obtain wellhead pressure, wellhead temperature, and temperature gradient on the wildcat well while the well is shut in.
3. Start well to flow at nearly the capacity of the well at a constant rate. This flow will be a cleanup flow and should be considered as one point of an isochronal test. Duration of flow should be approximately 72 hours.
4. Take wellhead pressures, temperatures, measurements and orifice-meter flow rates while well is flowing. Also collect water samples.
5. When well is shut in, get wellhead pressure buildup and temperatures at the same frequency as drawdown test, including instantaneous shut-in pressures to catch peak wellhead pressure. Continue shut in until wellhead pressures and temperatures stabilize or a maximum of probably not more than 24 hours.

Some modification of the above may be required if the reservoir is of the vapor-dominated type.

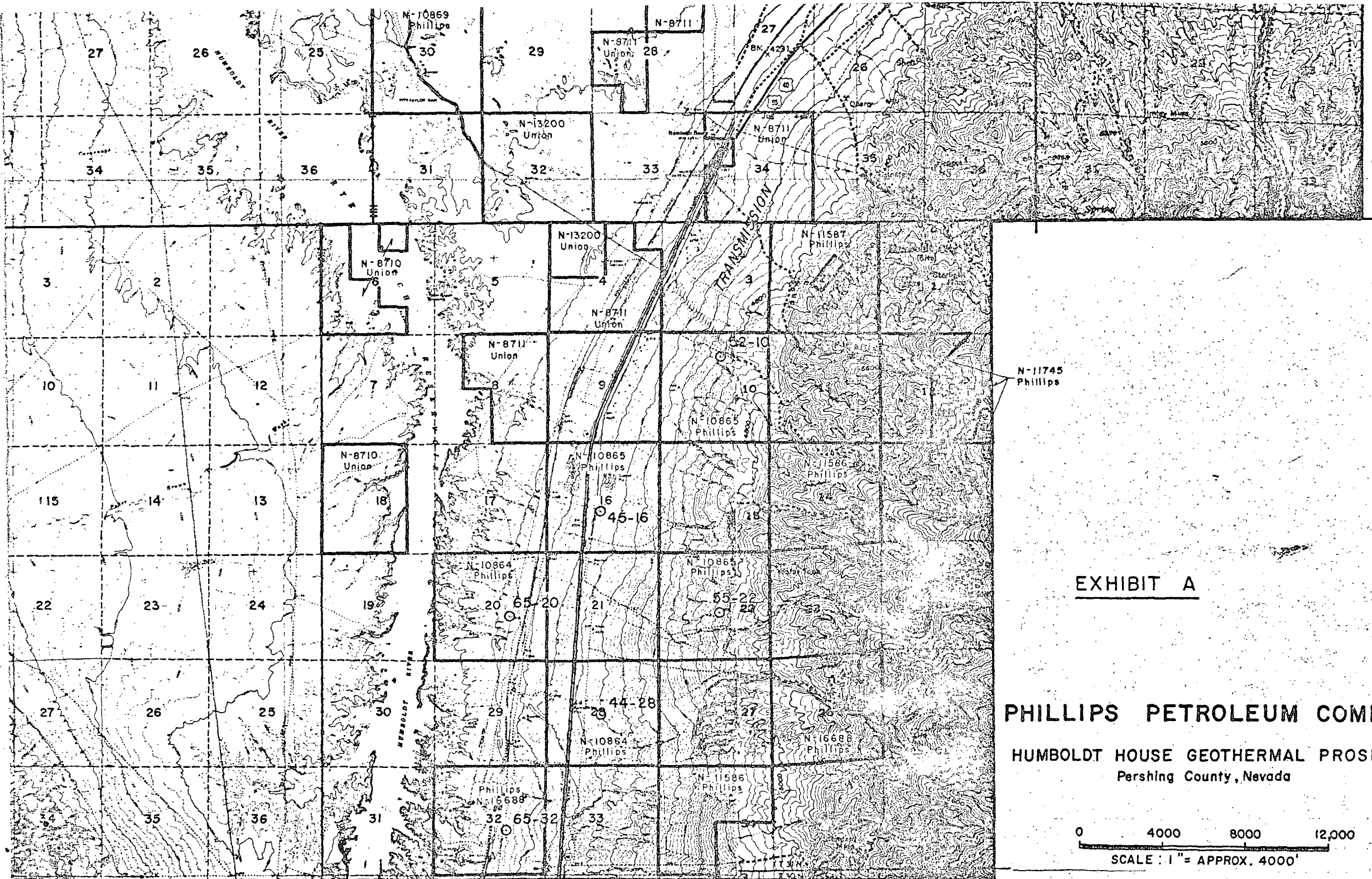


EXHIBIT A

**PHILLIPS PETROLEUM COMPANY,**  
**HUMBOLDT HOUSE GEOTHERMAL PROSPECT**  
 Pershing County, Nevada

