GEOThermal SERVICES, INC.

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GEOThermal SERVICES, INC.

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

September 8, 1978

Mr. John Knox
Geothermal Development
Sunoco Energy Development Co.
12700 Park Central Place, Suite 1500
Dallas, Texas 75251

Dear John:

Per our telephone conversations, we have enclosed two copies of a final report for the intermediate depth borehole No. 1-78-U1 of the Socorro Prospect, New Mexico. I hope these will meet both Chet Bonar and your needs.

If we can provide any additional services, please do not hesitate to contact us.

Sincerely,

Jim Combs
President

Enclosures

GEOThermal DIVISION
RECEIVED

SEP 11 1978

**SUNOCO ENERGY
DEVELOPMENT CO.**

FINAL REPORT

SUNOCO ENERGY DEVELOPMENT CO.

SOCORRO PROSPECT, NEW MEXICO

GTS JOB NO. 5-77

GEOHERMAL DIVISION
RECEIVED

DEC 07 1977

**SUNOCO ENERGY
DEVELOPMENT CO.**

GEOThermal SERVICES, INC.

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

Letter of Transmittal

December 3, 1977

Mr. W. L. Parchman, Jr.
Manager, Geothermal Development
Sunoco Energy Development Co.
12700 Park Central Place, Suite 1500
Dallas, Texas 75251

Dear Mr. Parchman:

Enclosed herewith is GeoThermal Services, Inc.'s Final Report on the Socorro Prospect, New Mexico, Job No. 5-77.

At least one area is sufficiently interesting to warrant some follow-up work, particularly in view of your successful bidding at the recent KGRA competitive lease sale. We look forward to being of additional service to you during the next phase of your evaluation.

Sincerely,

L. H. Axtell, President
California Registered Geologist #2007

Enclosure

GEOThermal SERVICES, INC.

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

SUNOCO ENERGY DEVELOPMENT CO.

Socorro Prospect, New Mexico

GTS Job No. 5-77

SUMMARY

During the period May 19, 1977 to July 22, 1977, fourteen heat flow boreholes were completed on the Socorro Prospect, New Mexico. Rock types encountered ranged from unconsolidated Quaternary alluvium to dense volcanic rocks. Depths of the holes were from 60 to 440 feet with an average total depth of 288 feet. Geothermal gradients from the fourteen boreholes ranged from 0.32 to 7.58 °F/100 ft. Thermal conductivity values of 3.6 to 7.5 mcal/cm-sec-°C were obtained from a total of 76 samples of drill cuttings. Individual heat flow values range from 0.3 to 5.4 HFU (1 HFU - 1 μ cal/cm²-sec). The linearity of the gradients for these holes suggests that heat transport in the shallow subsurface penetrated by these boreholes is predominately by conduction; however, the magnitude of the heat flow for eight of the boreholes indicates that they are disturbed by groundwater movement. Based on published data as well as the results of the present survey, a value of about 2.5 HFU is probably representative of the background heat flow in the area of the Socorro Prospect.

The heat flow determination of 5.4 HFU in borehole No. 5-77-B20 could indicate a prospect of commercial quality. Heat flow values greater than

3 HFU require either melting within the shallow crust or convective transport of heat by water or magma. This heat flow value, therefore, supports the observation of modern uplift in the Socorro area over a postulated magma chamber situated at a depth of $11\pm$ miles.

Based on the data collected during this exploration project, we recommend that a second phase program of more closely-spaced heat flow boreholes be drilled on the Socorro Prospect to determine the lateral extent of the high heat flow zone characterized by hole No. 5-77-B20.

INTRODUCTION

During the period May 19, 1977 to July 22, 1977, fourteen heat flow holes were completed for Sunoco Energy Development Company in the Socorro Prospect, New Mexico (Fig. 1). Drilling operations were conducted in Townships 1, 2 and 3 South, Ranges 1, 2 and 3 West, New Mexico Principal Meridian. Final hole locations are shown on the Base Map No. 5-77 (Fig. 2) located in the pocket at the back of this report.

Four separate temperature runs were made on twelve of the fourteen holes drilled; the other two holes had three separate runs. Seventy-six thermal conductivity determinations were made on one to ten drill cutting samples from each of the fourteen holes. Selected borehole data are presented in Table 1. These include elevation, total depth, average geothermal gradient, gradient interval, average thermal conductivity, number of samples, and calculated value of heat flow for each hole. A composite diagram of the estimated equilibrium temperature profiles is presented in Figure 3. Equilibrium profiles and preliminary temperature/depth profiles for each hole are presented in Appendix A. Individual thermal conductivity measurements are tabulated in Appendix B. Individual temperature surveys, lithologic and geophysical logs, including self-potential, electrical resistance, continuous temperature and natural gamma are provided in Appendix C.

Drilling operations were conducted on Federal lands controlled by either the U. S. Forest Service (USFS) or the Bureau of Land Management (BLM). Several sites which were staked and scheduled to be drilled on private (Fee) lands were canceled early in the program because suitable arrangements with

Figure 1. Location Map of the Socorro Prospect, New Mexico with Published Heat Flow Data (Sass, *et al.*, 1976).

TABLE 1. SELECTED HEAT FLOW BOREHOLE DATA
SOCORRO PROSPECT, NEW MEXICO
GTS JOB NO. 5-77

HOLE NO.	ELEVATION (feet)	TOTAL DEPTH (feet)	GEO THERMAL GRADIENT (°F/100 ft)	GRADIENT INTERVAL (feet)	THERMAL CONDUCTIVITY (mcal/cm-sec-°C)	NO. OF SAMPLES	HEAT FLOW (HFU)
47 5-77-B1	4880	250	1.37	50-240	4.0	5	1.0
46 5-77-B2	5210	440	3.18	100-430	5.6	5	3.2
45 5-77-B9	5360	249	3.94	50-240	4.0	10	2.9
44 5-77-B12	4920	230	2.16	80-220	4.3	10	1.7
42 5-77-B15	5040	260	2.99	50-250	4.6	5	2.5
41 5-77-B16	4900	320	2.36	70-310	4.6	5	2.0
20 5-77-B19	6090	378	0.96	50-370	4.8	5	0.8
32 5-77-B20	5320	240	7.58	130-230	3.9	4	5.4
7 5-77-B21	5910	381	0.32	80-370	5.2	5	0.3
5-77-B22	5980	61	1.90	40-60	4.3	1	1.5
5-77-B23	6360	300	2.16	50-290	4.1	5	1.6
5-77-F1	6150	320	2.27	50-310	6.2	6	2.6
5-77-F3	6609	286	1.68	100-280	5.1	5	1.6
5-77-F4	6400	316	1.24	70-310	5.5	5	1.2

the owners had not been made. Drilling operations on USFS lands were performed under Prospecting Permit, File Reference 2820, issued on July 5, 1977, by the Magdalena Ranger District. Those operations on BLM administered lands were performed under Notice of Intent No. 3-77. All holes were drilled and completed in accordance with the Revised Special Stipulations for Shallow Temperature Gradient Holes of the U. S. Geological Survey, the Environmental Stipulations of the Bureau of Land Management, and the Stipulations of the U. S. Forest Service by: (a) running a capped string of 3/4 inch steel pipe to bottom; (b) placing an annular cement plug from 10 feet below ground level to 6 inches below ground level; (c) filling the pipe with water and (d) putting a cap on the pipe.

Those sites located on Federal land (whether surface, mineral or both surface and mineral) required an Archaeological Reconnaissance Survey in accordance with item #2 of N2-3200-1(A), October, 1974. Twenty-eight sites were surveyed for objects of historical significance by a team from New Mexico State University, Las Cruces, New Mexico, authorized by Federal Antiquities Permit No. 76-NM-107. Copies of these reports are included in Appendix D.

All holes were abandoned in accordance with the Revised Special Stipulations for Shallow Temperature Gradient Holes of the U. S. Geological Survey, the Environmental Stipulations of the Bureau of Land Management, and the Stipulations of the U. S. Forest Service by: (a) cutting off the 3/4 inch pipe 6 inches below ground level; (b) filling the top 10 feet of the pipe with cement; (c) covering the pipe with dirt and (d) restoring the site as nearly as possible to original condition. Abandonment of all holes was completed in November, 1977. A compliance check was scheduled for the week of

November 14, 1977, by an Authorized Officer of the Bureau of Land Management. Copies of the Notice of Completion and the release of liability will be forwarded in a supplemental letter.

Drilling conditions were variable. Those holes drilled in sediments tended to be unstable and had a tendency to cave in. Surprisingly, loss of circulation was not a great problem. Several holes encountered hard volcanic rocks. This slowed penetration rates considerably; in one instance only 10 feet of hole was completed in one day. Drill bits wore out quickly; bit life in these holes was 100 feet or less. The major problem in the Prospect area was the lack of access to some key areas, particularly around Socorro Peak. These areas are characterized by steep, narrow roads which are not negotiable by a drill rig of the size required to effectively drill these hard rocks.

RESULTS

In the area of the Socorro Prospect, rock types varied from unconsolidated Quaternary alluvium to dense volcanic rocks. Hole depths ranged from 61 to 440 feet and drilling time was between one and five days. Average total depth was 288 feet and average drilling time was about three days. As previously noted, due to the state of the terrain and subsurface, drilling conditions were variable.

Geothermal gradients from the fourteen boreholes ranged from 0.32 to 7.58 °F/100 ft (Table 1). The relative magnitude of the geothermal gradients can be seen in the composite of the estimated equilibrium temperature profiles presented in Figure 3. The linearity of the gradients for these holes (Fig. 3 and Appendix A) suggests that heat transport in the shallow subsurface penetrated by these boreholes is predominately by conduction; however, the magnitude of the geothermal gradients for some of the boreholes (e.g., holes No. 5-77-B19 and -B21) indicates that these boreholes are disturbed by groundwater movement. The average geothermal gradients for all fourteen holes are plotted on Figure 4 enclosed at the back of this report.

Using a divided-bar cell apparatus, thermal conductivity measurements (Appendix B) were made on a total of 76 samples of drill cuttings collected at various depths from the holes. The thermal conductivities ranged from 3.6 to 7.6 mcal/cm-sec-°C. These values are for samples identified as rock types ranging from clays to acidic volcanics and are correlative with published thermal conductivities. The average thermal conductivity for each borehole over the depth interval from which the geothermal gradient was selected is presented in Table 1.

Heat flow values (Table 1) were calculated by multiplying the average thermal conductivity for each hole by the geothermal gradient over the sampled interval. Individual heat flow values range from 0.3 to 5.4 HFU (1 HFU = 1 μ cal/cm²-sec). The heat flow values are plotted on Figure 5 at the back of this report.

DISCUSSION AND CONCLUSIONS

The Socorro Prospect is situated in the Rio Grande Rift in central New Mexico. The Rio Grande Rift, which has developed since the late Miocene, is an area of extensive volcanism and young extensional tectonics (Chapin and Seager, 1975). The Socorro Mountain block and the Socorro cauldron are covered by silicic volcanics and exhibit several young silicic volcanic centers. Modern uplift has been observed in the Socorro area (Reilinger and Oliver, 1976) over a postulated magma chamber lying at a depth of about 11 mi (Sanford, et al., 1973). Several thermal springs having temperatures of about 90°F are present on the eastern slope of the Socorro Mountain block (Sanford, 1977).

Within the Socorro area anomalously high heat flow values have been observed. The results of previous heat flow work in the immediate vicinity of the Socorro Prospect are presented in Table 2 and are included on two of the figures at the back of this report. The geothermal gradients at these seven locations range from 2.09 to 13.3 °F/100 ft while the thermal conductivities vary from 4.0 to 7.3 mcal/cm-sec-°C resulting in heat flows of 2.2 to 12. HFU. In addition to these published heat flow values, Clark and Summers (1971) have published a considerable amount of data on the hydrology, geochemistry, and subsurface temperatures of wells and springs in the area of this Prospect.

Based on the published data (Table 2) as well as the results of the present survey (Table 1), a value of about 2.5 HFU is probably representative of the background heat flow in the area of the Socorro Prospect. A surface heat flow of 2.5 HFU implies partial melting in the lower crust and upper

TABLE 2. PUBLISHED HEAT FLOW BOREHOLE DATA
SOCORRO PROSPECT, NEW MEXICO
GTS JOB NO. 5-77

HOLE NO	ELEVATION (feet)	TOTAL DEPTH (feet)	GEOHERMAL GRADIENT (°F/100 ft)	GRADIENT INTERVAL (feet)	THERMAL CONDUCTIVITY (mcal/cm-sec-°C)	NO. OF SAMPLES	HEAT FLOW (HFU)
NY1 ¹	8500	920	2.16	492-920	6.3	7	2.5
CD1 ¹	5030	525	2.09	230-525	5.9	6	2.2
SP1 ²	5120	167	8.72	36-167	7.3	7	12.
SP2 ³	4950	68	13.2	35-68	4.0	1	9.6
SP3 ³	4960	70	13.3	40-70	4.0*	0	9.7
BC1 ³	5320	130	8.88	40-130	4.0*	0	6.5
BC2 ³	5300	100	9.23	40-100	4.0*	0	6.7

*Assumed value

¹Data adapted from Reiter, et al., 1975.

²Data adapted from Reiter and Smith, 1977 for Socorro Peak East No. 1.

³Data adapted from Sanford, 1977 for holes No. 4, 5, 7 and 8.

mantle beneath the Prospect but does not indicate the presence of an economic geothermal deposit. With a background heat flow of 2.5 HFU, any determinations less than 1.8 HFU and greater than 8.0 HFU are most likely caused by convective heat transfer due to cold or warm groundwater circulating in the shallow subsurface. At least eight of the fourteen boreholes (holes No. 5-77-B1, -B12, -B19, -B21, -B22, -B23, -F3, and -F4) of the present project are disturbed by groundwater circulation. The influx of cold groundwater is evident because of the low heat flow values. Four of the boreholes (holes No. 5-77-B2, -B9, -B15, and -B16) appear to be good data points; however, they do not indicate the existence of a commercial geothermal deposit in this portion of the Socorro Prospect. Since six of the boreholes in the southwestern part of the Prospect are distorted by groundwater influx, the heat flow data is inconclusive as to the prospect quality. The seventh borehole (hole No. 5-77-F1) with a heat flow of 2.6 HFU is quite comparable to the published value of 2.5 HFU (Reiter, et al., 1975) at the far southwestern corner of the Prospect. However, the value of 2.6 HFU is probably representative of background heat flow in the area as noted above.

Although the first three temperature surveys in borehole No. 5-77-B20 indicate a geothermal gradient of about 7.5 °F/100 ft below a depth of 100 feet (Appendix A and C), the fourth survey yields a geothermal gradient of 2.1 °F/100 ft. The fourth temperature survey appears to be disturbed by groundwater entry at about 120 feet into the annulus between the 3/4 inch pipe and the 4 3/4 inch diameter hole. This hypothesis of groundwater entry is supported by the data from most of the other boreholes in this portion

of the Prospect as well as by the occurrence of precipitation between the third survey in July and the fourth taken in November.

The heat flow determination of 5.4 HFU in borehole No. 5-77-B20 appears to be a good data point and could indicate a prospect of commercial quality. Furthermore, values greater than 5 HFU are representative of heat flow values obtained over commercially productive geothermal fields.

Heat flow values greater than 3 HFU require either melting within the shallow crust or convective transport of heat by water or magma. Because the Rio Grande Rift is an area of late Tertiary to Quaternary volcanism and extensional tectonics, the high heat flow is probably caused by the transient effects of fairly recent multiple intrusions in the shallow crust. Furthermore, geological models that employ the transient effects of recent crustal or upper mantle intrusions are preferred to explain the relatively sharp boundary of the heat flow anomaly. Therefore, one of the important questions in evaluating the commercial geothermal potential of this Prospect is whether any of the crustal intrusions penetrated near enough to the surface in the area of the Socorro Prospect to be presently functioning as a heat source for an economic geothermal system.

RECOMMENDATIONS

We recommend that a second phase project of closely-spaced heat flow boreholes be drilled on the Socorro Prospect to more accurately determine the lateral extent of the high heat flow zone characterized by hole No. 5-77-B20. In order to avoid potential problems caused by groundwater circulation, these additional holes should be sufficiently budgeted to insure reaching a target depth of at least 500 feet and to include grouting of the pipe from total depth to the surface.

Additional shallow holes, even to 500 feet, would probably be of little value in the area of groundwater disturbance in the southwestern portion of the Socorro Prospect. Either deeper holes (to 1500 feet) or some other geophysical technique will be necessary to complete the evaluation.

Upon request, we at GTS would be pleased to be involved in any of the follow-on planning, decision making, and drilling and logging of any additional shallow and/or intermediate depth heat flow boreholes.

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Prepared by:

Steve Quiett
Vice President, Operations

Jim Combs
California Registered Geophysicist GP#664
Vice President, Research & Development

GeoThermal Services, Inc.
10072 Willow Creek Road
San Diego, California 92131

November, 1977

APPENDIX A

ESTIMATED EQUILIBRIUM TEMPERATURE PROFILES
WITH PRELIMINARY TEMPERATURE/DEPTH PROFILES

GTS JOB NO. 5-77

TEMPERATURE (°F)

40 50 60 70 80 90 100 110

0

100

200

PTH

300

400

500

TD 250'

ESTIMATED EQUILIBRIUM PROFILE

HOLE NO. 5-77-B1

$\Delta T/\Delta Z \approx 1.37$ °F/100'

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

TEMPERATURE (°F)

40 50 60 70 80 90 100 110

0

100

200

300

400

500

DEPTH

ESTIMATED EQUILIBRIUM PROFILE

HOLE NO. 5-77-B2

$\Delta T / \Delta Z = 3.18$ °F/100'

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

TD 440'

TEMPERATURE (°F)

40 50 60 70 80 90 100 110

0

100

200

300

400

500

DEPTH (FT)

TD 249'

ESTIMATED EQUILIBRIUM PROFILE

HOLE NO. 5-77-B9

$\Delta T/\Delta Z \approx 3.94$ °F/100'

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

TEMPERATURE (°F)

40 50 60 70 80 90 100 110

100

200

300

400

500

DEPTH (FT)

TD - 249'

PRELIMINARY PROFILE

HOLE NO. S-77-B-9

$\Delta T / \Delta Z \equiv$ °F/100'

DRILLED -

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

● 6/8/77 ▲ 6/10/77 ■ 6/16/77 ○ 7/27/77

TEMPERATURE (°F)

40

50

60

70

80

90

100

110

0

100

200

300

400

500

DEPTH (FT)

TD 230'

ESTIMATED EQUILIBRIUM PROFILE

HOLE NO. 5-77-B12

$\Delta T/\Delta Z \approx 2.16$ °F/100'

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

TEMPERATURE (°F)

40

50

60

70

80

90

100

110

0

100

200

300

400

500

DEPTH (FT)

PRELIMINARY PROFILE

HOLE NO. 5-77-B-12

$\Delta T / \Delta Z \approx$ °F/100'

DRILLED—

GEO THERMAL SERVICES, INC.

SAN DIEGO, CALIFORNIA

T.D. - 230'

• 6/6/77 ▲ 6/8/77 ■ 6/14/77 ○ 7/28/77

TEMPERATURE (°F)

40 50 60 70 80 90 100 110

0

100

200

300

400

500

DEPTH (FT)

TD 260'

ESTIMATED EQUILIBRIUM PROFILE

HOLE NO. 5-77-B15

$\Delta T / \Delta Z \approx 2.99$ °F/100'

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

TEMPERATURE (°F)

40 50 60 70 80 90 100 110

0

100

200

300

400

500

TD-260'

PRELIMINARY PROFILE

HOLE NO. 5-77-B-15

$\Delta T/\Delta Z \approx$ °F/100'

DRILLED-

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

▲ 5/24/77 ▲ 7/11/77 ■ 7/17/77 ○ 7/28/77

TEMPERATURE (°F)

40 50 60 70 80 90 100 110

0

100

200

300

400

500

DEPTH (FT)

TD 320'

ESTIMATED EQUILIBRIUM PROFILE

HOLE NO. 5-77-B16

$\Delta T/\Delta Z \approx 2.36$ °F/100'

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

TEMPERATURE (°F)

40

50

60

70

80

90

100

110

0

100

200

300

400

500

Depth (ft)

TEMPERATURE (°F)

40 50 60 70 80 90 100 110

0

100

200

300

400

500

DEPTH (FT)

TD 380

ESTIMATED EQUILIBRIUM PROFILE

HOLE NO. 5-77-B19

$\Delta T/\Delta Z \approx 0.96$ °F/100'

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

TEMPERATURE (°F)

40

50

60

70

80

90

100

110

0

100

200

300

400

500

DEPTH (FT)

TD-378'

PRELIMINARY PROFILE

HOLE NO. 5-77-B-19

$\Delta T / \Delta Z \approx$

°F/100'

DRILLED-

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

• 7/1/77 ▲ 7/2/77 ■ 7/9/77 ○ 11/6/77

TEMPERATURE (°F)

40

50

60

70

80

90

100

110

0

100

200

300

400

500

DEPTH (FT)

TD 380'

ESTIMATED EQUILIBRIUM PROFILE

HOLE NO. 5-77-B20

$\Delta T/\Delta Z \approx 7.58$ °F/100'

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

TEMPERATURE (°F)

40

50

60

70

80

90

100

110

0

100

200

300

400

DEPTH (FT)

500

PRELIMINARY PROFILE

HOLE NO. 5-77-B-20

$\Delta T / \Delta Z = 7.0$ °F/100'

DRILLED—

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

TD-240'

● 6/28/77 ▲ 6/30/77 ■ 7/6/77 ○ 11/6/77

TEMPERATURE (°F)

40 50 60 70 80 90 100 110

0

100

200

300

400

500

TD 381'

ESTIMATED EQUILIBRIUM PROFILE

HOLE NO. 5-77-B21

$\Delta T/\Delta Z \approx 0.32$ °F/100'

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

TEMPERATURE (°F)

40

50

60

70

80

90

100

110

0

100

200

300

400

500

DEPTH (FT)

PRELIMINARY PROFILE

HOLE NO. 5-77-B-21

$\Delta T / \Delta Z \approx$ °F/100'

DRILLED-

GEO THERMAL SERVICES, INC.

SAN DIEGO, CALIFORNIA

● 6/17/77 ▲ 6/19/77 ■ 6/25/77 ○ 11/10/77

TEMPERATURE (°F)

40 50 60 70 80 90 100 110

0

TD 61'

100

200

300

400

500

ESTIMATED EQUILIBRIUM PROFILE

HOLE NO. 5-77-B22

$\Delta T/\Delta Z \approx 1.86$ °F/100'

GEO THERMAL SERVICES, INC.

SAN DIEGO, CALIFORNIA

TEMPERATURE (°F)

40

50

60

70

80

90

100

110

0

100

200

300

400

500

DEPTH (FT)

T.D. - 61'

PRELIMINARY PROFILE

HOLE NO. 5-77-B-22

$\Delta T/\Delta Z \equiv$ °F/100'

DRILLED-

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

● 6/12/77 ▲ 6/14/77 ■ 6/22/77 ○ 11/5/77

TEMPERATURE (°F)

40

50

60

70

80

90

100

110

0

100

200

300

400

500

TD 300'

ESTIMATED EQUILIBRIUM PROFILE

HOLE NO. 5-77-B23

$\Delta T/\Delta Z \approx 2.16$ °F/100'

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

TEMPERATURE (°F)

40

50

60

70

80

90

100

110

0

100

200

300

400

500

TD 320'

ESTIMATED EQUILIBRIUM PROFILE

HOLE NO. 5-77-F1

$\Delta T/\Delta Z \approx 2.27$ °F/100'

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

TEMPERATURE (°F)

40 50 60 70 80 90 100 110

0

100

200

300

400

500

DEPTH (FT)

PRELIMINARY PROFILE

HOLE NO. 5-77-F-1

$\Delta T / \Delta Z \approx 2.0$ °F/100'

DRILLED—

GEO THERMAL SERVICES, INC.

SAN DIEGO, CALIFORNIA

TD-320'

● 7/23/77 ▲ 7/25/77 ■ 11/9/77

TEMPERATURE (°F)

40 50 60 70 80 90 100 110

0

100

200

300

400

500

DEPTH (FT)

TD 286'

ESTIMATED EQUILIBRIUM PROFILE

HOLE NO. 5-77-F3

$\Delta T/\Delta Z \approx 1.68$ °F/100'

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

TEMPERATURE (°F)

40

50

60

70

80

90

100

110

0

100

200

300

400

500

DEPTH (FT)

TD-276'

PRELIMINARY PROFILE

HOLE NO. 5-77-F-3

$\Delta T/\Delta Z = 0.8$ °F/100'

DRILLED-

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

● 7/23/77 ▲ 7/25/77 ■ 11/9/77

TEMPERATURE (°F)

40 50 60 70 80 90 100 110

0

100

200

300

400

500

TD 315'

ESTIMATED EQUILIBRIUM PROFILE

HOLE NO. 5-77-F4

$\Delta T/\Delta Z \approx 1.24$ °F/100'

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

TEMPERATURE (°F)

40

50

60

70

80

90

100

110

0

100

200

DEPTH (FT)

300

400

500

PRELIMINARY PROFILE

HOLE NO. 5-77-F-4

$\Delta T / \Delta Z \approx 0.7$

°F/100'

DRILLED-

GEO THERMAL SERVICES, INC.
SAN DIEGO, CALIFORNIA

● 7/10/77 ▲ 7/12/77 ■ 7/14/77 ○ 11/7/77

APPENDIX B

THERMAL CONDUCTIVITY DATA

GTS JOB NO. 5-77

THERMAL CONDUCTIVITY DATA

GTS JOB NO. 5-77 - SOCORRO PROSPECT, NEW MEXICO

HOLE NUMBER	DEPTH (feet)	ASSUMED POROSITY (%)	THERMAL CONDUCTIVITY (mcal/cm-sec-°C)
5-77-B1	50	20	4.2
5-77-B1	100	20	4.1
5-77-B1	150	20	3.7
5-77-B1	200	15	4.1
5-77-B1	250	15	4.0
5-77-B2	240	15	5.8
5-77-B2	290	15	5.5
5-77-B2	340	15	5.6
5-77-B2	390	15	5.4
5-77-B2	440	15	5.6
5-77-B9	50	20	3.7
5-77-B9	50	20	3.8
5-77-B9	100	20	3.7
5-77-B9	100	20	3.7
5-77-B9	150	20	4.1
5-77-B9	150	20	3.7
5-77-B9	200	15	4.3
5-77-B9	200	15	3.8
5-77-B9	245	15	4.7
5-77-B9	245	15	4.2
5-77-B12	50	20	4.2
5-77-B12	50	20	4.2
5-77-B12	100	20	4.0
5-77-B12	100	20	4.1

THERMAL CONDUCTIVITY DATA

GTS JOB NO. 5-77 - SOCORRO PROSPECT, NEW MEXICO

HOLE NUMBER	DEPTH (feet)	ASSUMED POROSITY (%)	THERMAL CONDUCTIVITY (mcal/cm-sec-°C)
5-77-B12	150	20	3.7
5-77-B12	150	20	4.3
5-77-B12	200	15	4.3
5-77-B12	200	15	4.6
5-77-B12	230	15	4.5
5-77-B12	230	15	4.8
5-77-B15	60	20	4.4
5-77-B15	110	20	4.3
5-77-B15	160	20	4.7
5-77-B15	210	15	4.5
5-77-B15	260	15	4.8
5-77-B16	120	20	4.2
5-77-B16	170	20	4.6
5-77-B16	220	15	4.5
5-77-B16	270	15	5.2
5-77-B16	320	15	4.6
5-77-B19	180	20	4.4
5-77-B19	230	15	4.8
5-77-B19	280	15	5.0
5-77-B19	330	15	4.7
5-77-B19	380	15	5.1
5-77-B20	90	20	4.2
5-77-B20	150	20	3.6
5-77-B20	150	20	3.9

THERMAL CONDUCTIVITY DATA

GTS JOB NO. 5-77 - SOCORRO PROSPECT, NEW MEXICO

HOLE NUMBER	DEPTH (feet)	ASSUMED POROSITY (%)	THERMAL CONDUCTIVITY (mcal/cm-sec-°C)
5-77-B20	200	15	3.9
5-77-B21	180	20	5.2
5-77-B21	230	15	5.4
5-77-B21	280	15	5.0
5-77-B21	330	15	5.4
5-77-B21	381	15	5.1
5-77-B22	61	20	4.3
5-77-B23	100	20	4.2
5-77-B23	150	20	4.1
5-77-B23	200	15	4.4
5-77-B23	250	15	4.0
5-77-B23	300	15	3.9
5-77-F1	120	20	5.4
5-77-F1	170	20	5.4
5-77-F1	220	15	6.2
5-77-F1	270	15	6.4
5-77-F1	320	15	7.5
5-77-F1	320	15	6.6
5-77-F3	90	20	4.8
5-77-F3	140	20	4.9
5-77-F3	190	20	5.2
5-77-F3	240	15	5.3
5-77-F3	286	15	5.2
5-77-F4	110	20	5.2

THERMAL CONDUCTIVITY DATA

GTS JOB NO. 5-77 - SOCORRO PROSPECT, NEW MEXICO

HOLE NUMBER	DEPTH (feet)	ASSUMED POROSITY (%)	THERMAL CONDUCTIVITY (mcal/cm-sec-°C)
5-77-F4	160	20	5.5
5-77-F4	210	15	5.6
5-77-F4	260	15	5.8
5-77-F4	315	15	5.5

APPENDIX C

INDIVIDUAL TEMPERATURE SURVEYS, LITHOLOGIC AND
GEOPHYSICAL LOGS, INCLUDING SELF-POTENTIAL, ELECTRICAL
RESISTANCE, CONTINUOUS TEMPERATURE AND NATURAL GAMMA

GTS JOB NO. 5-77

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B1 TD 250'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B1
RUN NO. 1
DATE 6-9-77
TIME:
START 9:00 A.M.
END 9:45 A.M.
SENSOR SERIAL NO.
376
OPERATOR
Michael R. Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	92.30	74.06	280			550		
20	111.64	66.91	290			560		
30	109.34	67.69	300			570		
40	108.43	68.00	310			580		
50	108.54	67.96	320			590		
60	107.88	68.17	330			600		
70	107.58	68.27	340			610		
80	106.99	68.48	350			620		
90	106.72	68.59	360			630		
100	106.57	68.62	370			640		
110	106.46	68.66	380			650		
120	106.28	68.73	390			660		
130	105.76	68.90	400			670		
140	105.20	69.12	410			680		
150	105.61	68.98	420			690		
160	105.89	68.87	430			700		
170	105.80	68.90	440			710		
180	105.71	68.94	450			720		
190	105.34	69.08	460			730		
200	104.84	69.26	470			740		
210	104.75	69.26	480			750		
220	104.35	69.40	490			760		
230	104.22	69.48	500			770		
240	103.92	69.58	510			780		
250 TD.	103.72	69.66	520			790		
260			530			800		
270			540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B1 TD 250'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B1
RUN NO. 2
DATE 6-11-77
TIME: START 6:00 P.M.
END 6:30 P.M.
SENSOR SERIAL NO. 376
OPERATOR Michael R Glascock

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	112.40	66.65	280			550		
20	115.78	65.54	290			560		
30	111.93	66.81	300			570		
40	111.16	67.05	310			580		
50	110.96	67.11	320			590		
60	110.31	67.35	330			600		
70	109.85	67.48	340			610		
80	109.33	67.69	350			620		
90	109.00	67.79	360			630		
100	108.75	67.86	370			640		
110	108.56	67.93	380			650		
120	108.30	68.03	390			660		
130	107.91	68.17	400			670		
140	107.78	68.20	410			680		
150	107.41	68.34	420			690		
160	107.14	68.45	430			700		
170	106.84	68.55	440			710		
180	106.64	68.62	450			720		
190	106.30	68.73	460			730		
200	106.02	68.83	470			740		
210	105.73	68.94	480			750		
220	105.32	69.08	490			760		
230	104.99	69.19	500			770		
240	104.62	69.33	510			780		
250	104.31	69.44	520			790		
260			530			800		
270			540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B1 TD 250'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B1

RUN NO. 3

DATE 6-17-77

TIME:

START 1:30 P.M.

END 2:10 P.M.

SENSOR SERIAL NO.
376

OPERATOR
Michael R Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	117.50	65.00	280			550		
20	118.43	64.72	290			560		
30	113.76	66.19	300			570		
40	112.76	66.52	310			580		
50	112.29	66.68	320			590		
60	111.70	66.88	330			600		
70	111.20	67.05	340			610		
80	110.63	67.25	350			620		
90	110.20	67.38	360			630		
100	109.82	67.52	370			640		
110	109.45	67.62	380			650		
120	108.99	67.79	390			660		
130	108.69	67.89	400			670		
140	108.36	68.00	410			680		
150	108.05	68.10	420			690		
160	107.66	68.24	430			700		
170	107.28	68.38	440			710		
180	106.92	68.52	450			720		
190	106.48	68.66	460			730		
200	106.14	68.80	470			740		
210	105.75	68.90	480			750		
220	105.36	69.05	490			760		
230	105.04	69.19	500			770		
240	104.68	69.30	510			780		
250 TD	104.40	69.40	520			790		
260			530			800		
270			540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B1 TD 250'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B1
RUN NO. 4 Abandoned

DATE 7-27-77

TIME:
START 8:00 A.M.
END 8:35 A.M.

SENSOR SERIAL NO.
376

OPERATOR
Michael R. Blascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	109.00	67.79	280			550		
20	119.53	64.38	290			560		
30	115.57	65.61	300			570		
40	114.04	66.12	310			580		
50	113.54	66.29	320			590		
60	112.99	66.45	330			600		
70	112.44	66.65	340			610		
80	111.92	66.81	350			620		
90	111.47	66.95	360			630		
100	111.08	67.08	370			640		
110	110.59	67.25	380			650		
120	110.25	67.35	390			660		
130	109.92	67.48	400			670		
140	109.50	67.62	410			680		
150	109.20	67.72	420			690		
160	108.80	67.86	430			700		
170	108.44	68.00	440			710		
180	108.03	68.13	450			720		
190	107.58	68.27	460			730		
200	107.20	68.41	470			740		
210	106.78	68.55	480			750		
220	106.51	68.66	490			760		
230	106.21	68.76	500			770		
240	105.76	68.90	510			780		
250	105.46	69.01	520			790		
260			530			800		
270			540			810

REMARKS _____

[illegible]

HOLE NO. 31

LOG HEADING

HOLE NO. 5-77-B1	TIME START: 8:30 AM END: 9:30 AM	REFERENCE MAP 5-77	NOTES: Temp Rtg: 100 TC: 1 Pos: 3.32 V.S: 0.73
UNIT NO. 5GT85	NOMINAL HOLE DIAMETER 4 3/4 IN.		
OPERATOR(S) Michael R. Gassner	DRILLING MEDIUM 4.6		
DATE 6/3/77	TYPE OF MUD Bentonite		
DRILLED DEPTH 330 FT. ELEVATION 4930 FT.	GROUND WATER (?) DEPTH(S)		
NUCLEAR RADIATION		INSTRUMENTATION	ELECTRIC LOG

HOLE NUMBER	1	2	3	PROBE NUMBER	5055	DEPTH (INTERVAL)	13.250 ft.
DEPTH (INTERVAL) Ft.	0-250			TYPE	Trap	RESISTANCE	20 Ohms
RANGE	C.P.S. 0-200			PROBE NUMBER	5382	S.P.	100 MV
TIME CONSTANT	Sec. 1			TYPE	Grout	VERTICAL SCALE	10 Ft./in.
LOGGING SPEED Ft./Min.	20			REMARKS:		FLUID LEVEL	43.76
VERTICAL SCALE Ft./in.	10					TEMPERATURE	
DIGITAL RECORD?	-					DEPTH (INTERVAL)	0-250 Ft.
						RANGE	10-70 Ohms
						VERTICAL SCALE	10 Ft./in.
						LOGGING SPEED	2 Ft./Min.

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B-2 TD 440'
REFERENCE MAP S-77
REMARKS _____

HOLE NO. B-2
RUN NO. 1
DATE 5-24-77
TIME:
START 3:00 P.M.
END 4:00 P.M.
SENSOR SERIAL NO.
376
OPERATOR
Michael R Glascock

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	112.46	66.61	280	86.88	76.37	550		
20	110.91	67.15	290	86.25	76.65	560		
30	105.91	68.87	300	85.73	76.88	570		
40	104.58	69.33	310	85.01	77.21	580		
50	103.63	69.69	320	84.39	77.49	590		
60	102.81	69.98	330	83.89	77.72	600		
70	101.83	70.35	340	83.23	78.02	610		
80	100.84	70.72	350	82.54	78.34	620		
90	100.07	70.98	360	81.85	78.67	630		
100	99.15	71.34	370	81.19	78.98	640		
110	98.38	71.64	380	80.52	79.30	650		
120	97.51	71.97	390	79.88	79.61	660		
130	96.78	72.26	400	79.20	79.94	670		
140	96.06	72.54	410	78.66	80.24	680		
150	95.35	72.82	420	77.93	80.57	690		
160	94.67	73.09	430	77.29	80.89	700		
170	93.99	73.37	440 T.D.	76.68	81.20	710		
180	93.44	73.59	450			720		
190	92.82	73.84	460			730		
200	92.15	74.12	470			740		
210	91.58	74.36	480			750		
220	90.86	74.66	490			760		
230	90.21	74.93	500			770		
240	89.59	75.19	510			780		
250	88.88	75.50	520			790		
260	88.17	75.81	530			800		
270	87.51	76.09	540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B-3 TD 440'
REFERENCE MAP S-77
REMARKS _____

HOLE NO. B-2
RUN NO. 2
DATE 5-26-77
TIME: START 7:30 P.M.
END 8:30 P.M.
SENSOR SERIAL NO. 376
OPERATOR Michael R. Glascock

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	113.80	66.19	280	86.75	76.43	550		
20	115.10	65.77	290	86.10	76.72	560		
30	109.55	67.59	300	85.46	77.00	570		
40	107.60	68.27	310	84.80	77.30	580		
50	106.25	68.73	320	84.17	77.59	590		
60	105.17	69.12	330	83.55	77.87	600		
70	104.09	69.51	340	82.94	78.16	610		
80	102.99	69.91	350	82.28	78.46	620		
90	101.96	70.28	360	81.61	78.78	630		
100	101.00	70.65	370	80.93	79.10	640		
110	100.15	70.95	380	80.26	79.43	650		
120	99.35	71.27	390	79.59	79.75	660		
130	98.30	71.67	400	78.99	80.04	670		
140	97.59	71.94	410	78.37	80.35	680		
150	96.84	72.23	420	77.67	80.70	690		
160	95.94	72.59	430	77.05	81.01	700		
170	95.17	72.89	440 TD	76.48	81.30	710		
180	94.41	73.20	450			720		
190	93.53	73.55	460			730		
200	92.66	73.91	470			740		
210	91.89	74.23	480			750		
220	91.11	74.55	490			760		
230	90.32	74.88	500			770		
240	89.56	75.21	510			780		
250	88.87	75.50	520			790		
260	88.11	75.83	530			800		
270	87.46	76.11	540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B2 TD 440'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B2
RUN NO. 3
DATE 6-1-77
TIME: START 6:00 P.M.
END 7:00 P.M.
SENSOR SERIAL NO. 376
OPERATOR Michael R Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	112.00	66.78	280	87.19	76.23	550		
20	116.20	65.42	290	86.48	76.55	560		
30	110.80	67.18	300	85.80	76.85	570		
40	108.61	67.93	310	85.11	77.16	580		
50	107.40	68.34	320	84.43	77.47	590		
60	106.34	68.73	330	83.78	77.77	600		
70	105.24	69.12	340	83.14	78.06	610		
80	103.96	69.55	350	82.45	78.38	620		
90	102.82	69.98	360	81.80	78.69	630		
100	101.94	70.31	370	81.11	79.02	640		
110	101.01	70.65	380	80.46	79.33	650		
120	100.07	70.98	390	79.80	79.65	660		
130	99.07	71.37	400	79.17	79.96	670		
140	98.23	71.70	410	78.53	80.27	680		
150	97.43	72.00	420	77.91	80.58	690		
160	96.45	72.39	430	77.29	80.89	700		
170	95.69	72.69	440 TD	76.75	81.16	710		
180	94.85	73.02	450			720		
190	93.97	73.38	460			730		
200	93.15	73.71	470			740		
210	92.36	74.03	480			750		
220	91.65	74.33	490			760		
230	90.84	74.67	500			770		
240	90.11	74.97	510			780		
250	89.40	75.28	520			790		
260	88.59	75.62	530			800		
270	87.89	75.93	540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B2 TD 440'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B2
RUN NO. 4 Abandoned
DATE 7-27-77
TIME:
START 11:00 A.M.
END 12:00 P.M.
SENSOR SERIAL NO.
376
OPERATOR
Michael R. Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	102.30	70.17	280	88.01	75.87	550		
20	114.74	65.90	290	87.31	76.18	560		
30	112.04	66.78	300	86.60	76.49	570		
40	109.67	67.55	310	85.92	76.80	580		
50	108.34	68.03	320	85.25	77.10	590		
60	107.20	68.41	330	84.58	77.40	600		
70	106.10	68.80	340	83.92	77.70	610		
80	104.96	69.19	350	83.25	78.01	620		
90	103.83	69.62	360	82.61	78.31	630		
100	102.84	69.98	370	81.92	78.63	640		
110	101.77	70.35	380	81.28	78.94	650		
120	100.94	70.68	390	80.63	79.25	660		
130	100.04	71.02	400	80.01	79.55	670		
140	99.13	71.35	410	79.39	79.85	680		
150	98.34	71.65	420	78.76	80.16	690		
160	97.43	72.00	430	78.15	80.46	700		
170	96.59	72.33	440 TD	77.64	80.72	710		
180	95.78	72.65	450			720		
190	94.92	72.99	460			730		
200	94.08	73.33	470			740		
210	93.29	73.65	480			750		
220	92.56	73.95	490			760		
230	91.71	74.30	500			770		
240	90.97	74.61	510			780		
250	90.24	74.92	520			790		
260	89.42	75.27	530			800		
270	88.72	75.57	540			810

REMARKS _____

[illegible]

LOG HEADING

HOLE NO. 5-77-82	TIME START 11:00 AM END 12:30 PM	REFERENCE MAP 5-77	NOTES: Top 100 81 832 65 218
UNIT NO. 56755	NOMINAL HOLE DIAMETER 1 3/8 IN.		
OPERATOR(S) Michel R. Basso	DRIILLING MEDIUM H ₂ O		
DATE 5-23-77	TYPE OF MUD: Bentonite		
DRILLED DEPTH 440' FT. ELEVATION 3210 FT.	GROUND WATER (H) DEPTH(S)		

NUCLEAR RADIATION			INSTRUMENTATION		ELECTRIC LOG	
RUN NUMBER	1	2	3	PROBE NUMBER	3005	DEPTH (INTERVAL) 37-440' FT.
DEPTH (INTERVAL) FT.	0-440'			TYPE	6-2	RESISTANCE 20 ohms
RANGE C.P.S.	0-200			PROBE NUMBER	3008	S.P. 100 M.V.
TIME CONSTANT Sec.	2			TYPE	6-2	VERTICAL SCALE 10 FT./in.
LOGGING SPEED Ft./Min.	20			REMARKS		FLUID LEVEL 87 FT.
VERTICAL SCALE Ft./in.	10					TEMPERATURE
DIGITAL RECORD?	—					DEPTH (INTERVAL) 0-440' FT.
						RANGE 405-90.9°F
						VERTICAL SCALE 10° FT./in.
						LOGGING SPEED 25 FT./min.

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B9 TD 249'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B9
RUN NO. 1
DATE 6-8-77
TIME: START 7:00 P.M.
END 7:30 P.M.
SENSOR SERIAL NO. 376
OPERATOR Michael R Glascock

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	119.70	64.32	280			550		
20	117.13	65.13	290			560		
30	113.31	66.35	300			570		
40	111.80	66.85	310			580		
50	110.93	67.15	320			590		
60	109.96	67.45	330			600		
70	109.03	67.79	340			610		
80	108.10	68.10	350			620		
90	107.20	68.41	360			630		
100	106.21	68.76	370			640		
110	105.36	69.05	380			650		
120	104.40	69.40	390			660		
130	103.50	69.73	400			670		
140	102.53	70.09	410			680		
150	101.49	70.46	420			690		
160	100.44	70.87	430			700		
170	99.42	71.24	440			710		
180	98.22	71.70	450			720		
190	97.16	72.11	460			730		
200	96.24	72.47	470			740		
210	95.28	72.85	480			750		
220	94.34	73.23	490			760		
230	93.47	73.58	500			770		
240	92.58	73.94	510			780		
250	91.84	74.25	520			790		
260	TD. 249'		530			800		
270			540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B9 TD 249'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B9
RUN NO. 2
DATE 6-10-77
TIME: START 5:00 P.M.
END 5:30 P.M.
SENSOR SERIAL NO. 376
OPERATOR Michael R Glasgow

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	117.90	64.88	280			550		
20	119.83	64.29	290			560		
30	115.52	65.64	300			570		
40	114.23	66.06	310			580		
50	113.37	66.32	320			590		
60	112.25	66.68	330			600		
70	111.02	67.11	340			610		
80	109.90	67.48	350			620		
90	108.76	67.86	360			630		
100	107.49	68.31	370			640		
110	106.48	68.66	380			650		
120	105.42	69.05	390			660		
130	104.44	69.40	400			670		
140	103.44	69.76	410			680		
150	102.49	70.09	420			690		
160	101.44	70.50	430			700		
170	100.39	70.87	440			710		
180	99.24	71.31	450			720		
190	98.17	71.72	460			730		
200	97.15	72.11	470			740		
210	96.19	72.49	480			750		
220	95.26	72.86	490			760		
230	94.31	73.24	500			770		
240	93.41	73.60	510			780		
250	92.77	73.86	520			790		
260	T.D. 249'		530			800		
270			540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B9 TD 249'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B9
RUN NO. 3
DATE 6-16-77
TIME:
START 3:00 P.M.
END 3:30 P.M.
SENSOR SERIAL NO.
376
OPERATOR
Michael R Glascock

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	120.52	64.07	280			550		
20	121.24	63.86	290			560		
30	116.60	65.29	300			570		
40	115.08	65.77	310			580		
50	114.17	66.06	320			590		
60	113.12	66.42	330			600		
70	111.85	66.81	340			610		
80	110.68	67.21	350			620		
90	109.56	67.59	360			630		
100	108.36	68.00	370			640		
110	107.24	68.41	380			650		
120	106.14	68.80	390			660		
130	105.03	69.19	400			670		
140	103.93	69.58	410			680		
150	102.88	69.95	420			690		
160	101.86	70.31	430			700		
170	100.76	70.72	440			710		
180	99.61	71.17	450			720		
190	98.57	71.57	460			730		
200	97.54	71.96	470			740		
210	96.62	72.32	480			750		
220	95.64	72.71	490			760		
230	94.69	73.09	500			770		
240	93.75	73.46	510			780		
250	92.99	73.77	520			790		
260	249' T.D.		530			800		
270			540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B9 TD 249'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B9
RUN NO. 4 Abandoned
DATE 7-27-77
TIME:
START 2:00 P.M.
END 2:30 P.M.
SENSOR SERIAL NO.
376
OPERATOR
Michael R Glasgow

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	110.90	67.15	280			550		
20	119.94	64.26	290			560		
30	118.10	64.82	300			570		
40	116.43	65.35	310			580		
50	115.38	65.67	320			590		
60	114.28	66.03	330			600		
70	113.03	66.45	340			610		
80	111.81	66.85	350			620		
90	110.67	67.21	360			630		
100	109.46	67.62	370			640		
110	108.31	68.03	380			650		
120	107.15	68.41	390			660		
130	105.99	68.83	400			670		
140	104.87	69.22	410			680		
150	103.83	69.62	420			690		
160	102.70	70.02	430			700		
170	101.58	70.42	440			710		
180	100.46	70.83	450			720		
190	99.32	71.28	460			730		
200	98.22	71.70	470			740		
210	97.28	72.06	480			750		
220	96.39	72.41	490			760		
230	95.45	72.78	500			770		
240	94.52	73.15	510			780		
249' 250'	93.79	73.45	520			790		
260			530			800		
270			540			810

REMARKS _____

[illegible]

LOG HEADING

HOLE NO. 5-77-87	TIME START: 2:45 PM END: 1:45 PM	REFERENCE MAP 5-77	NOTES: Temp. 100 TC 1 PS 8.32 VS 0.78
UNIT NO. 56795	NOMINAL HOLE DIAMETER 1 1/2 IN.	DRILLING MEDIUM 160	
OPERATOR(S) Michael R. Shuck	TYPE OF MUD Bentonite		
DATE 6/6/77	DRILLED DEPTH 249' FT.	GROUND WATER (?) DEPTH(S)	
ELEVATION 5332' FT.			

NUCLEAR RADIATION			INSTRUMENTATION		ELECTRIC LOG	
RUN NUMBER	1	2	3	PROBE NUMBER	SC05	DEPTH (INTERVAL) 23' 242' FT.
DEPTH (INTERVAL) FT.	0-249'			TYPE	Temp	RESISTANCE 20 Ohms
RANGE C.P.S.	0-200			PROBE NUMBER	2492	S.P. 10.9 M.V.
TIME CONSTANT Sec.	2			TYPE	Gamma	VERTICAL SCALE 10 Fc/In.
LOGGING SPEED Ft./Min.	20			REMARKS		FLUID LEVEL 23' Ft.
VERTICAL SCALE Ft./In.	10					
DIGITAL RECORD ?	-					

TEMPERATURE	
DEPTH (INTERVAL)	0-249' Fc
RANGE	40-90 °F
VERTICAL SCALE	15 Fc/In.
LOGGING SPEED	25 Ft./Min.

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B12 TD 230'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B12
RUN NO. 1
DATE 6-6-77
TIME: START 5:00 P.M.
END 5:45 P.M.
SENSOR SERIAL NO. 376
OPERATOR Michael R. Glesrock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	117.00	65.16	280			550		
20	113.76	66.19	290			560		
30	108.40	68.00	300			570		
40	106.43	68.69	310			580		
50	105.85	68.87	320			590		
60	105.35	69.05	330			600		
70	104.60	69.33	340			610		
80	103.60	69.69	350			620		
90	102.60	70.06	360			630		
100	101.40	70.50	370			640		
110	101.82	70.35	380			650		
120	101.46	70.46	390			660		
130	101.37	70.50	400			670		
140	101.08	70.61	410			680		
150	100.70	70.76	420			690		
160	100.23	70.95	430			700		
170	99.55	71.19	440			710		
180	99.25	71.31	450			720		
190	98.72	71.51	460			730		
200	98.30	71.67	470			740		
210	97.86	71.84	480			750		
220	97.47	71.99	490			760		
230	97.56	71.95	500			770		
240			510			780		
250			520			790		
260			530			800		
270			540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B12 TD 230'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B12
RUN NO. 2
DATE 6-8-77
TIME:
START 7:45 P.M.
END 8:30 P.M.
SENSOR SERIAL NO.
376
OPERATOR Michael R. Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	120.70	64.01	280			550		
20	117.60	64.97	290			560		
30	111.79	66.85	300			570		
40	109.93	67.48	310			580		
50	109.44	67.65	320			590		
60	108.70	67.89	330			600		
70	107.89	68.17	340			610		
80	106.90	68.52	350			620		
90	105.80	68.90	360			630		
100	104.63	69.33	370			640		
110	105.17	69.12	380			650		
120	104.54	69.37	390			660		
130	104.16	69.48	400			670		
140	103.69	69.66	410			680		
150	103.27	69.80	420			690		
160	102.77	69.98	430			700		
170	102.13	70.24	440			710		
180	101.62	70.42	450			720		
190	101.13	70.61	460			730		
200	100.57	70.80	470			740		
210	100.06	70.98	480			750		
220	99.54	71.20	490			760		
230	99.21	71.32	500			770		
240			510			780		
250			520			790		
260			530			800		
270			540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B12 TD 230'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B12

RUN NO. 3

DATE 6-14-77

TIME: _____

START 3:00 P.M.

END 3:30 P.M.

SENSOR SERIAL NO.
376

OPERATOR
Michael R Glascock

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	118.32	64.75	280			550		
20	119.87	64.26	290			560		
30	114.00	66.12	300			570		
40	112.03	66.78	310			580		
50	111.21	67.05	320			590		
60	110.42	67.32	330			600		
70	109.53	67.62	340			610		
80	108.64	67.93	350			620		
90	107.74	68.24	360			630		
100	106.98	68.48	370			640		
110	106.73	68.59	380			650		
120	106.05	68.80	390			660		
130	105.47	69.01	400			670		
140	104.92	69.22	410			680		
150	104.35	69.40	420			690		
160	103.78	69.62	430			700		
170	103.19	69.84	440			710		
180	102.60	70.06	450			720		
190	102.07	70.24	460			730		
200	101.52	70.46	470			740		
210	100.96	70.65	480			750		
220	100.40	70.87	490			760		
230 TD.	99.81	71.09	500			770		
240			510			780		
250			520			790		
260			530			800		
270			540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B12 TD 230

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B12
RUN NO. 4 Abandoned

DATE 7-28-77
TIME: _____

START 8:00 A.M.
END 8:30 A.M.

SENSOR SERIAL NO.
376

OPERATOR
Michael R Glasgow

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	109.34	67.69	280			550		
20	119.87	64.26	290			560		
30	115.61	65.61	300			570		
40	113.33	66.35	310			580		
50	112.33	66.68	320			590		
60	111.49	66.95	330			600		
70	110.55	67.25	340			610		
80	109.66	67.55	350			620		
90	108.83	67.86	360			630		
100	108.15	68.07	370			640		
110	107.65	68.24	380			650		
120	106.98	68.48	390			660		
130	106.36	68.69	400			670		
140	105.80	68.90	410			680		
150	105.22	69.12	420			690		
160	104.64	69.33	430			700		
170	104.00	69.55	440			710		
180	103.40	69.76	450			720		
190	102.85	69.95	460			730		
200	102.24	70.20	470			740		
210	101.70	70.39	480			750		
220	101.16	70.57	490			760		
230	100.60	70.80	500			770		
240			510			780		
250			520			790		
260			530			800		
270			540			810

[illegible]

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B-15 TD 260'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B-15
RUN NO. 1
DATE 5-30-77
TIME: START 7:00 P.M.
END 7:30 P.M.
SENSOR SERIAL NO. 376
OPERATOR Michael E. Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	121.57	63.74	280			550		
20	113.94	66.16	290			560		
30	110.53	67.28	300			570		
40	108.00	68.13	310			580		
50	107.60	68.27	320			590		
60	107.54	68.31	330			600		
70	106.56	68.62	340			610		
80	105.59	68.98	350			620		
90	104.82	69.26	360			630		
100	104.71	69.30	370			640		
110	104.97	69.19	380			650		
120	104.08	69.51	390			660		
130	103.53	69.73	400			670		
140	102.64	70.06	410			680		
150	101.69	70.39	420			690		
160	101.05	70.61	430			700		
170	100.51	70.83	440			710		
180	100.12	70.98	450			720		
190	99.26	71.30	460			730		
200	98.14	71.73	470			740		
210	98.47	71.60	480			750		
220	97.57	71.95	490			760		
230	95.75	72.66	500			770		
240	96.59	72.33	510			780		
250	95.63	72.71	520			790		
260 T.D.	95.90	72.60	530			800		
270			540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B-15 TD 260'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B-15
RUN NO. 2
DATE 6-1-77
TIME: START 9:00 AM.
END 9:30 AM.
SENSOR SERIAL NO. 376
OPERATOR Michael R Glasgow

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	127.60	61.97	280			550		
20	119.02	64.54	290			560		
30	114.88	65.83	300			570		
40	112.79	66.52	310			580		
50	111.80	66.85	320			590		
60	111.17	67.05	330			600		
70	110.03	67.45	340			610		
80	109.15	67.72	350			620		
90	108.38	68.00	360			630		
100	107.93	68.17	370			640		
110	107.55	68.27	380			650		
120	106.71	68.59	390			660		
130	105.97	68.83	400			670		
140	105.12	69.15	410			680		
150	104.17	69.48	420			690		
160	103.47	69.73	430			700		
170	102.65	70.02	440			710		
180	102.06	70.24	450			720		
190	100.93	70.68	460			730		
200	100.08	70.98	470			740		
210	99.86	71.07	480			750		
220	98.96	71.42	490			760		
230	97.50	71.98	500			770		
240	97.47	71.99	510			780		
250	96.58	72.34	520			790		
260	96.01	72.56	530			800		
270			540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B15 TD 260'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B15

RUN NO. 3

DATE 6-7-77

TIME:

START 10:30 AM.

END 11:10 AM.

SENSOR SERIAL NO.
376

OPERATOR
Michael R Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	126.10	62.41	280			550		
20	122.36	63.50	290			560		
30	117.82	64.91	300			570		
40	115.77	65.54	310			580		
50	114.36	65.99	320			590		
60	113.18	66.38	330			600		
70	112.12	66.75	340			610		
80	111.26	67.01	350			620		
90	110.38	67.32	360			630		
100	109.58	67.59	370			640		
110	108.73	67.89	380			650		
120	107.92	68.17	390			660		
130	107.07	68.45	400			670		
140	106.26	68.73	410			680		
150	105.38	69.05	420			690		
160	104.58	69.33	430			700		
170	103.82	69.62	440			710		
180	103.05	69.87	450			720		
190	102.11	70.24	460			730		
200	101.39	70.50	470			740		
210	100.73	70.76	480			750		
220	99.97	71.03	490			760		
230	99.02	71.39	500			770		
240	98.32	71.66	510			780		
250	97.54	71.96	520			790		
260 TD.	96.80	72.25	530			800		
270			540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B15 TD 260'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B15
RUN NO. 4 Abandoned
DATE 7-28-77
TIME:
START 10:45 A.M.
END 11:20 A.M.
SENSOR SERIAL NO.
376
OPERATOR
Michael R. Blascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	117.00	65.16	280			550		
20	123.31	63.23	290			560		
30	119.02	64.54	300			570		
40	116.89	65.19	310			580		
50	115.58	65.61	320			590		
60	114.49	65.96	330			600		
70	113.43	66.32	340			610		
80	112.62	66.58	350			620		
90	111.74	66.88	360			630		
100	110.88	67.15	370			640		
110	109.97	67.45	380			650		
120	109.15	67.72	390			660		
130	108.30	68.03	400			670		
140	107.46	68.31	410			680		
150	106.59	68.62	420			690		
160	105.75	68.90	430			700		
170	104.97	69.19	440			710		
180	104.15	69.48	450			720		
190	103.29	69.80	460			730		
200	102.51	70.09	470			740		
210	101.77	70.35	480			750		
220	101.02	70.65	490			760		
230	100.13	70.98	500			770		
240	99.33	71.28	510			780		
250	98.50	71.59	520			790		
260 TD	97.76	71.88	530			800		
270			540			810

[illegible]

100-443881-100

LOG HEADING

HOLE NO. 5-77-B15	TIME START: 5:02 A.M.	REFERENCE MAP 5-77	NOTES: Temp 100 Rd 100 FC 1 Dss 8.32 1.8 2.73
UNITS NO. 56755	TIME END: 5:45 A.M.	NOMINAL HOLE DIAMETER 1 1/2 IN.	
OPERATOR(S) Michael R Glasgow		DRILLING MEDIUM H ₂ O	
DATE 5-29-77		TYPE OF MUD Bentonite	
DRILLED DEPTH 260 FT.		GROUND WATER (I)	
ELEVATION 3230 FT.		DEPTH(S)	

NUCLEAR RADIATION			INSTRUMENTATION		ELECTRIC LOG	
RUN NUMBER	1	2	3	PROBE NUMBER 5005	DEPTH (INTERVAL) 40-260 FE	
DEPTH (INTERVAL) FT. 0-260				TYPE Temp	RESISTANCE 10 Ohms	
RANGE C.P.S. 0-200				PROBE NUMBER 5292	S.P. 100 MV	
TIME CONSTANT Sec. 2				TYPE Gamma	VERTICAL SCALE 10 Ft./In.	
LOGGING SPEED Ft./Min. 20				REMARKS: K/Solar: 1033-1035 depth time: 1.350 sec	FLUID LEVEL 40 FE	
VERTICAL SCALE Ft./In. 10					TEMPERATURE	
DIGITAL RECORD 2					DEPTH (INTERVAL) 40-260 FE	
					RANGE 40-100 OF	
					VERTICAL SCALE 10 Ft./In.

Michael & Glorice

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B-16 TD 320'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B 16
RUN NO. 1
DATE 5-27-77
TIME: START 7:00 P.M.
END 7:45 P.M.
SENSOR SERIAL NO. 376
OPERATOR Michael R Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	125.50	62.58	280	99.88	71.07	550		
20	120.00	64.23	290	99.30	71.29	560		
30	115.41	65.67	300	98.71	71.51	570		
40	114.01	66.12	310	98.07	71.76	580		
50	113.53	66.29	320 TD.	97.98	71.79	590		
60	112.88	66.48	330			600		
70	112.15	66.71	340			610		
80	111.71	66.88	350			620		
90	111.05	67.08	360			630		
100	109.89	67.48	370			640		
110	109.35	67.65	380			650		
120	108.31	68.03	390			660		
130	108.15	68.07	400			670		
140	107.61	68.27	410			680		
150	106.87	68.52	420			690		
160	106.38	68.69	430			700		
170	105.85	68.87	440			710		
180	105.36	69.05	450			720		
190	104.92	69.22	460			730		
200	104.21	69.48	470			740		
210	103.56	69.69	480			750		
220	102.88	69.95	490			760		
230	102.50	70.09	500			770		
240	101.92	70.31	510			780		
250	101.39	70.50	520			790		
260	100.91	70.68	530			800		
270	100.36	70.87	540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B-16 TD 320'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B-16
RUN NO. 2
DATE 5-29-77
TIME:
START 7:00 P.M.
END 7:45 P.M.
SENSOR SERIAL NO.
376
OPERATOR
Michael R. Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	128.70	61.66	280	101.21	70.57	550		
20	124.70	62.81	290	100.61	70.80	560		
30	116.54	65.32	300	99.94	71.04	570		
40	117.56	64.97	310	99.30	71.29	580		
50	116.82	65.22	320 TD.	98.87	71.45	590		
60	116.16	65.42	330			600		
70	115.20	65.74	340			610		
80	114.52	65.96	350			620		
90	113.71	66.22	360			630		
100	112.84	66.52	370			640		
110	112.06	66.75	380			650		
120	111.24	67.05	390			660		
130	110.43	67.32	400			670		
140	109.51	67.62	410			680		
150	105.54	69.01	420			690		
160	101.13	70.61	430			700		
170	90.80	74.68	440			710		
180	103.51	69.73	450			720		
190	106.68	68.59	460			730		
200	106.09	68.80	470			740		
210	105.49	69.01	480			750		
220	104.80	69.26	490			760		
230	104.18	69.48	500			770		
240	103.53	69.73	510			780		
250	102.97	69.91	520			790		
260	102.40	70.13	530			800		
270	101.82	70.35	540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B16 TD 320'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B16
RUN NO. 3

DATE 6-5-77
TIME:

START 10:00 AM
END 10:50 AM

SENSOR SERIAL NO.
376

OPERATOR
Michael R Glascock

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	125.00	62.73	280	101.41	70.50	550		
20	128.01	61.86	290	100.77	70.72	560		
30	122.11	63.59	300	100.11	70.98	570		
40	119.88	64.26	310	99.48	71.22	580		
50	118.77	64.60	320	98.91	71.44	590		
60	117.81	64.91	330			600		
70	116.70	65.26	340			610		
80	115.82	65.54	350			620		
90	114.95	65.80	360			630		
100	114.07	66.09	370			640		
110	113.25	66.35	380			650		
120	112.37	66.65	390			660		
130	111.63	66.91	400			670		
140	110.84	67.18	410			680		
150	109.82	67.52	420			690		
160	109.03	67.79	430			700		
170	107.91	68.17	440			710		
180	107.88	68.17	450			720		
190	107.44	68.34	460			730		
200	106.78	68.55	470			740		
210	106.11	68.80	480			750		
220	105.34	69.08	490			760		
230	104.63	69.33	500			770		
240	103.94	69.58	510			780		
250	103.27	69.80	520			790		
260	102.64	70.06	530			800		
270	102.03	70.28	540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B16 TD 320'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B16
RUN NO. A Abandoned
DATE 7-28-77
TIME:
START 2:00 P.M.
END 2:45 P.M.
SENSOR SERIAL NO.
376
OPERATOR
Michael R Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	116.00	65.48	280	101.94	70.31	550		
20	126.63	62.26	290	101.29	70.54	560		
30	122.58	63.44	300	100.63	70.80	570		
40	119.94	64.26	310	100.00	71.02	580		
50	118.45	64.69	320	99.42	71.24	590		
60	117.43	65.04	330			600		
70	116.42	65.35	340			610		
80	115.56	65.61	350			620		
90	114.70	65.90	360			630		
100	113.85	66.16	370			640		
110	113.06	66.42	380			650		
120	112.25	66.68	390			660		
130	111.49	66.95	400			670		
140	110.86	67.15	410			680		
150	110.03	67.45	420			690		
160	109.26	67.69	430			700		
170	108.57	67.93	440			710		
180	108.16	68.07	450			720		
190	107.66	68.24	460			730		
200	107.00	68.48	470			740		
210	106.34	68.73	480			750		
220	105.69	68.94	490			760		
230	105.00	69.19	500			770		
240	104.36	69.40	510			780		
250	103.75	69.62	520			790		
260	103.16	69.84	530			800		
270	102.52	70.09	540			810

[illegible]

HOLE NO. 316

LOG HEADING

Self Potential
 100 MV

Resistivity
 20 ohms

Fluid Level 142

X 215'

X 215'

Temperature (°F)

Natural Gamma (CPS)
 Range 0-200 cps
 TC 2 sec. Logging Speed 20 ft/min

X 214'
 UNSATURATED

M. J. K. Glascock
 5/20/77

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B19 TD 378'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B19
RUN NO. 1
DATE 7-1-77
TIME:
START 3:30 P.M.
END 4:10 P.M.
SENSOR SERIAL NO.
376
OPERATOR Michael R. Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	111.60	66.91	280	111.72	66.88	550		
20	119.39	64.41	290	111.85	66.81	560		
30	115.17	65.74	300	111.66	66.88	570		
40	112.90	66.48	310	111.34	67.01	580		
50	112.82	66.52	320	111.22	67.05	590		
60	112.25	66.68	330	111.01	67.11	600		
70	111.06	67.08	340	110.96	67.11	610		
80	111.06	67.08	350	110.84	67.18	620		
90	111.65	66.88	360	110.92	67.15	630		
100	112.64	66.58	370	110.96	67.11	640		
110	112.88	66.48	380	111.38	66.98	650		
120	113.06	66.42	390	378' T.D.		660		
130	113.01	66.45	400			670		
140	112.62	66.58	410			680		
150	112.62	66.58	420			690		
160	112.48	66.61	430			700		
170	112.50	66.61	440			710		
180	112.26	66.68	450			720		
190	112.33	66.68	460			730		
200	112.20	66.71	470			740		
210	112.14	66.75	480			750		
220	112.32	66.68	490			760		
230	112.71	66.55	500			770		
240	112.52	66.61	510			780		
250	112.46	66.61	520			790		
260	112.50	66.61	530			800		
270	112.42	66.65	540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B19 TD 378'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B19
RUN NO. 2
DATE 7-2-77
TIME:
START 10:00 A.M.
END 10:50 A.M.
SENSOR SERIAL NO.
376
OPERATOR Michael R. Glasrock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	115.60	65.61	280	114.90	65.83	550		
20	126.15	62.38	290	114.72	65.90	560		
30	122.17	63.56	300	114.45	65.96	570		
40	119.92	64.26	310	114.10	66.09	580		
50	119.39	64.41	320	113.78	66.19	590		
60	119.06	64.50	330	113.52	66.29	600		
70	118.36	64.72	340	113.24	66.38	610		
80	118.26	64.75	350	112.98	66.45	620		
90	118.26	64.75	360	112.71	66.55	630		
100	118.34	64.75	370	112.48	66.61	640		
110	118.23	64.78	378' TD	112.30	66.68	650		
120	117.99	64.85	390			660		
130	117.91	64.88	400			670		
140	117.66	64.94	410			680		
150	117.54	65.00	420			690		
160	117.40	65.04	430			700		
170	117.27	65.07	440			710		
180	117.03	65.16	450			720		
190	116.86	65.19	460			730		
200	116.70	65.26	470			740		
210	116.48	65.32	480			750		
220	116.38	65.35	490			760		
230	116.29	65.38	500			770		
240	116.06	65.45	510			780		
250	115.77	65.54	520			790		
260	115.57	65.61	530			800		
270	115.34	65.70	540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B19 TD 378'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B19
RUN NO. 3

DATE 7-9-77
TIME: _____

START 11:00 A.M.
END 11:50 A.M.

SENSOR SERIAL NO.
376

OPERATOR
Michael R Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	111.70	66.88	280	116.58	65.29	550		
20	127.53	62.00	290	116.31	65.38	560		
30	125.19	62.67	300	116.01	65.48	570		
40	122.83	63.38	310	115.66	65.57	580		
50	122.10	63.59	320	115.31	65.70	590		
60	121.75	63.68	330	114.97	65.80	600		
70	121.32	63.83	340	114.62	65.93	610		
80	121.00	63.92	350	114.29	66.03	620		
90	120.77	63.98	360	113.97	66.12	630		
100	120.60	64.04	370	113.68	66.22	640		
110	120.39	64.10	380	113.42	66.32	650		
120	120.15	64.17	390			660		
130	119.98	64.23	400			670		
140	119.80	64.29	410			680		
150	119.52	64.38	420			690		
160	119.33	64.44	430			700		
170	119.10	64.50	440			710		
180	118.82	64.60	450			720		
190	118.67	64.63	460			730		
200	118.49	64.69	470			740		
210	118.30	64.75	480			750		
220	118.11	64.82	490			760		
230	117.97	64.85	500			770		
240	117.73	64.94	510			780		
250	117.46	65.00	520			790		
260	117.22	65.10	530			800		
270	116.98	65.16	540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER 5-77B19 TD 380'

REFERENCE MAP S-77

REMARKS ABANDONMENT SURVEY

HOLE NO. 5-77-B19
RUN NO. # ABD

DATE 11/6/77
TIME:

START 2:05 PM
END 2:45

SENSOR SERIAL NO. 2

OPERATOR JUDD MUSKAT

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	123.36	67.44	280	132.32	64.85	550		
20	137.24	63.52	290	132.02	64.94	560		
30	141.72	62.35	300	131.87	64.98	570		
40	141.09	62.51	310	131.46	65.08	580		
50	140.05	62.78	320	131.05	65.21	590		
60	139.30	62.96	330	130.60	65.34	600		
70	138.69	63.14	340	130.25	65.43	610		
80	138.22	63.25	350	129.88	65.53	620		
90	137.71	63.39	360	129.44	65.66	630		
100	137.48	63.45	370	128.82	65.84	640		
110	137.14	63.54	380	128.81	65.82	650		
120	136.88	63.61	390			660		
130	136.72	63.64	400			670		
140	136.47	63.72	410			680		
150	136.19	63.79	420			690		
160	135.97	63.86	430			700		
170	135.70	63.91	440			710		
180	135.42	64.00	450			720		
190	135.07	64.09	460			730		
200	134.84	64.17	470			740		
210	134.69	64.20	480			750		
220	134.24	64.33	490			760		
230	134.04	64.38	500			770		
240	133.75	64.45	510			780		
250	133.34	64.56	520			790		
260	132.97	64.67	530			800		
270	132.75	64.72	540			810

REMARKS _____

[illegible]

LOG HEADING

HOLE NO. 5-17-319	TIME START: 8:28A	REFERENCE MAP 5-77	NOTES: Temp Rate 100 Rate 100 Rate 100 Rate 100
UNIT NO. 5GTSS	ENDS: 1:15 PM	NOMINAL HOLE DIAMETER 1 1/8 IN.	Rate 100
OPERATOR(S) Michael R. Glesco	DRILLING MEDIUM 1/2"	TYPE OF MUD Bentonite	Rate 100
DATE 6/30/77	GROUNDWATER (Y) DEPTH(S)		Rate 100
DRILLED DEPTH 373 FT.			Rate 100
ELEVATION 6210 FT.			Rate 100

NUCLEAR RADIATION			INSTRUMENTATION		ELECTRIC LOG	
RUN NUMBER	1	2	PROBE NUMBER	5005	DEPTH (INTERVAL)	11-373 FT.
DEPTH (INTERVAL) Ft.	0-373		TYPE	Temp	RESISTANCE	20 Ohms
RANGE	0-200		PROBE NUMBER	5292	VERTICAL SCALE	100 MV
TIME CONSTANT	2		TYPE	Temp	FLUID LEVEL	21-6
LOGGING SPEED Ft./Min.	20		REMARKS:		TEMPERATURE	
VERTICAL SCALE Ft./In.	12		5-17-319		DEPTH (INTERVAL)	0-373 FT.
DIGITAL RECORD			1000		RANGE	10-100
					VERTICAL SCALE	100 Ft./In.
					LOGGING SPEED	20 Ft./Min.

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B20 TD 240'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B20

RUN NO. 1

DATE 6-28-77

TIME:

START 1:30 P.M.

END 2:10 P.M.

SENSOR SERIAL NO.
376

OPERATOR
Michael R. Glescock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	103.60	69.69	280			550		
20	107.06	68.45	290			560		
30	101.70	70.39	300			570		
40	99.73	71.12	310			580		
50	98.41	71.63	320			590		
60	96.88	72.22	330			600		
70	95.07	72.93	340			610		
80	92.73	73.88	350			620		
90	90.13	74.96	360			630		
100	87.69	76.01	370			640		
110	86.50	76.54	380			650		
120	84.93	77.24	390			660		
130	83.06	78.10	400			670		
140	81.22	78.97	410			680		
150	80.52	79.30	420			690		
160	79.24	79.92	430			700		
170	77.68	80.69	440			710		
180	76.27	81.41	450			720		
190	74.95	82.09	460			730		
200	73.77	82.71	470			740		
210	72.37	83.46	480			750		
220	71.02	84.20	490			760		
230	69.69	84.95	500			770		
240 T.D.	68.59	85.58	510			780		
250			520			790		
260			530			800		
270			540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B20 TD 240'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B20

RUN NO. 2

DATE 6/30/77

TIME: _____

START 5:00 P.M.

END 5:30 P.M.

SENSOR SERIAL NO.
376

OPERATOR
Michael R. Glascock

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	107.60	68.27	280			550		
20	110.57	67.25	290			560		
30	104.60	69.33	300			570		
40	102.09	70.24	310			580		
50	100.11	70.98	320			590		
60	98.43	71.62	330			600		
70	96.48	72.38	340			610		
80	94.09	73.33	350			620		
90	91.27	74.49	360			630		
100	88.56	75.64	370			640		
110	86.87	76.37	380			650		
120	85.19	77.12	390			660		
130	83.19	78.04	400			670		
140	81.61	78.78	410			680		
150	80.66	79.23	420			690		
160	79.30	79.89	430			700		
170	77.67	80.70	440			710		
180	76.15	81.47	450			720		
190	74.89	82.12	460			730		
200	73.44	82.89	470			740		
210	71.98	83.68	480			750		
220	70.62	84.43	490			760		
230	69.25	85.20	500			770		
240	68.16	85.83	510			780		
250			520			790		
260			530			800		
270			540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B20 TD 240'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B20

RUN NO. 3

DATE 7-6-77

TIME: _____

START 9:00 A.M.

END 9:30 A.M.

SENSOR SERIAL NO. 376

OPERATOR Michael R. Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	108.90	67.83	280			550		
20	116.24	65.42	290			560		
30	108.94	67.83	300			570		
40	104.89	69.22	310			580		
50	102.64	70.06	320			590		
60	100.64	70.80	330			600		
70	98.49	71.60	340			610		
80	96.02	72.56	350			620		
90	92.94	73.79	360			630		
100	89.81	75.10	370			640		
110	87.89	75.93	380			650		
120	85.85	76.83	390			660		
130	84.10	77.62	400			670		
140	82.31	78.45	410			680		
150	80.94	79.10	420			690		
160	79.47	79.81	430			700		
170	77.95	80.56	440			710		
180	76.30	81.39	450			720		
190	74.90	82.12	460			730		
200	73.39	82.91	470			740		
210	71.95	83.69	480			750		
220	70.61	84.43	490			760		
230	69.24	85.20	500			770		
240 TD.	68.09	85.87	510			780		
250			520			790		
260			530			800		
270			540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER S-77-B20 TD 240'

REFERENCE MAP S-77

REMARKS ABANDONMENT SURVEY
PIPE ONLY 1/2 FULL H₂O

HOLE NO. S-77-B20

RUN NO. 4ABD

DATE 11/6/77

TIME:

START 11:20

END 11:45

SENSOR SERIAL NO.

2

OPERATOR

JUDD MUSKAT

FT.	K L	°F	FT.	K L	°F	FT.	K L	°F
10	120.56	68.29	280			550		
20	124.63	67.06	290			560		
30	124.64	67.06	300			570		
40	121.37	68.04	310			580		
50	118.12	69.04	320			590		
60	115.27	69.96	330			600		
70	112.91	70.14	340			610		
80	109.75	71.80	350			620		
90	105.44	73.31	360			630		
100	102.48	74.39	370			640		
110	99.99	75.31	380			650		
120	98.72	75.81	390			660		
130	98.06	76.06	400			670		
140	97.40	76.32	410			680		
150	96.97	76.50	420			690		
160	96.59	76.64	430			700		
170	96.61	76.64	440			710		
180	95.84	76.95	450			720		
190	94.94	77.31	460			730		
200	94.55	77.45	470			740		
210	93.67	77.81	480			750		
220	94.18	77.61	490			760		
230	93.19	78.01	500			770		
240	92.44	78.31	510			780		
250			520			790		
260			530			800		
270			540			810

REMARKS _____

[illegible]

LOG HEADING

HOLE NO. 5-77-B20	TIME START: 5:00 A.M. END: 6:20 A.M.	REFERENCE MAP 5-77	NOTES: Temp. 100 Rate 1 P.S. 3.32 V.S. 0.78
UNIT NO. 5-GTS5	NOMINAL HOLE DIAMETER 4 3/4 IN.		
OPERATOR(S) Michael R. Glascock	DRILLING MEDIUM H ₂ O		
DATE 6/27/77	TYPE OF MUD Bentonite		
DRILLED DEPTH 240 FT. ELEVATION 5320 FT.	GROUND WATER (I)	DEPTH(S)	
NUCLEAR RADIATION		INSTRUMENTATION	ELECTRIC LOG
RUN NUMBER	1	PROBE NUMBER 5005	DEPTH (INTERVAL) 124'-240' Ft.
DEPTH (INTERVAL) Ft. 0-240'		TYPE Temp	RESISTANCE 20 Ohms
RANGE C.P.S. 0-200		PROBE NUMBER 5272	S.P. 100 MV
TIME CONSTANT Sec. 2		TYPE Gamma	VERTICAL SCALE 10 Ft./In.
LOGGING SPEED Ft./Min. 20		REMARKS: R. 1033 X 10 ⁻³ depth time - 19.350 sec	FLUID LEVEL 124' FT.
VERTICAL SCALE Ft./In. 10			TEMPERATURE
DIGITAL RECORD?			DEPTH (INTERVAL) 0-240' Ft.
			RANGE 40°-90° F
			VERTICAL SCALE 10 Ft./In.
			LOGGING SPEED 25 Ft./Min.

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B21 TD 381'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B21
RUN NO. 1
DATE 6-17-77
TIME:
START 10:AM
END 11AM
SENSOR SERIAL NO.
376
OPERATOR
Michael R Glescock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	127.50	62.00	280	123.27	63.23	550		
20	133.86	60.22	290	123.04	63.32	560		
30	127.52	62.00	300	120.01	64.23	570		
40	124.53	62.87	310	118.40	64.72	580		
50	124.30	62.93	320	122.05	63.59	590		
60	123.72	63.11	330	122.44	63.50	600		
70	124.02	63.02	340	122.26	63.53	610		
80	123.77	63.08	350	122.08	63.59	620		
90	123.64	63.14	360	121.92	63.65	630		
100	123.68	63.11	370	121.71	63.71	640		
110	123.19	63.26	380	123.42	63.20	650		
120	123.04	63.32	390 381' T.D.	123.94	63.05	660		
130	122.33	63.53	400			670		
140	122.91	63.35	410			680		
150	123.15	63.26	420			690		
160	123.21	63.26	430			700		
170	123.16	63.26	440			710		
180	123.11	63.29	450			720		
190	123.34	63.23	460			730		
200	123.24	63.26	470			740		
210	123.58	63.14	480			750		
220	123.64	63.14	490			760		
230	123.78	63.08	500			770		
240	123.73	63.11	510			780		
250	123.88	63.05	520			790		
260	123.48	63.17	530			800		
270	123.91	63.05	540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B21 TD 381'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B-21
RUN NO. 2
DATE 6-19-77
TIME:
START 9:00 AM
END 9:45 AM
SENSOR SERIAL NO.
376
OPERATOR
Michael R Glascock

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	127.00	62.15	280	125.80	62.49	550		
20	138.76	58.91	290	125.57	62.55	560		
30	132.08	60.71	300	124.24	62.93	570		
40	128.86	61.60	310	123.31	63.23	580		
50	128.26	61.77	320	125.14	62.70	590		
60	127.94	61.89	330	125.11	62.70	600		
70	127.77	61.92	340	124.93	62.76	610		
80	127.53	62.00	350	124.70	62.81	620		
90	127.32	62.06	360	124.54	62.87	630		
100	127.26	62.06	370	124.27	62.93	640		
110	127.04	62.15	380 ^{381'}	124.52	62.87	650		
120	126.87	62.17	390			660		
130	126.50	62.29	400			670		
140	126.83	62.20	410			680		
150	126.73	62.23	420			690		
160	126.78	62.20	430			700		
170	126.68	62.23	440			710		
180	126.57	62.26	450			720		
190	126.66	62.23	460			730		
200	126.57	62.26	470			740		
210	126.62	62.26	480			750		
220	126.53	62.29	490			760		
230	126.56	62.26	500			770		
240	126.44	62.32	510			780		
250	126.39	62.32	520			790		
260	126.14	62.41	530			800		
270	126.17	62.38	540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B21 TD 381

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B21
RUN NO. 3
DATE 6-25-77
TIME: START 9:00 AM
END 10:00 AM
SENSOR SERIAL NO. 376
OPERATOR Michael R. Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	122.70	63.41	280	126.53	62.29	550		
20	136.43	59.54	290	126.34	62.35	560		
30	133.79	60.24	300	125.49	62.58	570		
40	130.28	61.21	310	124.84	62.79	580		
50	129.47	61.43	320	125.94	62.46	590		
60	129.14	61.55	330	125.86	62.46	600		
70	128.82	61.63	340	125.65	62.52	610		
80	128.61	61.69	350	125.41	62.61	620		
90	128.31	61.77	360	125.17	62.67	630		
100	128.15	61.80	370	124.90	62.76	640		
110	127.94	61.89	380	124.86	62.76	650		
120	127.68	61.94	380	124.84	62.79	660		
130	127.40	62.03	400			670		
140	127.60	61.97	410			680		
150	127.52	62.00	420			690		
160	127.52	62.00	430			700		
170	127.37	62.03	440			710		
180	127.19	62.09	450			720		
190	127.14	62.12	460			730		
200	127.03	62.15	470			740		
210	127.00	62.15	480			750		
220	126.98	62.15	490			760		
230	126.94	62.17	500			770		
240	126.89	62.17	510			780		
250	126.88	62.17	520			790		
260	126.79	62.20	530			800		
270	126.80	62.20	540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER 5-77-B21 TD 380'

REFERENCE MAP 5-77

REMARKS ABANDONMENT SURVEY

HOLE NO. 5-77-B21

RUN NO. 4-ABD

DATE 11/10/77

TIME:

START 4:00 PM

END 4:35 PM

SENSOR SERIAL NO. 2

OPERATOR JUDD MUSKAT

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	132.60	64.78	280	144.95	61.52	550		
20	144.01	61.75	290	144.63	61.59	560		
30	150.87	60.06	300	144.37	61.66	570		
40	151.01	60.04	310	144.19	61.72	580		
50	149.53	60.39	320	144.01	61.75	590		
60	148.50	60.64	330	143.85	61.79	600		
70	147.87	60.80	340	143.63	61.86	610		
80	147.61	60.85	350	143.39	61.92	620		
90	147.26	60.94	360	143.91	61.11	630		
100	146.97	61.02	370	144.08	61.74	640		
110	146.75	61.07	380	142.53	62.13	650		
120	146.56	61.12	390			660		
130	146.37	61.16	400			670		
140	146.27	61.20	410			680		
150	145.98	61.27	420			690		
160	146.18	61.21	430			700		
170	146.11	61.23	440			710		
180	145.96	61.27	450			720		
190	146.54	61.12	460			730		
200	146.50	61.12	470			740		
210	145.61	61.36	480			750		
220	145.53	61.38	490			760		
230	145.44	61.39	500			770		
240	145.36	61.41	510			780		
250	145.42	61.39	520			790		
260	145.17	61.47	530			800		
270	145.02	61.50	540			810

[illegible]

LOG HEADING

HOLE NO. 5-77-821	TIME START: 11:20 AM END: 2:38 PM	REFERENCE MAP: 5-A7	NOTES: Temp. 100 Rate 100 TC 10 PSS 8.32 KS 0.28
UNIT NO. 5GTSS	NOMINAL HOLE DIAMETER: 1 1/8 IN.	DRILLING MEDIUM: H ₂ O	
OPERATOR(S) Michael R. Casack	TYPE OF MUD: Bentonite		
DATE: 6/16/77	GROUND WATER (I) DEPTH(S)		
DRILLED DEPTH: 231 FT. ELEVATION: 5710 FT.			

NUCLEAR RADIATION			INSTRUMENTATION		ELECTRIC LOG	
RUN NUMBER	1	2	3	PROBE NUMBER	5025	DEPTH (INTERVAL) 65'-331' F6
DEPTH (INTERVAL) Ft.	0-331'			TYPE	Temp	RESISTANCE 20 Ohms
RANGE C.P.S.	0-200			PROBE NUMBER	5292	SP. 100 MV
TIME CONSTANT Sec.	2			TYPE	Gamma	VERTICAL SCALE 10 FT./IN.
LOGGING SPEED Ft./Min.	20			REMARKS		FLUID LEVEL 65' F6
VERTICAL SCALE Ft./In.	10					TEMPERATURE
DIGITAL RECORD?	-					DEPTH (INTERVAL) 2-331' F6
						RANGE 40°-70° F
						VERTICAL SCALE 10 FT./IN.
						LOGGING SPEED 25' Ft./Min.

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B22 TD 61'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B22

RUN NO. 1

DATE 6-12-77

TIME:

START 3:00 P.M.

END 3:15 P.M.

SENSOR SERIAL NO.
376

OPERATOR
Michael R. Glascock

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	116.66	65.26	280			550		
20	118.93	64.57	290			560		
30	114.40	65.99	300			570		
40	113.42	66.32	310			580		
50	120.54	64.07	320			590		
60	122.67	63.41	330			600		
61	123.66	63.11	340			610		
80			350			620		
90			360			630		
100			370			640		
110			380			650		
120			390			660		
130			400			670		
140			410			680		
150			420			690		
160			430			700		
170			440			710		
180			450			720		
190			460			730		
200			470			740		
210			480			750		
220			490			760		
230			500			770		
240			510			780		
250			520			790		
260			530			800		
270			540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B22 TD 61'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B22

RUN NO. 2

DATE 6-14-77

TIME: _____

START 7:00 P.M.

END 7:20 P.M.

SENSOR SERIAL NO.
376

OPERATOR
Michael R Glascock

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	124.80	62.79	280			550		
20	128.32	61.77	290			560		
30	122.28	63.53	300			570		
40	121.59	63.74	310			580		
50	124.53	62.87	320			590		
60	125.83	62.49	330			600		
70			340			610		
80			350			620		
90			360			630		
100			370			640		
110			380			650		
120			390			660		
130			400			670		
140			410			680		
150			420			690		
160			430			700		
170			440			710		
180			450			720		
190			460			730		
200			470			740		
210			480			750		
220			490			760		
230			500			770		
240			510			780		
250			520			790		
260			530			800		
270			540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER B22 TD 61'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B22

RUN NO. 3

DATE 6-22-77

TIME:

START 10 AM

END 10:20 AM

SENSOR SERIAL NO.
376

OPERATOR
Michael R Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	126.96	62.15	280			550		
20	133.77	60.24	290			560		
30	127.62	61.97	300			570		
40	126.31	62.35	310			580		
50	127.23	62.09	320			590		
60 61 TD	127.70	61.94	330			600		
70			340			610		
80			350			620		
90			360			630		
100			370			640		
110			380			650		
120			390			660		
130			400			670		
140			410			680		
150			420			690		
160			430			700		
170			440			710		
180			450			720		
190			460			730		
200			470			740		
210			480			750		
220			490			760		
230			500			770		
240			510			780		
250			520			790		
260			530			800		
270			540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER 5-M-B-22 TD 61'

REFERENCE MAP 5-77

REMARKS ABANDONMENT SURVEY

HOLE NO. 5-M-B-22

RUN NO. 4-ABD

DATE 11-05

TIME:

START 11:08

END 11:15

SENSOR SERIAL NO. 2

OPERATOR JUDD MUSKAT

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	135.20	64.06	280			550		
20	143.07	61.99	290			560		
30	147.41	60.89	300			570		
40	148.44	60.66	310			580		
50	147.77	60.82	320			590		
60 61	146.79	61.05	330			600		
70	TD, 61'		340			610		
80			350			620		
90			360			630		
100			370			640		
110			380			650		
120			390			660		
130			400			670		
140			410			680		
150			420			690		
160			430			700		
170			440			710		
180			450			720		
190			460			730		
200			470			740		
210			480			750		
220			490			760		
230			500			770		
240			510			780		
250			520			790		
260			530			800		
270			540			810

[illegible]

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B23 TD 300'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. B23
RUN NO. 1
DATE 6-15-77
TIME: START 9:00 A.M.
END 10:00 A.M.
SENSOR SERIAL NO. 376
OPERATOR Michael R Gluscock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	126.20	62.38	280	111.92	66.81	550		
20	128.52	61.72	290	110.58	67.25	560		
30	123.38	63.20	300 TD	110.48	67.28	570		
40	116.42	65.35	310			580		
50	114.93	65.83	320			590		
60	119.14	64.50	330			600		
70	120.35	64.10	340			610		
80	120.14	64.20	350			620		
90	120.14	64.20	360			630		
100	119.73	64.32	370			640		
110	119.09	64.50	380			650		
120	118.03	64.85	390			660		
130	117.36	65.04	400			670		
140	117.06	65.13	410			680		
150	116.83	65.22	420			690		
160	115.98	65.48	430			700		
170	115.83	65.54	440			710		
180	115.38	65.67	450			720		
190	114.96	65.80	460			730		
200	114.28	66.03	470			740		
210	113.89	66.16	480			750		
220	113.47	66.29	490			760		
230	113.12	66.42	500			770		
240	112.33	66.68	510			780		
250	111.96	66.78	520			790		
260	111.57	66.91	530			800		
270	111.48	66.95	540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B23 TD 300'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B23
RUN NO. 2
DATE 6-17-77
TIME:
START 11:30 A.M.
END 12:15 P.M.
SENSOR SERIAL NO.
376
OPERATOR
Michael R. Blascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	128.60	61.69	280	112.52	66.61	550		
20	134.10	60.16	290	111.86	66.81	560		
30	128.74	61.66	300 ^{TD}	111.43	66.98	570		
40	121.73	63.71	310			580		
50	121.35	63.80	320			590		
60	124.30	62.93	330			600		
70	124.45	62.87	340			610		
80	123.91	63.05	350			620		
90	123.42	63.20	360			630		
100	122.85	63.35	370			640		
110	122.17	63.56	380			650		
120	121.35	63.80	390			660		
130	120.70	64.01	400			670		
140	120.19	64.17	410			680		
150	119.57	64.35	420			690		
160	118.93	64.57	430			700		
170	118.51	64.69	440			710		
180	118.09	64.82	450			720		
190	117.69	64.94	460			730		
200	117.06	65.13	470			740		
210	116.51	65.32	480			750		
220	115.91	65.51	490			760		
230	115.39	65.67	500			770		
240	114.60	65.93	510			780		
250	114.00	66.12	520			790		
260	113.52	66.29	530			800		
270	113.08	66.42	540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER B23 TD 300'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. B23
RUN NO. 3
DATE 6-23-77
TIME:
START 2:00 P.M.
END 2:45 P.M.
SENSOR SERIAL NO.
376
OPERATOR
Michael R Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	134.07	60.16	280	113.36	66.32	550		
20	137.51	59.25	290	112.62	66.58	560		
30	131.66	60.82	300 TD	111.94	66.81	570		
40	126.32	62.35	310			580		
50	126.43	62.32	320			590		
60	127.31	62.06	330			600		
70	126.80	62.20	340			610		
80	126.10	62.41	350			620		
90	125.47	62.58	360			630		
100	124.84	62.79	370			640		
110	124.27	62.93	380			650		
120	123.82	63.08	390			660		
130	122.90	63.35	400			670		
140	122.28	63.53	410			680		
150	121.66	63.71	420			690		
160	121.00	63.92	430			700		
170	120.43	64.10	440			710		
180	119.86	64.26	450			720		
190	119.32	64.44	460			730		
200	118.72	64.63	470			740		
210	118.10	64.82	480			750		
220	117.49	65.00	490			760		
230	116.83	65.22	500			770		
240	116.09	65.45	510			780		
250	115.35	65.67	520			790		
260	114.71	65.90	530			800		
270	114.06	66.09	540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER 5-77-B23 TD 3001
REFERENCE MAP 5-77
REMARKS ABANDONMENT SURVEY

HOLE NO. 5-77-B23
RUN NO. 4-ABD
DATE 11/7/77
TIME:
START 9:25 am
END 9:55 am
SENSOR SERIAL NO. 2
OPERATOR JUDD MUSKAT

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	135.92	63.86	280	129.48	65.64	550		
20	146.15	62.21	290	128.56	65.91	560		
30	151.28	59.97	300	127.84	66.11	570		
40	150.10	60.26	310			580		
50	148.19	60.73	320			590		
60	147.02	61.00	330			600		
70	146.13	61.23	340			610		
80	145.27	61.45	350			620		
90	144.46	61.39	360			630		
100	143.70	61.84	370			640		
110	143.00	62.01	380			650		
120	142.19	62.22	390			660		
130	141.38	62.44	400			670		
140	140.64	62.62	410			680		
150	139.87	62.82	420			690		
160	139.06	63.03	430			700		
170	138.31	63.23	440			710		
180	137.66	63.41	450			720		
190	136.90	63.61	460			730		
200	136.18	63.81	470			740		
210	135.47	63.99	480			750		
220	134.63	64.22	490			760		
230	133.77	64.45	500			770		
240	132.83	64.71	510			780		
250	131.96	64.96	520			790		
260	131.18	65.17	530			800		
270	130.34	65.41	540			810

[illegible]

GEOTHERMAL SERVICES, INC.
7880 CONVOY COURT, SAN DIEGO, CA 92111

HOLE NO. 823

LOG HEADING

HOLE NO. <u>5-17-823</u>	TIME START: <u>11:45 AM</u> END: <u>12:30 PM</u>	REFERENCE MAP <u>5-77</u>	NOTES: Temp. <u>100</u> Rate <u>100</u> I.C. <u>1</u> R ₀₅ <u>8.32</u> V.S. <u>0.78</u>
UNIT NO. <u>5GTSS</u>	NOMINAL HOLE DIAMETER <u>1 3/8 IN.</u>		
OPERATOR(S) <u>Michael R. Glascock</u>	DILLING MEDIUM <u>1/2 0</u>		
DATE <u>6/14/77</u>	TYPE OF MUD <u>Bentonite</u>		
DRILLED DEPTH ELEVATION <u>300' FT.</u> <u>5360 FT.</u>	GROUND WATER (I) DEPTH(S)		

NUCLEAR RADIATION				INSTRUMENTATION		ELECTRIC LOG	
RUN NUMBER	1	2	3	PROBE NUMBER	5005	DEPTH (INTERVAL)	50'-300' FT.
DEPTH (INTERVAL) Ft.	0-300			TYPE	Temp	RESISTANCE	20 Ohms
RANGE	G.P.S.	0-200		PROBE NUMBER	5292	S.P.	100 MV
TIME CONSTANT	Sec.	2		TYPE	Gamma	VERTICAL SCALE	10 Ft./in.
LOGGING SPEED Ft./Min.	20			REMARKS: <i>K factor: 1.033 x 10⁻²</i> <i>lead time: 19,350 μs</i>	TEMPERATURE		
VERTICAL SCALE Ft./in.	10				DEPTH (INTERVAL)	0-300 FT.	
DIGITAL RECORD?	-				RANGE	40°-90° F	
					VERTICAL SCALE	10 Ft./in.	
						LOGGING SPEED	25 Ft./Min.

Michael R. Glascock
6/14/77

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER F1 TD 320'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. F1
RUN NO. 1
DATE 7-23-77
TIME:
START 9:10 A.M.
END 9:45 A.M.
SENSOR SERIAL NO.
376
OPERATOR
Michael E G/astro

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	115.00	65.80	280	110.42	67.32	550		
20	129.43	61.46	290	109.80	67.52	560		
30	129.05	61.55	300	109.04	67.79	570		
40	126.10	62.41	310	108.46	67.96	580		
50	124.33	62.93	320	107.96	68.13	590		
60	121.23	63.86	330			600		
70	121.41	63.80	340			610		
80	122.21	63.56	350			620		
90	121.92	63.65	360			630		
100	121.22	63.86	370			640		
110	120.54	64.07	380			650		
120	120.10	64.20	390			660		
130	119.63	64.35	400			670		
140	119.04	64.54	410			680		
150	118.33	64.75	420			690		
160	116.67	65.26	430			700		
170	115.38	65.67	440			710		
180	116.28	65.38	450			720		
190	115.48	65.64	460			730		
200	115.18	65.74	470			740		
210	114.68	65.90	480			750		
220	114.20	66.06	490			760		
230	113.42	66.32	500			770		
240	112.80	66.52	510			780		
250	111.85	66.81	520			790		
260	111.52	66.95	530			800		
270	110.64	67.25	540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER F1 TD 320'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. F1

RUN NO. 2

DATE 7-25-77

TIME:

START 10:15 A.M.

END 11:00 A.M.

SENSOR SERIAL NO.

376

OPERATOR
Michael R. Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	118.00	64.85	280	110.82	67.18	550		
20	131.67	60.82	290	110.19	67.38	560		
30	129.85	61.32	300	109.48	67.62	570		
40	126.19	62.38	310	108.87	67.83	580		
50	124.50	62.87	320 TD	108.40	68.00	590		
60	121.51	63.77	330			600		
70	122.00	63.62	340			610		
80	122.61	63.44	350			620		
90	122.30	63.53	360			630		
100	121.73	63.71	370			640		
110	121.03	63.92	380			650		
120	120.53	64.07	390			660		
130	119.97	64.23	400			670		
140	119.36	64.41	410			680		
150	118.69	64.63	420			690		
160	116.92	65.19	430			700		
170	116.04	65.48	440			710		
180	116.77	65.22	450			720		
190	115.87	65.51	460			730		
200	115.54	65.64	470			740		
210	115.03	65.80	480			750		
220	114.48	65.96	490			760		
230	113.75	66.19	500			770		
240	113.11	66.42	510			780		
250	112.24	66.71	520			790		
260	111.87	66.81	530			800		
270	111.07	67.08	540			810

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER S-77-F1 TD 320'
REFERENCE MAP S-77
REMARKS ABANDONMENT SURVEY

HOLE NO. S-77-F1
RUN NO. 3-ABD
DATE 11/8/77
TIME:
START 2:50
END 3:20
SENSOR SERIAL NO. 2
OPERATOR JUDD MUSKAT

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	134.14	64.35	280	125.26	66.87	550		
20	138.78	63.10	290	124.58	67.08	560		
30	143.82	61.81	300	123.74	67.32	570		
40	145.61	61.36	310	122.91	67.55	580		
50	144.47	61.65	320	122.33	67.75	590		
60	142.95	62.02	330			600		
70	141.88	62.29	340			610		
80	140.83	62.56	350			620		
90	139.76	62.85	360			630		
100	137.14	63.01	370			640		
110	138.01	63.30	380			650		
120	137.32	63.48	390			660		
130	136.54	63.70	400			670		
140	135.89	63.88	410			680		
150	135.01	64.11	420			690		
160	134.27	64.31	430			700		
170	133.52	64.53	440			710		
180	132.56	64.78	450			720		
190	131.92	64.96	460			730		
200	131.22	65.16	470			740		
210	130.80	65.28	480			750		
220	130.10	65.48	490			760		
230	129.53	65.64	500			770		
240	128.69	65.88	510			780		
250	127.86	66.11	520			790		
260	126.65	66.47	530			800		
270	125.82	66.70	540			810

REMARKS _____

[illegible]

LOG HEADING

HOLE NO. *F1*

HOLE NO. <i>5-77-F1</i>	TIME START: <i>12:54 AM</i> END: <i>12:45 PM</i>	REFERENCE MAP <i>5-77</i>	NOTES: <i>Temp</i> <i>Rate 100</i> <i>T.C. 1</i> <i>RS 332</i> <i>MS 079</i>
UNIT NO. <i>56755</i>	NOMINAL HOLE DIAMETER <i>1 7/8 IN.</i>		
OPERATOR(S) <i>Michael R. Gair</i>	DRILLING MEDIUM <i>W.O.</i>		
DATE <i>7/15/77</i>	TYPE OF MUD <i>Bentonite</i>		
DRILLED DEPTH ELEVATION <i>320' FT.</i> <i>6150' FT.</i>	GROUND WATER (I) DEPTH(SI) 		

NUCLEAR RADIATION				INSTRUMENTATION		ELECTRIC LOG	
RUN NUMBER	1	2	3	PROBE NUMBER	<i>5025</i>	DEPTH (INTERVAL)	<i>29'-320' Ft.</i>
DEPTH (INTERVAL) Ft.	<i>0-320</i>			TYPE	<i>Temp</i>	RESISTANCE	<i>20 Ohms</i>
RANGE	<i>0-200</i>			PROBE NUMBER	<i>5220</i>	S.P.	<i>100 mV</i>
TIME CONSTANT	<i>2</i>			TYPE	<i>Gamma</i>	VERTICAL SCALE	<i>10 ft/in.</i>
LOGGING SPEED Ft./Min.	<i>20</i>			REMARKS:		FLUID LEVEL	<i>27' Ft.</i>
VERTICAL SCALE Ft./In.	<i>10</i>					TEMPERATURE	
DIGITAL RECORD?						DEPTH (INTERVAL)	<i>0-320' Ft.</i>
						RANGE	<i>10°-70° F</i>
						VERTICAL SCALE	<i>10 ft/in.</i>
						LOGGING SPEED	<i>25 Ft./Min.</i>

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER F3 TD 286'

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. F3

RUN NO. 1

DATE 7-23-77

TIME:

START 8:00 AM

END 2:40 A.M.

SENSOR SERIAL NO.
376

OPERATOR
Michael R Glasgow

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	117.50	65.00	280	118.77	64.60	550		
20	135.93	59.68	290	120.01	64.23	560		
30	135.89	59.68	300			570		
40	130.76	61.07	310			580		
50	127.64	61.97	320			590		
60	126.70	62.23	330			600		
70	125.11	62.70	340			610		
80	124.05	62.99	350			620		
90	123.56	63.14	360			630		
100	121.73	63.71	370			640		
110	122.43	63.50	380			650		
120	121.47	63.77	390			660		
130	120.18	64.17	400			670		
140	121.61	63.74	410			680		
150	120.70	64.01	420			690		
160	120.97	63.92	430			700		
170	120.88	63.95	440			710		
180	120.21	64.17	450			720		
190	120.16	64.17	460			730		
200	120.14	64.20	470			740		
210	119.98	64.23	480			750		
220	120.37	64.10	490			760		
230	120.01	64.23	500			770		
240	119.66	64.32	510			780		
250	119.36	64.41	520			790		
260	119.08	64.50	530			800		
270	118.81	64.60	540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER F3 TD 286'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. F3
RUN NO. 2
DATE 7-25-77
TIME:
START 9:10 A.M.
END 9:45 A.M.
SENSOR SERIAL NO.
376
OPERATOR
Michael R Glascock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	123.00	63.32	280	119.21	64.47	550		
20	135.73	59.73	286 TD 290	119.37	64.41	560		
30	136.22	59.60	300			570		
40	132.05	60.71	310			580		
50	129.39	61.46	320			590		
60	128.32	61.77	330			600		
70	127.12	62.12	340			610		
80	125.76	62.49	350			620		
90	125.14	62.70	360			630		
100	124.86	62.76	370			640		
110	124.46	62.87	380			650		
120	123.46	63.17	390			660		
130	123.14	63.29	400			670		
140	123.08	63.29	410			680		
150	122.20	63.56	420			690		
160	122.32	63.53	430			700		
170	122.14	63.59	440			710		
180	121.61	63.74	450			720		
190	121.39	63.80	460			730		
200	121.31	63.83	470			740		
210	120.98	63.92	480			750		
220	121.09	63.89	490			760		
230	120.70	64.01	500			770		
240	120.32	64.14	510			780		
250	119.96	64.23	520			790		
260	119.62	64.35	530			800		
270	119.32	64.44	540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER 5-77-F3 TD 286'

REFERENCE MAP 5-77

REMARKS ABANDONMENT SURVEY

HOLE NO. 5-77-F3

RUN NO. 3-ABD

DATE 11/9/77

TIME:

START 1:25

END 1:58

SENSOR SERIAL NO. 2

OPERATOR JUDD MUSKAT

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	142.76	62.08	280	136.06	63.82	550		
20	149.23	60.46	290	135.82	63.82	560		
30	153.31	59.49	300	286' T.D.		570		
40	155.50	58.98	310			580		
50	154.18	59.29	320			590		
60	152.71	59.63	330			600		
70	151.19	59.99	340			610		
80	149.77	60.33	350			620		
90	148.24	60.71	360			630		
100	146.84	60.80	370			640		
110	146.23	61.20	380			650		
120	145.70	61.34	390			660		
130	144.45	61.65	400			670		
140	143.76	61.83	410			680		
150	143.42	61.90	420			690		
160	142.74	62.08	430			700		
170	142.18	62.22	440			710		
180	141.66	62.35	450			720		
190	141.12	62.49	460			730		
200	140.62	62.62	470			740		
210	140.02	62.78	480			750		
220	139.40	62.94	490			760		
230	138.83	63.09	500			770		
240	138.23	63.25	510			780		
250	137.69	63.39	520			790		
260	137.12	63.54	530			800		
270	136.59	63.68	540			810		

HOLE NO. F3
DATE _____
PROJECT GEOLOGIST
Michael R Glascock

HOLE NUMBER E3

SOURCE MAP 5-77

REMARKS _____

[illegible]

HOLE NO. FE

LOG HEADING

NUCLEAR RADIATION				INSTRUMENTATION		ELECTRIC LOG	
RUN NUMBER	1	2	3	PROBE NUMBER	616	DEPTH INTERVAL	11'-234' FT
DEPTH (INTERVAL) FT.	0-234'			TYPE	TEMP	RESISTANCE	290 Ohms
RANGE	C.P.S. 0-200			PROBE NUMBER	5014	S.P.	100 M
TIME CONSTANT	Sec. 2			TYPE	8	VERTICAL SCALE	10 FT/IN
LOGGING SPEED FT./Min.	20			REMARKS:		FLUID LEVEL	11' FT
VERTICAL SCALE FT./IN.	10					TEMPERATURE	
						DEPTH (INTERVAL)	0-234 FT
						RANGE	100-750° F
						VERTICAL SCALE	10 FT/IN

FIELD DATA SHEET TEMPERATURE SURVEY

HOLE NUMBER F4 TD 316' T.D.
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. F4
RUN NO. 1
DATE 7-10-77
TIME: START 8:00 A.M.
END 8:45 A.M.
SENSOR SERIAL NO. 376
OPERATOR Michael R Glasgow

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	116.10	65.45	280	121.61	63.74	550		
20	130.00	61.29	290	121.43	63.80	560		
30	131.75	60.79	300	121.22	63.86	570		
40	129.91	61.32	310	121.14	63.89	580		
50	127.66	61.94	320 ^{3/4}	121.35	63.80	590		
60	127.30	62.06	330			600		
70	126.26	62.35	340			610		
80	126.45	62.29	350			620		
90	125.88	62.46	360			630		
100	125.48	62.58	370			640		
110	124.92	62.76	380			650		
120	124.47	62.87	390			660		
130	122.63	63.44	400			670		
140	123.28	63.23	410			680		
150	123.46	63.17	420			690		
160	123.69	63.11	430			700		
170	123.71	63.11	440			710		
180	123.64	63.14	450			720		
190	123.55	63.14	460			730		
200	123.61	63.14	470			740		
210	123.87	63.05	480			750		
220	123.70	63.11	490			760		
230	123.34	63.23	500			770		
240	122.89	63.35	510			780		
250	122.68	63.41	520			790		
260	122.42	63.50	530			800		
270	121.95	63.62	540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER F4 TD 316'
REFERENCE MAP 5-77
REMARKS _____

HOLE NO. F4
RUN NO. 2
DATE 7-12-77
TIME:
START 9:15 A.M.
END 10:00 A.M.
SENSOR SERIAL NO.
376
OPERATOR
Michael R Glasrock

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	116.30	65.38	280	123.44	63.20	550		
20	134.67	60.00	290	123.04	63.32	560		
30	135.24	59.86	300	122.67	63.41	570		
40	133.78	60.24	310	122.28	63.53	580		
50	132.22	60.68	316'	122.11	63.59	590		
60	131.64	60.85	330			600		
70	130.83	61.07	340			610		
80	130.43	61.18	350			620		
90	129.90	61.32	360			630		
100	129.47	61.43	370			640		
110	128.97	61.57	380			650		
120	128.54	61.72	390			660		
130	125.74	62.52	400			670		
140	127.32	62.06	410			680		
150	127.50	62.00	420			690		
160	127.45	62.00	430			700		
170	127.23	62.09	440			710		
180	126.99	62.15	450			720		
190	126.74	62.23	460			730		
200	126.60	62.26	470			740		
210	126.41	62.32	480			750		
220	126.06	62.41	490			760		
230	125.52	62.58	500			770		
240	125.19	62.67	510			780		
250	124.74	62.81	520			790		
260	124.38	62.90	530			800		
270	123.88	63.05	540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER F4 TD 316' T.D.

REFERENCE MAP 5-77

REMARKS _____

HOLE NO. F4

RUN NO. 3

DATE 7-19-77

TIME:

START 10:00 A.M.

END 10:45 A.M.

SENSOR SERIAL NO.
376

OPERATOR
Michael R Glascock

FT.	K Ω	°F	FT.	K Ω	°F	FT.	K Ω	°F
10	124.21	62.96	280	124.31	62.93	550		
20	138.73	58.94	290	123.90	63.05	560		
30	137.96	59.12	300	123.48	63.17	570		
40	135.78	59.70	310	123.10	63.29	580		
50	134.00	60.19	316' T.D. 320	122.86	63.35	590		
60	133.24	60.41	330			600		
70	132.65	60.54	340			610		
80	132.48	60.60	350			620		
90	131.83	60.79	360			630		
100	131.32	60.93	370			640		
110	130.86	61.04	380			650		
120	130.32	61.21	390			660		
130	129.04	61.57	400			670		
140	129.22	61.52	410			680		
150	129.28	61.49	420			690		
160	129.03	61.57	430			700		
170	128.73	61.66	440			710		
180	128.41	61.74	450			720		
190	128.07	61.83	460			730		
200	127.72	61.94	470			740		
210	127.34	62.06	480			750		
220	126.93	62.17	490			760		
230	126.44	62.32	500			770		
240	126.01	62.43	510			780		
250	125.57	62.55	520			790		
260	125.18	62.67	530			800		
270	124.73	62.81	540			810

FIELD DATA SHEET
TEMPERATURE
SURVEY

HOLE NUMBER 5-77-F4 TD 315'
REFERENCE MAP 5-77
REMARKS ABANDONMENT SURVEY

HOLE NO. 5-77-F4
RUN NO. 4-ABD
DATE 11/7/77
TIME: START 11:50 am
END 12:15
SENSOR SERIAL NO. 2
OPERATOR JUDD MUSKAT

FT.	KΩ	°F	FT.	KΩ	°F	FT.	KΩ	°F
10	138.21	63.25	280	141.45	62.40	550		
20	149.93	60.30	290	140.91	62.53	560		
30	155.86	58.89	300	140.41	62.67	570		
40	156.25	58.80	310	139.94	62.80	580		
50	154.58	59.20	320	139.70	62.87	590		
60	153.08	59.54	330	315 T.D.		600		
70	151.91	59.83	340			610		
80	151.12	60.01	350			620		
90	150.48	60.17	360			630		
100	149.84	60.31	370			640		
110	149.29	60.46	380			650		
120	148.54	60.64	390			660		
130	147.85	60.80	400			670		
140	147.48	60.89	410			680		
150	147.18	60.96	420			690		
160	146.78	61.07	430			700		
170	146.49	61.14	440			710		
180	146.08	61.23	450			720		
190	145.64	61.34	460			730		
200	145.21	61.45	470			740		
210	144.81	61.56	480			750		
220	144.37	61.66	490			760		
230	143.86	61.79	500			770		
240	143.38	61.88	510			780		
250	142.98	62.02	520			790		
260	142.54	62.13	530			800		
270	141.91	62.28	540			810

REMARKS _____

[illegible]

GEOTHERMAL SERVICES, INC.
7880 CONVOY COURT, SAN DIEGO, CA 92111

HOLE NO. E1

LOG HEADING

HOLE NO. <u>5-11-E1</u>	TIME START: <u>11:00 A.M.</u> END: <u>2:30 P.M.</u>	REFERENCE MAP <u>5-77</u>	NOTES: Temp. Rate 100 TC 1 Pos 8.32 V.S. 0.78
UNIT NO. <u>56755</u>	NOMINAL HOLE DIAMETER <u>4 3/8 IN.</u>		
OPERATOR(S) <u>Michael R. Blasas</u>	DRILLING MEDIUM <u>H₂O</u>		
DATE <u>1/2/77</u>	TYPE OF MUD <u>Benfonite</u>		
DRILLED DEPTH ELEVATION <u>315' FT.</u> <u>640' FT.</u>	GROUND WATER (I) DEPTH(S)		

NUCLEAR RADIATION				INSTRUMENTATION		ELECTRIC LOG	
RUN NUMBER	1	2	3	PROBE NUMBER	5005	DEPTH (INTERVAL)	43'-315' Ft.
DEPTH (INTERVAL) Ft.	0-315'			TYPE	Temp	RESISTANCE	20 Ohms
RANGE	C.P.S. 0-200			PROBE NUMBER	5292	S.P.	100 MV
TIME CONSTANT	Sec. 2			TYPE	Gamma	VERTICAL SCALE	10' Ft./In.
LOGGING SPEED Ft./Min.	20			REMARKS:		FLUID LEVEL	43' Ft.
VERTICAL SCALE Ft./In.	10			<u>K-Heber: 1032X10⁵</u>		TEMPERATURE	
DIGITAL RECORD?	-			<u>End time: 19:50-25</u>		DEPTH (INTERVAL)	0-315' Ft.
						RANGE	10'-90' °F
						VERTICAL SCALE	10' Ft./In.
						LOGGING SPEED	25' Ft./Min.

APPENDIX D

ARCHAEOLOGICAL RECONNAISSANCE REPORTS

GTS JOB NO. 5-77

AN ARCHAEOLOGICAL RECONNAISSANCE
OF TWENTY PROPOSED DRILLING SITES
NEAR SOCORRO, NEW MEXICO

Roxanne K. Dunham

Federal Antiquities Permit No. 76-NM-107

A REPORT PREPARED FOR GEOTHERMAL SERVICES, INCORPORATED under the direction
of Dr. Stanley D. Bussey of the Cultural Resources Management Division,
Department of Sociology and Anthropology, New Mexico State University,
Las Cruces, New Mexico.

May 1977

Report No. 126

AN ARCHAEOLOGICAL RECONNAISSANCE
OF TWENTY PROPOSED DRILLING SITES
NEAR SOCORRO, NEW MEXICO

Roxanne K. Dunham

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Department of Sociology and Anthropology, New Mexico State University,
Las Cruces, New Mexico.

May 1977

Report No. 126

ABSTRACT

On May 18, 1977, an archaeologist from the Cultural Resources Management Division of the Department of Sociology and Anthropology, New Mexico State University, conducted an archaeological survey of twenty (20) proposed and two (2) alternate drill hole locations at the request of GeoThermal Services, Incorporated. The proposed drill hole locations are between eight and twelve miles (north and west) of Socorro, New Mexico. No significant cultural material was noted in the areas to be impacted by the drill sites. It is recommended that archaeological clearance be granted for the locations described in this report.

INTRODUCTION

An archaeological clearance survey was conducted on May 18, 1977, by Roxanne K. Dunham, archaeologist from the Cultural Resources Management Division of the Department of Sociology and Anthropology, New Mexico State University. The survey was conducted at the request of GeoThermal Services, Incorporated, for twenty (20) geothermal drill hole sites and two (2) alternate areas located eight to twelve miles north and west of Socorro, New Mexico, in Socorro County. The proposed locations are on land under the administration of the Bureau of Land Management, Socorro District. The archaeologist met with Cassandra Richards, Bureau of Land Management archaeologist, Socorro District, who gave clearance for drill holes B2, B3, B14, and B16 which were investigated in a previous survey, and were reported to contain no significant cultural material. Mr. David J. Lloyd, Project Geologist of GeoThermal Services, Incorporated, assisted the archaeologist in locating the exact areas to be impacted by the drill sites and provided U.S.G.S., Magdalena and Socorro, New Mexico Quadrant maps with drill site locations marked. No significant cultural material was found in the drill site locations to be impacted. Archaeological clearance is recommended for all drill sites except Drill Pad B1 and Drill Pad B9 for which alternate locations were chosen and surveyed.

SURVEY PROCEDURES

The archaeologist conducted an intensive survey of each proposed and alternate drilling location. Each drill site encompassed a 50+ foot

FIGURE 1: PROJECT LOCATION

FIGURE 2: Proposed Drill Pads B1-B17.
Socorro County, New Mexico (1959)

radius from the drill hole itself. The archaeologist walked transects at approximate 3 meter intervals on each drilling area and on adjacent areas which might be indirectly impacted in the course of construction of the drill pads.

LOCATION AND DESCRIPTION OF SURVEY AREAS

Drill Pad B1

Northwest $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of Section 16, Township 1 South, Range 1 West, Socorro County, New Mexico. A sparse lithic scatter of flaked silicic stone was found at this location. Also, present were four stacks of stones containing approximately 10 stones each, to a height of 2 to 3 courses or approximately 15 to 20 centimeters and approximately 40 centimeters in width. They were located at random intervals in an area that began 3 meters east of the drill hole location and continued 22 meters in an easterly direction. It is possible that the stone cairns were a type of claim or boundary marker. However, with the close association of obvious cultural materials, it would be difficult to determine the relationship of the cairns to the lithic scatter without further investigation. To eliminate the problem and expedite drilling procedures, the geologist decided to use an alternate drilling location. Vegetation in the area was predominantly creosote (*Larrea tridentata*) with mesquite (*Prosopis juliflora*) and desert grasses. Archaeological clearance is not recommended for this location without further investigation.

Alternate Drill Pad B1A

Northeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of Section 16, Township 1 South, Range 1 West, Socorro County, New Mexico. This alternate location is approximately $\frac{1}{4}$ mile east of B1. One piece of silicious rock was noted in the area, but further investigation of the immediate area produced no other cultural material. Vegetation was primarily creosote (Larrea tridentata) with some mesquite (Prosopis juliflora). Direct impact on archaeological material would be minimal for this area. Archaeological clearance is recommended.

Drill Pad B2

Northwest $\frac{1}{4}$ of the Northwest $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of Section 33, Township 1 South, Range 1 West, Socorro County, New Mexico. Archaeological clearance was granted by the Bureau of Land Management archaeologist, Cassandra Richards.

Drill Pad B3

Southeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of the Northwest $\frac{1}{4}$ of Section 34, Township 1 South, Range 1 West, Socorro County, New Mexico. Archaeological clearance was granted by the Bureau of Land Management archaeologist, Cassandra Richards.

Drill Pad B4

Southeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of Section 6, Township 2 South, Range 1 West, Socorro County, New Mexico. No archaeological material was found on this location. Vegetation consisted of juniper (Juniperus sp.) creosote (Larrea tridentata) and desert grasses, all low in density. Archaeological clearance is recommended.

Drill Pad B5

Southwest $\frac{1}{4}$ of the Northwest $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of Section 3, Township 2 South, Range 1 West, Socorro County, New Mexico. No archaeological material was found on this location. Vegetation was predominantly creosote (Larrea tridentata) with Apache-Plume (Fallugia paradoxa) and desert grasses also present. Archaeological clearance is recommended.

Drill Pad B6

Southwest $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of Section 8, Township 2 South, Range 1 West, Socorro County, New Mexico. This location has been previously disturbed by a pipeline installation. No archaeological material was found on this location. Vegetation consisted of creosote (Larrea tridentata). Archaeological clearance is recommended.

Drill Pad B7

Southwest $\frac{1}{4}$ of the Northwest $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of Section 9, Township 2 South, Range 1 West, Socorro County, New Mexico. No archaeological material was found on this location. Vegetation consisted of creosote (Larrea tridentata). Archaeological clearance is recommended.

Drill Pad B8

Southwest $\frac{1}{4}$ of the Northwest $\frac{1}{4}$ of the Southwest $\frac{1}{4}$ of Section 10, Township 2 South, Range 1 West, Socorro County, New Mexico. No archaeological material was found on this location. Vegetation was dominated by creosote (Larrea tridentata) with sparse mesquite

(*Prosopis juliflora*) and desert grasses. Archaeological clearance is recommended.

Drill Pad B9

Southeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of Section 7, Township 2 South, Range 1 West, Socorro County, New Mexico. A sparse scatter of flakes and debris of silicious stone materials, including obsidian, were found in the area to be directly impacted by construction. East of the drill hole location, approximately 35 meters, a possible knife fragment, bifacially manufactured, was found. In order to expedite the drilling procedure and eliminate the problem of possible impact, the geologist decided to relocate the drill site. Vegetation was dominated by creosote (*Larrea tridentata*) and desert grasses. Archaeological clearance is not recommended for this location without further investigation.

Alternate Drill Pad B9 A

Southeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of Section 7, Township 2 South, Range 1 West, Socorro County, New Mexico. This alternate drill site was located 50 meters west/northwest of B9. One isolated flake of obsidian was found in this area. Vegetation in this area was primarily creosote (*Larrea tridentata*) with desert grasses. Direct impact on archaeological material would be minimal in this area. Archaeological clearance is recommended.

Drill Pad B10

Southeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of Section 17, Township 2 South, Range 1 West, Socorro County, New Mexico. No

archaeological material was found on this location. Vegetation in this area was primarily creosote (Larrea tridentata) with desert grasses. Archaeological clearance is recommended.

Drill Pad B11

Southwest $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of the Northwest $\frac{1}{4}$ of Section 15, Township 2 South, Range 1 West, Socorro County, New Mexico. No archaeological material was found on this location. Vegetation consisted of creosote (Larrea tridentata), & sparse desert grasses. Archaeological clearance is recommended.

Drill Pad B12

Northwest $\frac{1}{4}$ of the Southwest $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of Section 21, Township 2 South, Range 1 West, Socorro County, New Mexico. No archaeological material was found on this location. Vegetation for the area was creosote (Larrea tridentata) with desert grasses present. Archaeological clearance is recommended.

Drill Pad B13

Southwest $\frac{1}{4}$ of the Southwest $\frac{1}{4}$ of the Southwest $\frac{1}{4}$ of Section 19, Township 2 South, Range 1 West, Socorro County, New Mexico. No archaeological material was found on this location. Vegetation consisted of creosote (Larrea tridentata) with some mesquite (Prosopis juliflora) and desert grasses. Archaeological clearance is recommended.

Drill Pad B14

Northeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of Section 30, Township 2 South, Range 1 West, Socorro County, New Mexico. Archaeological clearance was granted by the Bureau of Land Management archaeo-

logist, Cassandra Richards.

Drill Pad B15

Northeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of Section 29, Township 2 South, Range 1 West, Socorro County, New Mexico. No archaeological material was found on this location. Vegetation consisted of creosote (Larrea tridentata), Apache-Plume (Fallugia paradoxa). Archaeological clearance is recommended.

Drill Pad B16

Southeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of Section 28, Township 2 South, Range 1 West, Socorro County, New Mexico. Archaeological clearance was granted by the Bureau of Land Management archaeologist, Cassandra Richards.

Drill Pad B17

Northeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of Section 27, Township 2 South, Range 1 West, Socorro County, New Mexico. No archaeological material was found on the location. Vegetation consisted of creosote, (Larrea tridentata), prickly pear cactus, (Opuntia sp.) and desert grasses. Archaeological clearance is recommended.

Drill Pad B21

Southwest $\frac{1}{4}$ of the Southwest $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of Section 4, Township 3 South, Range 2 West, Socorro County, New Mexico. No archaeological material was found for this location. Vegetation consisted of narrow leaf yucca (Yucca angustissima), walking cane cholla (Opuntia spp.), and desert grasses. Archaeological clearance is recommended.

FIGURE 3: Proposed Drill Pads B21-B23.
Socorro County, New Mexico (1959)

Drill Pad B22

Southwest $\frac{1}{4}$ of the Southwest $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of Section 22, Township 3 South, Range 2 West, Socorro County, New Mexico. No archaeological material found on the location. Vegetation consisted of walking cane cholla (Opuntia sp.) and desert grasses.

Drill Pad B23

Southwest $\frac{1}{4}$ of the Southwest $\frac{1}{4}$ of the Southwest $\frac{1}{4}$ of Section 28, Township 3 South, Range 2 West, Socorro County, New Mexico. No archaeological material was found on the location. Vegetation consisted of walking cane cholla (Opuntia sp.) juniper (Juniperus sp.) and desert grasses. Archaeological clearance is recommended.

IMPACT ON ARCHAEOLOGICAL RESOURCES

Direct Impact

Direct impact is the immediate effect that disturbance of an area has on archaeological resources. This impact can occur through earth-moving, heavy equipment operation, or personnel activities in the course of construction. If construction is limited to the areas surveyed which contained no significant archaeological material and the areas which require further investigation are avoided (Drill Pads B1 and B9), there will be no unpredicted disturbance of archaeological remains.

Indirect Impact

Indirect impact is the result of the long-term effects of disturbance which may further damage archaeological remains. The indirect

impact in this situation will be minimal in that all drill locations are situated adjacent to existing roads. The effects of wind and water erosion, after the disturbance of the environment, will be more of a factor in the impact on the areas.

RECOMMENDATIONS

There was no significant archaeological material found on this survey, except on the locations of Drill Pads B1 and B9. If these drill locations are avoided, drilling activity in the other areas will have no significant impact on archaeological resources. Archaeological clearance is recommended, with the stipulations that if any cultural material is noticed during construction, the Bureau of Land Management shall be notified and Drill Pads B1 and B9 shall be avoided.

GeoThermal

NEW MEXICO STATE UNIVERSITY ARCHAEOLOGICAL SURVEY Services Project SITE NO.: L.A.

Site name _____ Quad no. _____ : Field No. GSS-1

Map source U.S.G.S. Socorro, NM, Socorro County 1959 Accessability: 4-wh. dr. foot sedan backhoe

NW ¼ of the NE ¼ of the SE ¼, Sec. 16, T. 1 N S R. 1 E W, County Socorro State NM

Location _____

Elevation _____

Stake location (MNM, Other) _____

Site is in what nearest named drainage? San Lorenzo Arroyo Nearest town Chamisa Nearest highway 125

Ownership Bureau of Land Management Informant _____

FEATURES (indicate number): Pit houses _____ Kivas _____ Surface rooms: Slab/Jacal _____ Masonry _____ Adobe _____ Other 4 rock cairns & lithic

Refuse area (direction) _____ Hearths _____ Burials _____ ~~Shed~~/Chipping area E Grids/Dams/Terraces/Borders _____ Petroglyphs/Pictographs _____ scatter

Trails/Steps/Toeholds _____ Other Rock Cairns E. of Drilling Stake

PLAN (check ☒): 1-room _____ Arc _____ Linear _____ L-shaped _____ C-shaped _____ F-shaped _____ E-shaped _____ ()-shaped _____

Enclosed plaza: by a wall _____ by rooms _____ Scattered dwelling units _____ Indeterminate _____ Other _____

Single-tier _____ Double-tier _____ ()-tiers _____ Part double-tier _____ Part ()-tiers _____ Orientation East Exposure from North

Modern structures on site _____

Nature and depth of fill _____ Area of site 4 m (N-S), 22m (E-W) meters/feet

Condition: Undisturbed _____ Eroded ☒ Pot-hunted _____ Pottery/Artifact abundance: 0, 10's, 100's, 1000's Multiple component site? _____

SITUATION (check ☒): Valley bottom _____ Bench/Terrace ☒ Slope _____ Ridge _____ Mesa top _____ Cliff edge _____ Overhang _____ Cave _____

Dune _____ Other _____

Terrain: Level _____ Broken ☒ Slopes to (direction) E Surface deposits: Alluvium ☒ Colluvium _____ Aeolian _____ Talus _____ Residual _____

Soil: Rocky _____ Gravelly ☒ Sandy ☒ Clayey _____ Other Desert Pavement Local outcrops: Sandstone _____ Shale _____ Limestone _____

Basalt ☒ Tuff _____ Caliche _____ Other _____ Arable land (type, distance & direction) 3 mi. E. To Rio Grande River Valley

Water (distance & direction): River _____ Arroyo _____ Stream confluence _____

Spring/Seep _____ Bedrock pool _____ Local vegetation patterns creosote predominating with some mesquite and desert grasses

Field remarks The 4 stone cairns each had about 10 stones, 2-3 courses in height (15-20 cm.) and 40 cm. in width. The first was about 3m. E of the drilling stake and were at random intervals to the East up to 22m. The chipping material was scattered throughout the cairn locations-relationship was not determined.

Impact: Type geothermal drilling with 50+ feet radius Direct ☒ Indirect _____

Mitigation? Avoid ☒ Monitor _____ Test _____ Excavate _____ Not Required _____

Statement of Eligibility _____ Nat'l Register Nomination _____ Date _____

CULTURE _____ / _____ Phase or Date _____ / _____
(component 1) (component 2) (component 1) (component 2)

Zone _____ Locality _____ Photo: B/W _____ Color _____

Lab remarks _____

UTM REFERENCE

13 / 321075 / 3788650
zone easting northing

NMSU Site No. 202

NMSU Report No. 126

Field recorder Roxanne Dunham Date May 18, 1977

Lab recorder _____ Date _____

Geothermal

NEW MEXICO STATE UNIVERSITY ARCHAEOLOGICAL SURVEY Services Project SITE NO.: L.A.

Site name _____ Quad no. _____ Field No. GSS-2

Map source U.S.G.S. Socorro, NM, Socorro County 1959 Accessibility: 4-wh. dr. sedan ☒ backhoe

SE 1/4 of the SE 1/4 of the SE 1/4, Sec. 7, T. 2 N, R. 1 W, County Socorro State NM

Location 2 mi. NW of Socorro, NM

Elevation 5331 ft.

Stake location (MNM, Other) _____

Site is in what nearest named drainage? Canoncito del Puertecito Nearest town del Lemitar Lemitar Nearest highway I 25

Ownership Bureau of Land Management Informant _____

FEATURES (indicate number): Pit houses _____ Kivas _____ Surface rooms: Slab/Jacal _____ Masonry _____ Adobe _____ Other Lithic scatter

Refuse area (direction) _____ Hearths _____ Burials _____ Sherd/Chipping area E Grids/Dams/Terraces/Borders _____ Petroglyphs/Pictographs _____

Trails/Steps/Tocholds _____ Other _____ of drilling site

PLAN (check ☒): 1-room _____ Arc _____ Linear _____ L-shaped _____ C-shaped _____ F-shaped _____ E-shaped _____ ()-shaped _____

Enclosed plaza: by a wall _____ by rooms _____ Scattered dwelling units _____ Indeterminate _____ Other _____

Single-tier _____ Double-tier _____ ()-tiers _____ Part double-tier _____ Part ()-tiers _____ Orientation _____ Exposure N

Modern structures on site _____

Nature and depth of fill _____ Area of site 20 m (NS) 45m (E-W) meters/feet

Condition: Undisturbed _____ Eroded _____ Pot-hunted _____ Pottery/Artifact abundance: 0, 10's, 100's, 1000's Multiple component site? _____

SITUATION (check ☒): Valley bottom _____ Bench/Terrace ☒ Slope _____ Ridge _____ Mesa top _____ Cliff edge _____ Overhang _____ Cave _____

Dune _____ Other _____

Terrain: Level _____ Broken ☒ Slopes to (direction) N Surface deposits: Alluvium ☒ Colluvium _____ Aeolian _____ Talus _____ Residual _____

Soil: Rocky _____ Gravelly ☒ Sandy ☒ Clayey _____ Other Desert Pavement Local outcrops: Sandstone _____ Shale _____ Limestone _____

Basalt ☒ Tuff _____ Caliche _____ Other _____ Arable land (type, distance & direction) 5 mi. E. To Rio Grande Valley

Water (distance & direction): River _____ Arroyo _____ Stream confluence _____

Spring/Seep _____ Bedrock pool _____ Local vegetation patterns Creosote and

some desert grasses.

Field remarks Lithic scatter, including obsidian, and a possible knife fragment which was bifacially manufactured which was located 35 mi. east of the drilling stake. Investigation of the surrounding area did not produce any more archaeological material.

Impact: Type geothermal drilling with 50+ feet radius Direct ☒ Indirect _____

Mitigation? Avoid ☒ Monitor _____ Test _____ Excavate _____ Not Required _____

Statement of Eligibility _____ Nat'l Register Nomination _____ Date _____

CULTURE _____ / _____ Phase or Date _____ / _____

Zone _____ Locality _____ Photo: B/W _____ Color _____

Lab remarks _____

UTM REFERENCE

13 / 317925 / 3779290
zone easting northing

NMSU Site No. 201

NMSU Report No. 126

Field recorder Roxanne Dunham Date May 18, 1977

Lab recorder _____ Date _____

AN ARCHAEOLOGICAL SURVEY OF
SIX PROPOSED GEOTHERMAL DRILLING
LOCATIONS, SOCORRO COUNTY, NEW MEXICO

Roxanne K. Dunham

Performed Under Permit Number 76-NM-107

A REPORT PREPARED FOR GEOTHERMAL SERVICES, INCORPORATED under the direction of Dr. Pamela C. Magers of the Cultural Resources Management Division, Department of Sociology and Anthropology, New Mexico State University, Las Cruces, New Mexico.

June 1977

Report No. 128

AN ARCHAEOLOGICAL SURVEY OF
SIX PROPOSED GEOTHERMAL DRILLING
LOCATIONS, SOCORRO COUNTY, NEW MEXICO

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Performed Under Permit Number 76-NM-107

A REPORT PREPARED FOR GEOTHERMAL SERVICES, INCORPORATED under the direction of Dr. Pamela C. Magers of the Cultural Resources Management Division, Department of Sociology and Anthropology, New Mexico State University, Las Cruces, New Mexico.

June 1977

Report No. 128

ABSTRACT

An archaeological clearance survey was conducted by New Mexico State University of six proposed geothermal drilling locations in Socorro County, New Mexico, for GeoThermal Services, Incorporated. The areas surveyed were on lands administered by the Bureau of Land Management, Socorro District, and the National Forest Service, Cibola National Forest, Magdalena Ranger Station. No archaeological sites or artifacts were encountered. We recommend that archaeological clearance be granted.

INTRODUCTION

On June 11, 1977, Roxanne K. Dunham, an archaeologist of the Cultural Resources Management Division, Department of Sociology and Anthropology, New Mexico State University, conducted an intensive archaeological survey of six proposed geothermal drilling locations in Socorro County, New Mexico, (Figure 1). The survey was conducted at the request of GeoThermal Services, Incorporated. The proposed drilling locations are on lands under the administration of the Bureau of Land Management, Socorro District, and the National Forest Service, Cibola National Forest, Magdalena Ranger Station.

Michael R. Glascock, Field Geologist of GeoThermal Services, Incorporated, assisted the archaeologist in locating the exact areas to be impacted by the drilling process.

SURVEY PROCEDURES

The drilling areas encompass a 50+ foot radius from the drill hole stake marker. The archaeologist walked three meter wide transects over the designated areas to insure complete coverage.

LOCATION AND DESCRIPTION OF SURVEY AREAS

Drilling locations with "B" designations are located on lands administered by the Bureau of Land Management and "F" on land administered by the National Forest Service. All drilling locations were placed

FIGURE 1: PROJECT LOCATION: ▲

beside existing access roads. A description of all six drilling locations follows:

- B 19: Northeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of the Southwest $\frac{1}{4}$ of Section 34, Township 3 South, Range 2 West, Socorro County, New Mexico, (Figure 3). Vegetation on this location was Juniper (Juniperous scopulorum), Mesquite (Prosopis juliflora), Cane Cholla (Opuntia sp.), Prickly Pear (Opuntia sp.), Broom snakeweed (Gutierrezia sarothrae), and various unidentified desert grasses. No archaeological evidence was found on this location. Archaeological clearance is recommended.
- B 20: Northeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of Section 31, Township 3 South, Range 1 West, Socorro County, New Mexico, (Figure 2). Vegetation on this location was Mesquite (Prosopis juliflora), Saltbush (Atriplex sp.), Little leaf Sumac (Rhus microphylla), Creosote bush (Larrea tridentata), Prickly Pear (Opuntia sp.), Cane Cholla (Opuntia sp.), Broom snakeweed (Gutierrezia sarothrae), Goosefoot (Chenopodium sp.) and various unidentified desert grasses. No archaeological evidence was found on this location. Archaeological clearance is recommended.
- F 1: Northeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of Section 34, Township 2 South, Range 3 West, Socorro County, New Mexico, (Figure 3). Vegetation on this location was Cane Cholla (Opuntia sp.), Narrow leaf yucca (Yucca angustissima), Broom snakeweed (Gutierrezia sarothrae), and various unidenti-

Mapped, edited, and published by the Geological Survey
Control by USGS and USC&GS
Compiled in 1961 from 1:24,000-scale maps dated 1959
Polyconic projection 1927 North American datum
10,000-foot grid based on New Mexico coordinate system,
central zone
1000 meter Universal Transverse Mercator grid ticks,
zone 13, shown in blue

FIGURE 2: SOCORRO, NEW MEXICO

FIGURE 3: MAGDALENA, NEW MEXICO

fied low to medium height desert grasses. No archaeological evidence was found on this location. Archaeological clearance is recommended.

- F 3: Southeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of Section 3, Township 3 South, Range 3 West, Socorro County, New Mexico, (Figure 3). Vegetation on this location was Pinon (Pinus edulis), Juniper (Juniperus scopulorum), Skunkbrush Sumac (Rhus trilobata), Cane Cholla (Opuntia sp.) Broom snakeweed (Gutierrezia sarothrae), Locoweed (Astragalus praelongus), and various unidentified low growing desert grasses. No archaeological evidence was found on this location. Archaeological clearance is recommended.
- F 4: Northwest $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of the Northwest $\frac{1}{4}$ of Section 13, Township 3 South, Range 3 West, Socorro County, New Mexico, (Figure 3). Vegetation on this location was Apache-Plume (Fallugia paradoxa), Cane Cholla (Opuntia sp.), Skunkbrush Sumac (Rhus trilobata), Broom Snakeweed (Gutierrezia sarothrae), Thread plant (Nemacladus glanduliferus), Goose-foot (Chenopodium sp.), and various unidentified low to medium height desert grasses. No archaeological evidence was found on this location. Archaeological clearance is recommended.
- F 5A: Northeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of the Southeast $\frac{1}{4}$ of Section 30, Township 3 South, Range 2 West, Socorro County, New Mexico, (Figure 3). Vegetation on this location was Pinon (Pinus edulis), Juniper (Juniperous scopulorum), Mountain

Mahogany (Cercocarpus betuloides), Cane Cholla (Opuntia sp.), Broom snakeweed (Gutierrezia sarothrae), Thread plant (Nemacladus glanduliferus), and various unidentified low to medium height desert grasses. No archaeological evidence was found. Archaeological clearance is recommended.

IMPACT ON CULTURAL RESOURCES

Direct Impact

Direct Impact is the immediate results on an area of construction and development. In archaeological terms, this could result in the destruction of archaeological evidence by earthmoving, heavy equipment operation, or construction workers attempting to collect artifacts from archaeological sites. No cultural resources are within the area of direct impact. All construction activity should be confined to the areas surveyed to insure that no unpredicted disturbance of archaeological material occurs. Any activity to be carried on outside of the right of way warrants further archaeological investigation before proceeding.

Indirect Impact

Indirect Impact is the adverse, long-term effect on archaeological evidence which is the result of construction activity. In many cases, it is the opening of new access roads into areas previously inaccessible to the public or improvement of roads which would not generally be used in their unmaintained condition. Therefore, it increases travel and the amount of vandalism to archaeological sites due to easier accessibility. Also, earth disturbance tends to increase the wind and water erosion, which can cause adverse effects on archaeological sites. No cultural

resources were found that would be subject to Indirect Impact.

RECOMMENDATIONS

No archaeological sites or artifacts were found in the six drilling locations. If all construction activity is limited to the surveyed areas, there will be no direct or indirect impact on the archaeological resources of the area. It is recommended that archaeological clearance be granted for these surveyed locations, with the stipulation that if any archaeological material is noticed during construction, an archaeologist from this office or the office of the Bureau of Land Management be notified at once and construction activity be halted.

FIGURE 2.

FIGURE 2.
FINAL HOLE LOCATIONS

FIGURE 4.

FIGURE 4.
GEOTHERMAL GRADIENTS (°F/100FT)

B21 This Report, See Table I.

SP1 Published Data, See Table 2.

FIGURE 5.

FIGURE 5.
HEAT FLOW (HFU)