

GLO1049

MAR 20 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

*NPR*

MAR 17 1978

Memorandum

To: Interested Parties

From: *Acting* Area Geothermal Supervisor

Subject: Plan of Operation, Sunoco Energy Development Company, Federal Leases NM-32270 and NM-32271, Socorro Peak KGRA, Socorro County, New Mexico (Ref: 1760 AGS-78-NM32270 EA#104-8)

UNIVERSITY OF UTAH  
RESEARCH INSTITUTE  
EARTH SCIENCE LAB.

Sunoco Energy Development Company has submitted a Plan of Operation in accordance with 30 CFR 270.78 (b) (5) to drill two (2) 1500' and three (3) 500' temperature gradient holes on Federal leases NM-32270 and NM-32271 in the Socorro Peak KGRA, Socorro County, New Mexico. A copy of the Plan of Operation is attached for your review and files.

An Environmental Analysis (EA#104-8) will be prepared by the Office of the Area Geothermal Supervisor for the proposed action. You are invited to participate in a field inspection led by Ken Bull, Salt Lake City District Geothermal Supervisor, USGS, on March 29, 1978. Participants are asked to meet at 8:30 a.m. at the Bureau of Land Management Socorro District Office, 200 Neel Ave., NW, Socorro, NM, Telephone: (505) 835-0412, FTS 474-5511.

Parties planning to attend should notify the Salt Lake City District Geothermal Supervisor by March 24, 1978. Only those parties responding will be notified in the event of postponement or cancellation.

All comments concerning the proposed action must be received no later than April 10, 1978, by:

Area Geothermal Supervisor  
Conservation Division  
U.S. Geological Survey  
345 Middlefield Road, MS 92  
Menlo Park, California 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.

FC  
USGS  
AGSO  
Memo  
NM  
Soc. Co.  
3/17/78



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's Office does not send draft Environmental Analyses (EA's) to interested parties for review for work proposed by lessees pursuant to 30 CFR 270.78. Certain parties, however, such as the surface managing agency, the lessee, GEAP, and USFWS will receive a copy of the completed 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 Environmental Analyses are available for inspection during normal business hours at the Area Geothermal Supervisor's Office and the Salt Lake City District Geothermal Supervisor's Office, as well as the appropriate BLM District Manager's Office and the New Mexico State Director, BLM Office.

*Barry A. Boudreau*

Attachment

INTERESTED PARTIES for EA#104-8  
SUNOCO ENERGY COMPANY  
Plan of Operation - 3-500' and 2-1500' STGH's  
Federal Leases NM-32270 and NM-32271  
Socorro Peak KGRA Area  
Socorro County, New Mexico

U.S. Geological Survey, Conserv. Div.  
District Geothermal Supervisor  
Attn: Ken Bull  
350 South Main St., Rm. 442  
Salt Lake City, UT 84111  
(801) 524-5245  
FTS: 588-5245

U.S. Geological Survey  
Conservation Manager, Central Region  
Attr: Area Geologist  
7200 West Alameda Ave., Denver, CO  
(303) 234-2855  
FTS: 234-2855

U.S. Geological Survey, Conserv. Div.  
Attn: Area Geologist, SRMA  
P.O. Drawer 1857  
Roswell, NM 88201  
(505) 622-9257  
FTS: 476-9257

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

Bureau of Land Management  
New Mexico State Director  
P.O. Box 1449  
Santa Fe, NM 87501  
(505) 988-1217  
FTS: 476-1217

Bureau of Land Management  
Socorro District Office  
P.O. Box 1456  
Socorro, NM 87801  
(505) 835-0412  
FTS: 474-5511

Bureau of Land Management  
Las Cruces District Office  
P.O. Box 1420  
Las Cruces, NM 88001  
(505) 523-5571  
FTS: 572-0257

Bureau of Land Management  
Geothermal Coordinator  
Attn: Ted Holland  
Denver Federal Center, Bldg. 50  
Denver, CO 80225  
(303) 234-5098  
FTS: 234-5098

U.S. Fish and Wildlife Service  
Regional Director, Region 2  
P.O. Box 1306  
Albuquerque, NM 87103  
(505) 766-2321  
FTS: 474-2321

U.S. Fish and Wildlife Service  
Ecological Services  
P.O. Box 1306  
Albuquerque, NM 87103  
(505) 766-2914  
FTS: 474-2914

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

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 SUNOCO ENERGY COMPANY, EA#104-8

U.S. Environmental Protection Agency  
Environmental Monitoring and Support  
Attn: Michael O'Connell  
P.O. Box 15072  
Las Vegas, NV 89114  
(702) 736-2969  
FTS: 595-2969

Environmental Improvement Agency  
Attn: Thomas Baca  
P.O. Box 2348  
Crown Building  
Santa Fe, NM 87503  
(505) 827-5271

State of New Mexico Offices:

New Mexico Dept. of Fish and Game  
Attn: William Huey  
Villagra Building  
Santa Fe, NM 87503  
(505) 827-2143  
FTS 476-2143

New Mexico State Planning Office  
Attn: Tom Merlan  
New Mexico State Historical Preserv. Off.  
505 Don Gastar Ave.  
Santa Fe, NM 87501  
(505) 827-5191  
FTS: 476-5191

New Mexico State Land Office  
Attn: Jack Kennedy  
P.O. Box 1148  
Santa Fe, NM 87501  
(505) 827-5378  
FTS: 476-5378

Dona Ana County Manager  
City Courthouse, Rm. 104  
Las Cruces, NM 88001  
(505) 523-5634

New Mexico Energy Resources Board  
Attn: Dennis Fedora  
P.O. Box 2770  
Santa Fe, NM 87501  
(505) 827-2471

University of Utah Research Institute  
Earth Science Laboratories  
Attn: Phillip Wright  
391 Chipeta Way  
Salt Lake City, UT 84108  
(801) 581-5226

New Mexico State Engineers Office  
Attn: S.E. Reynolds  
Bataan Memorial Building  
State Capitol  
Santa Fe, NM 87503  
(505) 827-2526

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

New Mexico Bureau of Mines  
Socorro, NM  
(505) 835-5402

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

Oil Conservation Commission  
Attn: Carl Ulvog  
P.O. Box 2088  
Santa Fe, NM 87501  
(505) 827-2434

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

Chevron USA, Inc.  
Minerals Staff  
Attn: Pat Smith  
P.O. Box 3722  
San Francisco, CA 94119  
(415) 894-2726

INTERESTED PARTIES for SUNOCO ENERGY COMPANY, EA#104-8

Dresser Industries, Inc.  
MAGCOBAR Division  
Attn: Jim Fox  
475 17th St., Suite 1600  
Denver, CO 80202  
(303) 629-8394

Energy and Natural Resources Consul.  
Attn: Richard Jodry  
P.O. Box 941  
Richardson, TX 75080  
(214) 238-9554

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

Geothermal Resources Council  
Attn: David Anderson  
P.O. Box 1033  
Davis, CA 95616  
(916) 758-2360

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

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

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

Hydro-Search, Inc.  
Attn: Virgil Wilhite  
333 Flint St.  
Reno, NV 89501  
(702) 322-4137

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

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

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

Republic Geothermal, Inc.  
Attn: Dwight Carey  
11823 East Slauson Ave., Suite 1  
Santa Fe Springs, CA 90670  
(213) 945-3661

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

Southland Royalty Company  
Attn: Jere Denton  
1600 First National Bank Bldg.  
Fort Worth, TX 76102  
(817) 390-9200

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

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

INTERESTED PARTIES for SUNOCO ENERGY COMPANY, EA#104-8

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

VTN  
Attn: Dick Hallett  
2301 Campus Dr.  
P.O. Box C-19529  
Irvine, CA 92713  
(714) 833-2450

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

Mr. Jack McNamera  
Law Center, Rm. 422  
University of Southern California  
(213) 741-7569

Warren M. Woodward  
125 Drew Dr.  
Reno, NV 89511  
(702) 825-3079

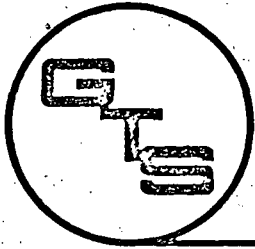
bcc: Reading file 101-02  
Subj. file 1760 (2403-01a) NM-32270 (POO for AGS-78-NM32270) EA#104-8  
ENV EA#104-8 R. Hoops  
ENG  
OPE

MODEL PLAN OF OPERATION  
GEOHERMAL RESOURCE EXPLORATION OPERATIONS

RECEIVED

MAR 7 1976

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



# GEO THERMAL SERVICES, INC.

10072 WILLOW CREEK ROAD, SAN DIEGO, CALIFORNIA 92131 • (714) 566-4520

## PLAN OF OPERATION

### GEO THERMAL RESOURCE EXPLORATION OPERATIONS

The following is a plan of operation for geothermal resource exploration operations to be conducted on United States Government Lands. For ease of reference, this plan is divided into separate sections labeled "A" through "J".

- A. Type of geothermal resource exploration operations to be conducted.
- B. Proposed locations of each temperature gradient hole.
- C. Description of equipment to be used in the drilling of temperature gradient holes and collection of data, and a diagram showing typical arrangement of equipment while drilling operations are being conducted.
- D. Procedures to be employed in drilling and completion of temperature gradient holes.
- E. Planned access to proposed temperature gradient hole locations.
- F. Location of camp sites, air strips and other supporting facilities.
- G. Any other areas of potential surface distribution.
- H. Methods for disposing of waste material.
- I. Methods of monitoring operation to ensure that operations are conducted in a manner that minimizes danger to life, property and the environment.
- J. Methods of abandoning holes after desired data has been obtained.

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- A. The type of exploration operations to be conducted is the drilling of temperature gradient holes for the purpose of determining the geothermal resource potential of the referenced lands.
- B. Locations of the proposed temperature gradient holes are shown on the accompanying map EXHIBIT "A".
- C. Equipment to be used during the course of exploration operations are as follows: Rotary Drilling Rig(s); Water Truck(s); Support Pickup(s) and Geophysical Van(s). Each is described in detail, below:

Drilling Rig(s):

Make - Portadrill

Type - Conventional rotary, mud or air

Maximum Capable Depth - 1,500'

Mounted on - Truck, 3-axle (2-rear driven)

Gross Weight - 40,000 lbs. (approx.)

Water Truck(s):

Capacity - 2,000 gal.

Mounted on - Truck, 3-axle (2-rear driven)

Gross Weight - 30,000 lbs. (approx.)

Support Pickup(s):

Conventional 4-wheel drive, 3/4 ton

Gross Weight - Under 8,000 lbs.

Geophysical Van(s):

Ford Econoline Van, 4-wheel drive

Gross Weight - Under 6,200 lbs.

/Continued .....

During the course of drilling the temperature gradient holes, it is likely that at various times all the above mentioned equipment will be on site. A typical arrangement for this equipment is shown in the accompanying diagram "C". Although the arrangement of equipment may change somewhat, it is expected that the drilling of the shallow temperature gradient holes will result in a disturbed area approximately 50' in radius from the hole location.

- D. All temperature gradient holes proposed herein are scheduled to be drilled to a total depth of 500' or 1500' below ground level. Drilling will be by conventional rotary mud or rotary air.

If mud is used, a Bentonite type drilling mud will be utilized. In addition to Bentonite mud, a supply of Barite will be on hand (and used if necessary) to control artesian flow, as well as lost circulation material to combat lost circulation zones and minimize loss of drilling fluids to formations being penetrated. In no case will poisonous or otherwise toxic drilling fluid additives be employed.

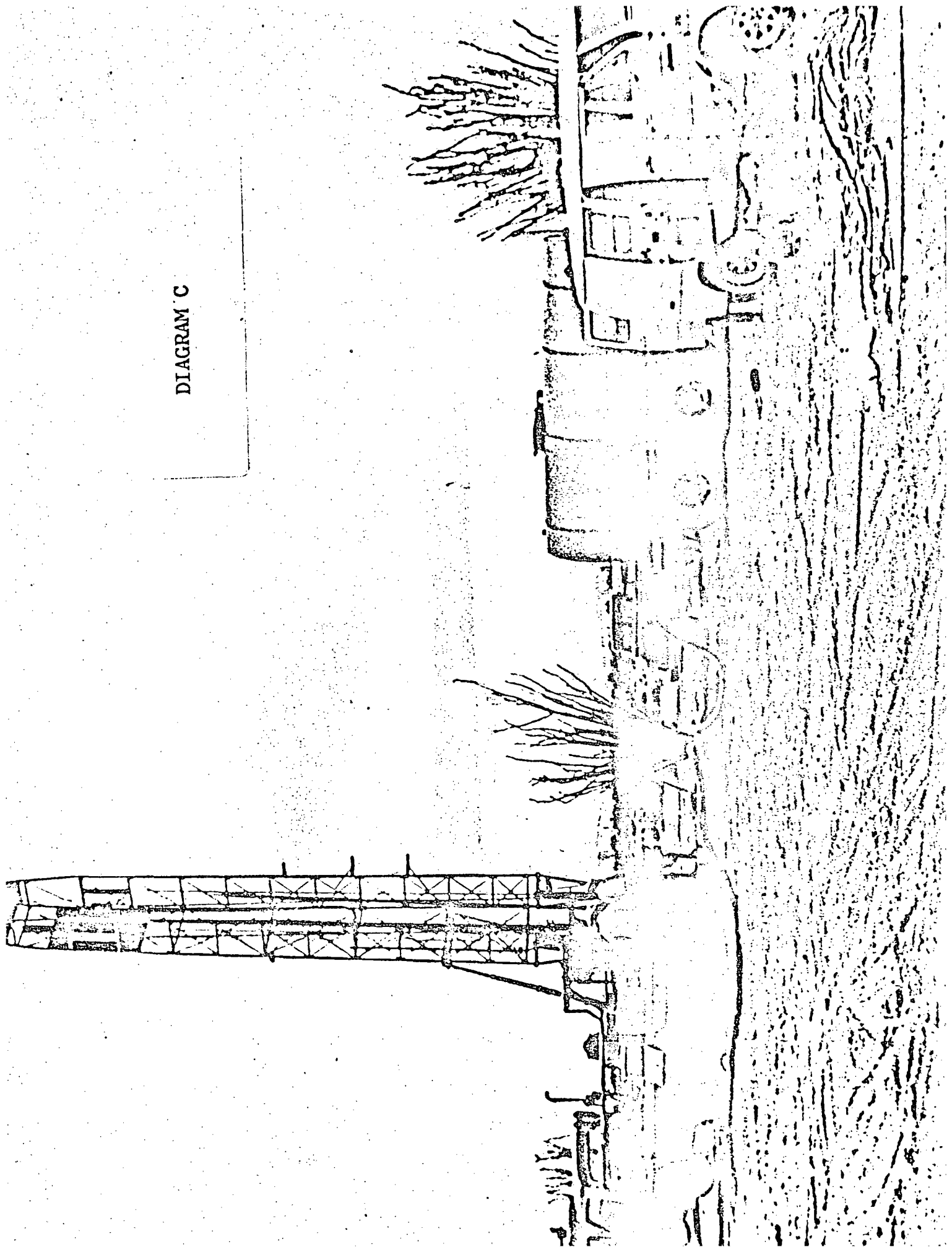
Nominal hole diameters will be in the 5" - 6" range, depending on the type of bit used (either conventional roller or drag type).

No excavations for mud pits will be necessary as a portable tank will be utilized. The dimensions of the tank are approximately 8' x 4' x 18".

Holes will be completed in such a manner as to prevent sub-surface inter-zonal migration of water and surface leakage by: a). running a capped string of small diameter (3/4" - 2-1/2") tubing from surface to total depth; b). filling the annular space between hole and tubing with heavy mud and cuttings to 10' below ground level and with cement from 10' to 6" below the surface; c). filling the tubing with water, and d). placing a cap on the pipe.

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DIAGRAM C



- E. Access to proposed hole locations will be on existing roads and trails wherever possible. It is probable, however, that "cross country" travel will be necessary to reach some locations. Where this is necessary, equipment will be moved across the shortest distance possible from existing road or trail to the hole location. Once a route is established, all equipment will be restricted to this route. Since all equipment has a maximum width of 8', this will result in a disturbed area of approximately the same width. Whenever possible, equipment will be routed around existing vegetation.
- F. No camp sites, air strips or other support facilities are to be located on U.S. Government land for this exploration operation.
- G. Other than the proposed drill sites, no other areas of potential surface disturbance exist, with the possible exception of equipment getting stuck in mud. This, however, would be along designated access routes or existing roads and trails and is a situation that would be avoided if at all possible.
- H. Waste material from this exploration operation will be those wastes resulting directly from drilling operations (i.e., mud, cuttings, etc.).

Drilling mud and cuttings will be disposed of at the hole site by discharging them onto the surface to a maximum depth of 6". Drilling sites will be selected so that the discharge of mud and cuttings will not contaminate lakes and perennial or intermittent streams.

- I. Several techniques will be employed to ensure that exploration operations are carried out with maximum safety to life and property and minimal impact on the environment and its attendant natural and cultural resources. These are outlined as follows:

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1. Before exploration operations commence:
  - a. Hole locations will be chosen to minimize surface disturbance.
  - b. No hole locations will be selected within 300' of perennial streams or lakes.
  - c. No holes will be drilled within a 1,500' radius of hot springs, fumaroles or other surface geothermal indicia.
  - d. If cross-country travel is necessary to reach a specific hole location, due care will be taken that the route be chosen to minimize surface disturbance and damage to vegetation and wildlife.
2. During drilling operations:
  - a. A graduate geologist experienced in the proposed geothermal exploration operations will be in the area at all times when drilling is being conducted.
  - b. No artesian flows are known to lie within the area where operations are to be conducted; however, a supply of Barite will be kept on hand should artesian flow be encountered.
  - c. If artesian flow occurs, the hole will be completed as detailed in Section "D", with the exception that the annular cement plug will be placed from total depth to 6" below ground level.
  - d. During drilling operations (when drilling with mud), return temperatures will be taken and recorded every 10'.
  - e. If mud return temperature reaches 120°F, all drilling operations will cease and circulation

/Continued .....

will be maintained for thirty minutes while monitoring mud temperature and tank volume for possible hot artesian flow or lost circulation. If neither occurs, tubing will be run to total depth and the hole will be completed as in Section "D". If artesian flow is noted, the hole will be completed as in Section "I", Item 2-c. If lost circulation occurs, it will be controlled with lost circulation material and completed as in Section "D".

- f. If there should be a sudden marked increase in mud return temperature of several degrees in only a few feet, all drilling operations will cease and circulation will be maintained for thirty minutes monitoring mud temperature and mud tank volume for possible hot artesian flow or lost circulation. If neither, then drilling will continue cautiously while keeping careful watch on mud return temperature and mud tank volume. In no case will drilling operations continue after mud return temperature reaches 120°F. Depending on conditions, hole will be appropriately completed as in Section "D", or Section "I", Item 2-c.
- g. If flowing steam or hot water ( $\geq 150^{\circ}\text{F}$ ) is encountered, further drilling will stop immediately and the hole will be completed as in Section "I", Item 2-c.
- h. Every effort will be made to minimize the possibility of a fire. Ground fires will be built only in areas clear of vegetation for a radius of 10'. Internal combustion engines operated on site will be equipped with an U.S.F.S. approved spark arrestor.
- i. Fire fighting equipment on hand will consist of:

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- (1) water truck, 2,000 gallon capacity, equipped with an auxiliary water pump and hose that can be used to extinguish a fire, should one break out; (2) a #0 long handled (46") shovel for each crew member; (3) a dry chemical fire extinguisher with classification 3-A:20-B:C.
- j. Mud and cuttings will not be discharged onto the surface where such discharge could cause: (1) soil erosion; (2) pollution of surface waters or lakes and perennial or intermittent streams; (3) undue harm to wildlife or other natural resources.
- k. All equipment to be operated during this program has met Federal regulations with regards to noise and air pollution.
- l. The area where operations are to be conducted has a very low human population and, as such, it is anticipated that there will be no hazards to public health and safety.
- m. Every effort will be made to preserve the natural vegetation and animal life of the area by restricting equipment movement to the minimum necessary to efficiently complete the proposed operation.
- n. If American antiquities or other objects of historic or scientific interest including, but not limited to historic or pre-historic ruins, fossils or artifacts are discovered in the performances of the permit, the item(s) or condition(s) will be left intact and immediately brought to the attention of the authorized officer.
- o. All equipment will be operated at a safe and reasonable speed.

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Page Eight

3. After drilling is completed:
  - a. The drill site will be completely cleaned of trash and debris.
  - b. All drill cuttings discharged onto the surface will be leveled to a maximum height of 6".
  - c. The area will be restored as nearly as practical to its original condition.
  
- J. After the desired data has been obtained, the holes will be abandoned by: a). cutting off tubing 6" below ground level; b). filling the top 10' of tubing with cement and c). covering the hole with dirt to original surface contour. Except as otherwise noted, all test equipment, both surface and sub-surface, will be removed at the completion of the exploration operations.

9/1/77

SQ/dcp



DRILLING PROGRAM - 1,500' HEAT FLOW HOLES

SUNOCO ENERGY DEVELOPMENT CO.

SOCORRO PROSPECT, NEW MEXICO

DRILLING PROGRAM - 1,500' HEAT FLOW HOLES

SUNOCO ENERGY DEVELOPMENT CO.

SOCORRO PROSPECT, NEW MEXICO

NOTE: All depths referenced to ground level.

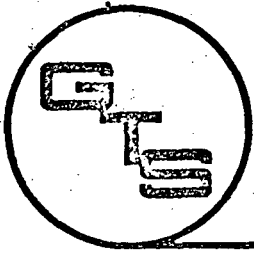
1. Stake location. Get site and access route approval, as well as any approvals/permits necessary for access improvement (grading, etc.) from the appropriate regulatory agency.
2. Excavate Mud Pit to hold 8,000 gallons drilling fluid. Approximate dimensions are 25' x 7' x 6' deep. Pit should have a "deep end" (7' to 8' deep) located at mud return end. If pit fluid loss to ground will be excessive, line pit with Dupont "Hypalon" or equivalent.
3. Move in drilling equipment. Jack up rig to provide clearance for B.O.P.E.
4. Spud and drill 11" hole to 150' or 10' into first competent formation, whichever comes first. Use air or regular Bentonite type drilling mud.
5. Measure and record mud or air return temperature every 10'.
6. Condition hole for logging and running casing by circulating for a minimum of 2 hours.
7. Run Geothermal Services, Inc. temperature, gamma and electric logs.
8. Run and cement 7" or 8-5/8" steel casing (land on bottom). If no lost circulation problems to casing depth, use 20% excess neat cement (70 sacks at 150'). Displace cement with drilling mud. If no cement returns in annulus, perform top job as necessary to fill annulus with cement to one (1) foot below surface. If lost circulation problems were encountered, circulate cement until cement returns to surface.

9. Install B.O.P.E. flange, 2" fill-up line with gate valve (below flange) and pressure gauge.
10. Install B.O.P.E. (Hydril Pneumatic Annular Type, or equivalent).
11. After 24 hours, clean out cement to 10' above casing shoe and pressure test casing and blowout preventer for 10 minutes.
12. If B.O.P.E. test OK, drill 6-1/4" hole to 1,500' with mud, air or air/foam.
13. At the end of each 10 hour tour condition hole for 1 hr. (or until mud is free of cuttings):
  - A. If mud temperature <125°F, hang one joint of pipe and kelly in hole. Close B.O.P.E. and fill-up line gate valve. Check pressure gauge installed in fill-up line. Shut down rig until next tour.
  - B. If mud temperature >125°F or depth is greater than 500 feet, commence 24 hour drilling operations.
14. At start of next tour check pressure gauge in fill-up line.
15. Run Geothermal Services, Inc. temperature log. After reaching bottom, pull temperature probe up 10' and stop for 15 minutes or until temperature stabilizes. Record temperature every 5 minutes. Referring to Table 1 (below) and "Boiling Point Curve" (on last page), if final bottom-hole temperature is within 50°F of boiling point for that depth, proceed to step No. 18 of this program.

TABLE 1

<u>DEPTH</u>	<u>BOILING TEMPERATURE (F°)</u>
100'	265
200'	306
300'	331
400'	352
500'	370
600'	387
700'	401
800'	413
900'	422
1,000'	430
1,100'	439
1,200'	445
1,300'	451
1,400'	458
1,500'	467

16. If temperature OK, drill ahead recording mud return temperature every 10'. If mud return temperature reaches 180°F, proceed to step No. 18 of this program.
17. Repeat steps Nos. 13 through 16 until either T.D. of 1,500' is reached or high temperatures necessitate completion at shallower depth.
18. Upon reaching T.D., circulate and condition mud and hole for logging for no less than 8 hours.
19. Run Geothermal Services, Inc. temperature, gamma and electric logs.
20. Land bull plugged 2" steel pipe on bottom.
21. Hang 180' of 2" steel pipe along side of bull plugged steel pipe. Mix 60 sacks (20% excess) neat cement and pump until annulus is filled with cement to ground level. Pull the 180' pipe.
22. Place dog house over hole and check bull plugged 2" pipe for height clearance. Remove dog house; cut and thread tubing as necessary to fit inside dog house.
23. Fill 2" pipe with a ethelene glycol water mixture: install tubing cap with pressure gauge and relief valve.
24. Replace dog house and cement into place by pouring concrete pad 6" larger than dog house. Install cover on dog house and lock in place.
25. Move out equipment and restore location as nearly as practical to original condition.



# GEOTHERMAL SERVICES, INC.

10072 WILLOW CREEK ROAD, SAN DIEGO, CALIFORNIA 92131 • (714) 566-4520

March 4, 1978

U.S. Geological Survey  
Office of the Geothermal Supervisor  
Suite 400, Room 401  
2465 East Bayshore Road  
Palo Alto, California 94303

RECEIVED

MAR 7 1978

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

ATTN: DAVE BICKMORE

RE: GeoThermal Services, Inc., Model Plan of Operation submitted August 31, 1977-Ref.EA 104; drilling of heat flow holes on United States Geothermal Leases NM-32270 and NM-32271.

Dear Mr. Bickmore:

This letter is submitted as an addendum to the above referenced report and may be cited as authority for the additions and changes listed below. For ease of reference, two copies of the Model Plan of Operation are enclosed herewith.

1. To page three, Item "D", paragraph four, should be added: "Mud pits will be excavated for hole locations Nos. U-1 and U-2. The approximate dimensions of the pits will be 25 ft x 7 ft x 6 ft in depth."
2. To page five, Item 2 "b", add: "To further ensure that formation pressures can be controlled, surface casing will be set into competent rock and cemented in place in holes Nos. U-1 and U-2, which are scheduled to be drilled to 1500 feet below ground level. To the surface casing will be fitted an annular blow out preventor with an appropriate working pressure."
3. Page five, Item 2 "e", after "120°F " insert: "...in 500 foot deep holes of 180°F in 1500 foot deep holes..."
4. Page six, Item "f", after "120°F" add: "...or 180°F in 1500 foot deep holes."
5. Hole locations are as shown on the accompanying map labeled "Exhibit A".

In addition, enclosed please find a shaded plat map showing the leased areas as well as the United States Geothermal Lease numbers on which exploration operations will be conducted. This is Exhibit "B".

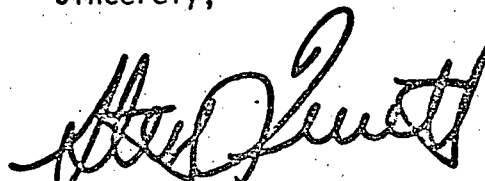
/Continued

March 4, 1978

Further, archeological clearance for the hole locations is being completed by the San Juan County Archeological Research Center and Library and a copy of their report should be available shortly. No problems of an archeological nature are anticipated at any of the hole locations.

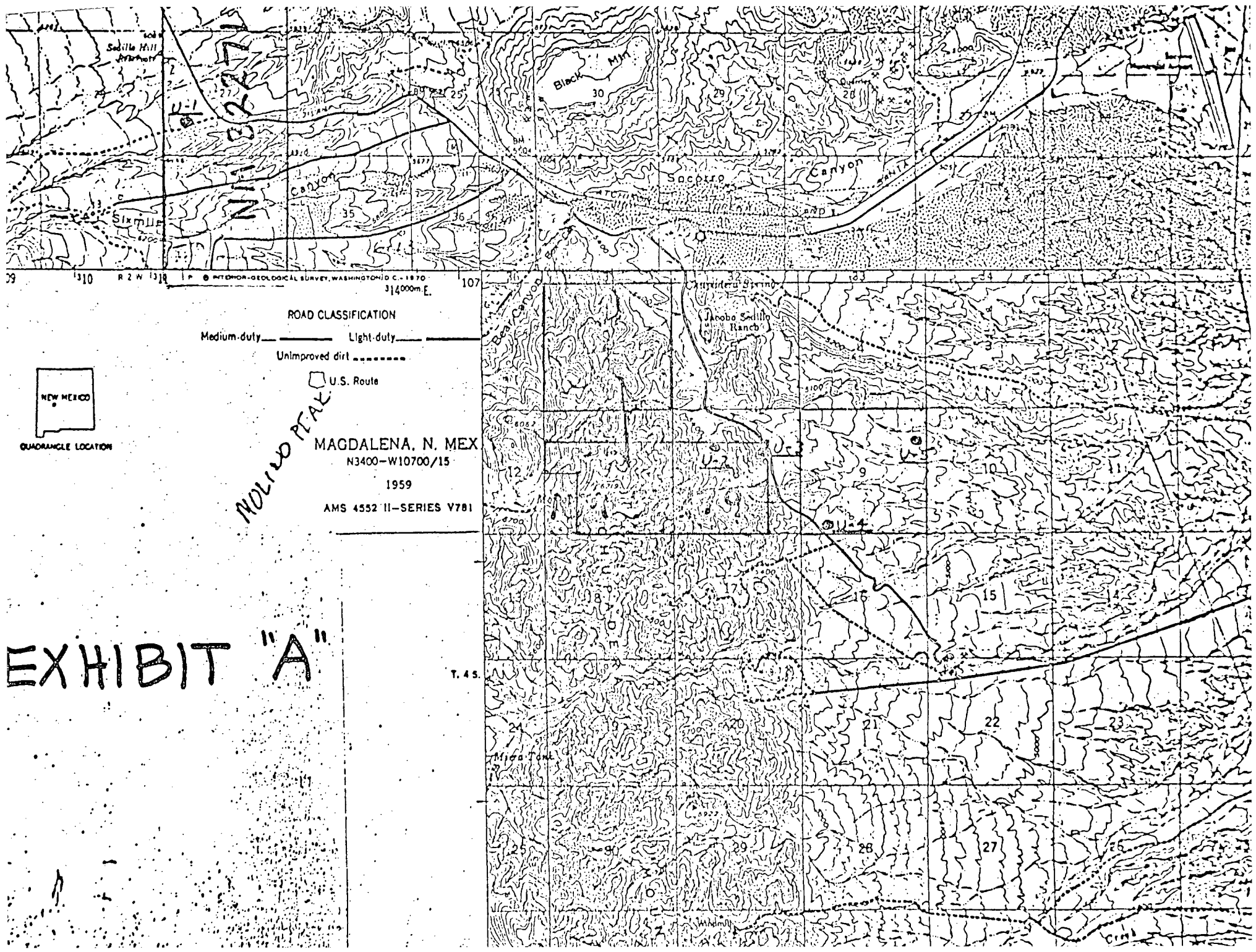
If you have any questions or require further information, please feel free to call me.

Sincerely,

A handwritten signature in cursive script, appearing to read "Steve Quiett".

Steve Quiett  
Senior Project Manager

SBQ:sq  
Encls



ROAD CLASSIFICATION  
Medium-duty \_\_\_\_\_ Light-duty \_\_\_\_\_  
Unimproved dirt - - - - -

U.S. Route



QUADRANGLE LOCATION

MAGDALENA, N. MEX

N3400-W10700/15

1959

AMS 4552 II-SERIES V781

NOLVO PEAK

EXHIBIT "A"

T. 45.

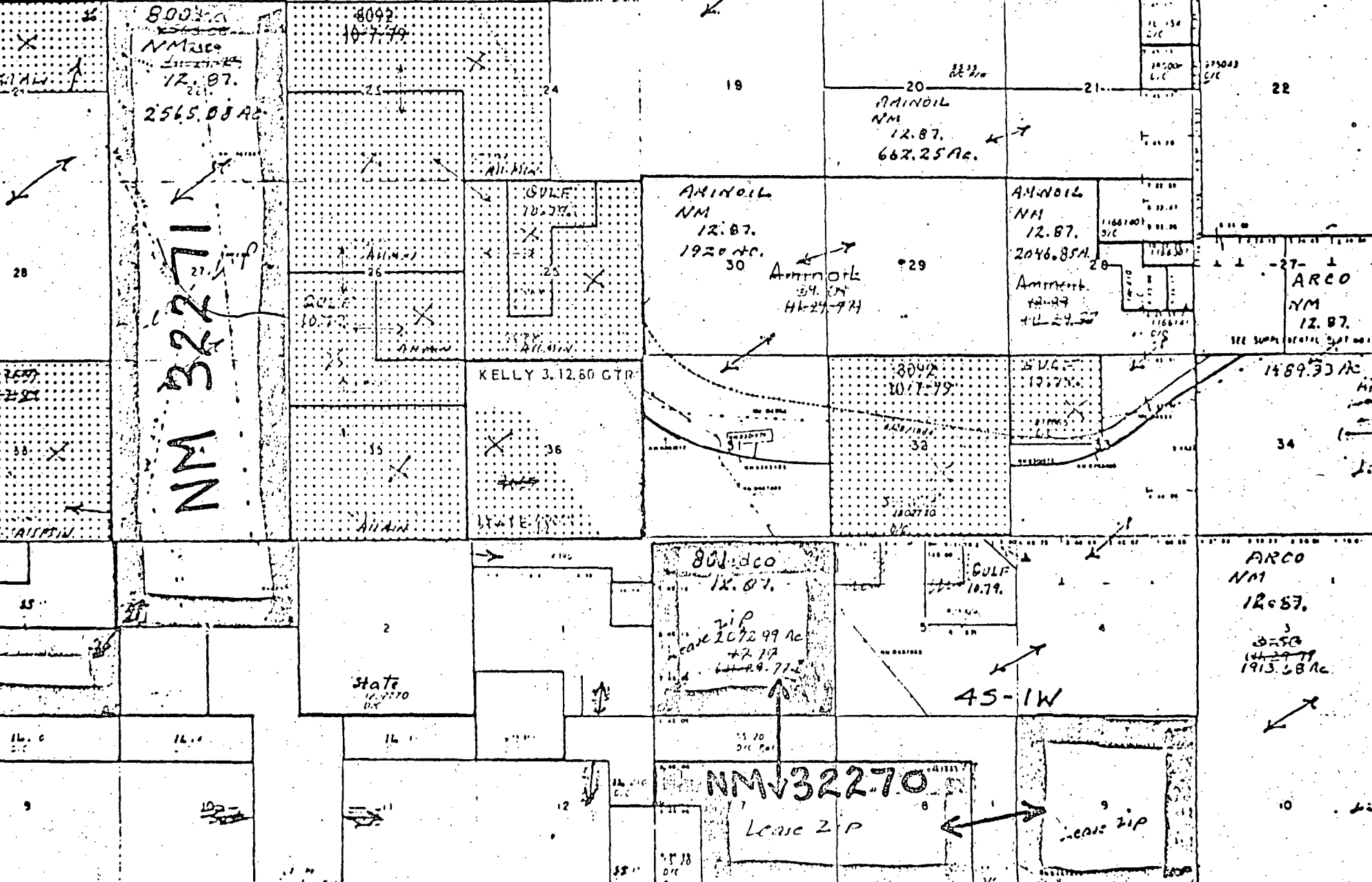
GULF  
1.80 GTR

*1/4 sec section*

# EXHIBIT B

ST-11-12  
1202770  
D/C

4-1-12  
1202770  
D/C



NM 322711

AMINOIL  
NM  
12.87.  
1920 etc.  
30

Amnork  
34 ON  
11-27-74

AMINOIL  
NM  
12.87.  
2046.85 Ac

ARCO  
NM  
12.87.

1489.33 Ac

80040  
12.87.  
zip  
near 2072.99 Ac  
+ 2.77  
11-29-71

45-1W

NM 32270  
Lease 2 P

ARCO  
NM  
12.87.

3-5-80  
11-27-74  
1915.68 Ac

Lease 2 P

state  
12.87.1970

KELLY 3.12.60 GTR

80040  
NM 12.87.  
2565.08 Ac

AMINOIL  
NM  
12.87.  
662.25 Ac.

187500  
D/C

11154  
D/C

140125  
D/C

11180  
D/C

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