Carl

UNIVERSITY OF UTAH RESEARCH INSTITUTE

UURI

EARTH SCIENCE LABORATORY
420 CHIPETA WAY, SUITE 120
SALT LAKE CITY, UTAH 84108
TELEPHONE 801-581-5283

MEMORANDUM

2 August 1982

TO: Susan Prestwich, Program Manager
Department of Energy/DGE
550 2nd Street
Idaho Falls, ID

FROM: Carl A. Ruscetta, Technical Program Coordinator

SUBJECT: State Coupled Resource Assessment Program
Review of Kansas Final Report and Deliverables Status
Contract DE-A507-79ET 27204, Mods. 001 thru 006

A copy of the final Project Report for the subject contract work was received at ESL on July 26, 1982 and has been reviewed with respect to the satisfaction of deliverable requirements.

This final report consists of Volume I, Text (3 sections) and Volume II, Appendices (5 sections). A copy of the Title, Index, Introduction and Abstract pages of the report are attached to this letter, together with the updated contract summary.

Please note that the Ks geothermal map, printing bid opening was on July 30 and printing and distribution is expected to be completed by early September, 1982. The completion of Dr. David Blackwell's work (SMU subcontract; Task 4 Mod 005) is expected to be completed in July and August, 1982, and the results added to the geothermal gradient data base prior to the contract completion date of September 20, 1982. Geothermal Map distribution and the addition of the final Blackwell data will essentially complete the subject contract requirements.

Carl A. Ruscetta

CAR:gm
enclosures
cc: Don Steeples

# ASSESSMENT OF THE GEOTHERMAL RESOURCES OF KANSAS

VOLUME I - TEXT
FINAL REPORT

Submitted to the Geothermal Division
of the U.S. Department of Energy

Don W. Steeples and Sandra A. Stavnes, editors
Don W. Steeples, Principle Investigator
Kansas Geological Survey
Lawrence, Kansas

June, 1982

VOLUME I
TABLE OF CONTENTS

KS FINAL REPORT

CHECK TOPICS AGAINST CONTRACT DELIVERABLES.

# INTRODUCTION

The purpose of this research is to provide a regional assessment of the geothermal energy potential for Kansas, using both of geological and geophysical information. In addition to evaluation of low temperature geothermal resource areas for the state, information obtained on the geology of the Precambrian basement rocks may provide the basis for future geological and geophysical studies for the Midcontinent.

# METHOD OF INVESTIGATION

This report includes the following regional geological and geophysical studies:

1a - establishment of a geothermal gradient data base from approximately 45,000 bottom hole temperatures recorded from well logs and interpretation of this data in terms of regional geology,

1b - establishment and interpretation of a second data base of geothermal gradients from thermal logging data from 144 "holes of opportunity" in the state under the auspices of Dr. Don Steeples and Sandra Stavnes of the Kansas Geological Survey,

2 - detailed evaluation of heat flow and geothermal potential for Kansas on the basis of data from nine holes carried out under the auspices of Dr. David Blackwell and John Steele of Southern Methodist University,

3 - development of a thermal conductivity probe that could be used both in situ and in the laboratory by Dr. Marios Sophocleous and Mitchell Hall of the Kansas Geological Survey,

4 - aquisition and analyses of aeromagnetic and gravity (southeastern Kansas) data for Kansas carried out under the auspices of Dr. Harold Yarger and George Lam (gravity) of the Kansas Geological Survey,

5 - paleomagnetic investigation of two Precambrian basement cores from KGS-USGS observation holes located in northeastern Kansas carried out under the auspices of Dr. Ken Kodama of Lehigh University,

6 - evaluation of the silica geothermometer technique with special consideration for the postulated heat flow anomaly in northwestern Kansas (Swanberg and Morgan, 1979) carried out under the auspices of Dr. Don Whittemore and Nelda Roehl of the Kansas Geological Survey.

Abstracts for these studies follow:

GEOTHERMAL GRADIENT VALUES FOR KANSAS FROM BOTTOM HOLE TEMPERATURES AND THERMAL LOGGING DATA

A United States Department of Energy sponsored geothermal resource survey for the State of Kansas was undertaken in 1979. This paper is a partial summary of that survey. The purpose of this study was to investigate the subsurface temperature distribution for the state and to explain any geographic variation observed.

Geothermal gradient values are extrapolated from bottom hole temperatures recorded on oil and gas well logs. These gradients are used to delineate general geothermal trends which were examined in the field by thermal logging. The results of the thermal logging indicate that geothermal gradients for the state range from 25 $^{o}$C/Km to 55 $^{o}$C/Km.

Variations in the geothermal gradient data for Kansas appear to be controlled by:

1) topography of the crystalline basement surface

2) variations in rates of heat production in the crystalline basement, presumably, but not necessarily, resulting from variations in basement rock type

3) variation in thermal conductivity in the sedimentary section.

4) possible convection eastward and upward from the Denver-Julesberg Basin.

The effects of factor 1 are most evident statewide (i.e., thousands of square miles) whereas those for factors 2, 3 and 4 are evident over smaller areas for which factor 1 is essentially invariant.

HEAT FLOW AND GEOTHERMAL POTENTIAL OF KANSAS

Temperature, thermal conductivity measurements and heat flow values are presented for four holes originally drilled for water resources investigations by the U.S. and Kansas Geological Surveys. These holes cut most of the sedimentary section and were cased and allowed to reach temperature equilibrium. Several types of geophysical logs were also run for these holes. Temperature data from an additional five wells are also presented. Temperature gradients in the sedimentary section vary over a large range (over 4:1), and there are significantly different temperatures at the same depth in different portions of the state. Temperatures as high as 34°C occur at a depth of 500 m in the south-central portion of the state and 28°C or lower in other parts of the state. In addition to cuttings measurements, thermal conductivities were estimated from geophysical well log parameters; the results are useful and more use of the technique is suggested. Using these results geophysical well logs can be used to predict temperatures as a function of depth in areas for which no temperatures are available if heat flow is assumed. The extreme variation in gradients observed in the holes occur because of the large contrast in thermal conductivity values. Shale thermal conductivity values appear to have been overestimated in the past and the Paleozoic shales in Kansas have thermal conductivity values of about $1.18 \pm 0.03$ $Wm^{-1}K^{-1}$. On the high side, evaporite and dolomite units have thermal conductivities of over 4 $Wm^{-1}K^{-1}$. In spite of the large variations of gradient the heat flow values throughout the holes do not vary more than 10 per cent and any water flow effects which might be present due to the lateral motion on any of the aquifers are less than 10 per cent. The best estimates for heat flow

in the four holes come from the carbonate units below the base of the Pennsylvanian and the values range from 48 $mWm^{-2}$ to 62 $mWm^{-2}$. Two of the holes were drilled to basement and correlation of the heat flow with the basement radioactivity suggests that the heat flow-heat production line postulated for the Midcontinent by Roy et al (1968a) applies to these data. Because of the low thermal conductivity of the shales the radiogenic pluton concept should apply to the Midcontinent. Thus if very radioactive plutons can be identified, much higher temperatures may occur in the sedimentary section than has been thought possible in the past. However, the past overestimation of shale conductivity values suggests that some previous high heat flow values in the Midcontinent are probably not correct and the high gradients are merely due instead to normal heat flow and very low thermal conductivity values. In spite of its presence in the Midcontinent region there could be significant use of geothermal energy in Kansas for space heating, thermal assistance and heat pump applications because the temperatures in the sedimentary section in much of Kansas are in excess of 40°C.

## DEVELOPMENT OF A LOW COST THERMAL CONDUCTIVITY PROBE

Low cost thermal conductivity probes were developed that could be used in situ and in the laboratory. These cylindrical type probes were calibrated by comparing thermal conductivity measurements obtained in Ottawa sand to those available for Ottawa sand in the literature. Cylindrical probes are most suited for soft rock thermal conductivity measurements where the probe can be inserted into the sediments with little effort. However, it was found that reliable measurements were obtained in the laboratory from dolomite core from the Arbuckle Group. A hole was drilled in the center of the core the

diameter of the probe and the probe was inserted. Thermal conductivity measurements obtained were compatible with those obtained by Blackwell and Steele (Chapter 3, this report) for similar dolomite samples from the Arbuckle Group in Kansas.

## REGIONAL INTERPRETATION OF KANSAS AEROMAGNETIC DATA

The Kansas Geological Survey has completed a 72,000 line kilometer aeromagnetic survey of the state. The total intensity magnetic field contour map, along with spectrally filtered versions, provide a better understanding of basement composition and paleotectonics within the state.

The magnetic data indicate that the southern part of the Proterozoic Central North American Rift System (CNARS) does not terminate in central Kansas but continues along a southeastern trend to at least the Oklahoma border. Some of the current seismicity within the state appears to be correlated with reactivated faults within CNARS.

There are indications of a distinct (paleoplate?) boundary between the 1600-1700 m.y. old mesozonal granitic terrane to the north and the 1400 m.y. old epizonal granitic terrane to the south.

There are numerous highly magnetic shallow granitic plutons, several known from drilling to be 1350 m.y. old, embedded in the older granitic crust in northeastern Kansas.

## PALEOMAGNETIC RESULTS FROM THE OSAWATOMIE CORE AND BIG SPRINGS CORE, KANSAS

Paleomagnetic studies of nine independently oriented samples from a core drilled into the Precambrian basement rocks at an aeromagnetic high near Osawatomie, Kansas and four samples from a basement core drilled at

a separate aeromagnetic high near Big Springs, Kansas suggest that these rocks are magnetic enough to produce the observed total field anomalies. The characteristic directions derived from Zijderveld plots of the alternating field demagnetization data have inclinations (Osawatomie I = -20.5°, Big Springs I = 51.5°) which agree reasonably well with the radiometric ages (1355 m.y.b.p.) for these rocks based on Irving and McGlynn's (1976) apparent polar wander path for the North American Precambrian. The difference in mean inclinations for the two cores, however, does suggest that there may be a 50-80 m.y. difference in the cooling age of the two intrusive bodies. Steep NRM inclinations in most of the Osawatomie samples and some of the Big Springs samples suggest the presence of an IRM in the rocks which may have been acquired during drilling. This could indicate that the in situ NRM intensity for the Osawatomie core may be less than the measured NRM intensity by a factor of two.

## GRAVITY MEASUREMENTS IN KANSAS

Approximately 16,000 new gravity measurements have been taken in Kansas in recent years. The average spacing in eastern Kansas is one mile east-west by four miles north-south and in western Kansas is one mile east-west by two miles north-south. Bouger gravity maps of the first 6000 points reveal numerous basement related anomalies not apparent in the earlier statewide Bouger gravity map (Woolard, 1958). A new gravity map of entire eastern Kansas will be completed by fall, 1982. Approximately 15,000 additional measurements will be taken in western Kansas during the next two years with a new map expected in 1984. These new data are proving very useful in the study of basement lithology and tectonics.

GEOTHERMAL MAPPING OF WESTERN KANSAS BASED ON CHEMICAL GEOTHERMOMETERS

Geothermal temperatures were computed from five chemical geothermometers for approximately 1,200 irrigation well waters from the broad, unconsolidated aquifers in the western two-thirds of Kansas. The chalcedony and Na-K-Ca geothermometers gave the most reasonable temperatures, although ranging widely between 3-88°C. Higher temperatures computed from both equations were distributed throughout northwestern Kansas and extended into the west-central part of the state. Quartz and Na/K geothermometer temperatures were unreasonably high and many temperatures from a Na-K-Ca geothermometer modified for carbon dioxide were below 0°C. The correlation between chalcedony geothermometer temperature and subsurface temperatures at 300 meters derived from thermal logging of boreholes is statistically highly significant; the correlation coefficient is 0.68. However, the geochemistry of sediments in the aquifers, which are less than 200 meters in depth, is probably a much more important control on dissolved silica and cation concentrations than temperatures underneath the aquifers. The Pliocene strata of the Ogallala aquifer generally contain a greater percentage of volcanic ash than the Pleistocene sediments across Kansas. Larger deposits of silicified rock cemented with opal, (derived from ash leaching), occur more frequently in the northern part than elsewhere in the Ogallala Formation of western Kansas. The greater volumes of ash and opal, (containing silica more soluble than chalcedony and quartz), give rise to the higher silica concentrations in groundwaters of northwest and parts of west-central Kansas. Leaching

of the potassium-rich ash and feldspar in the Ogallala aquifer could also explain a similar distribution of higher ratios of dissolved potassium to higher total dissolved solids.

# ASSESSMENT OF THE GEOTHERMAL RESOURCES OF KANSAS

VOLUME II - APPENDICES
FINAL REPORT

Submitted to the Geothermal Division
of the U.S. Department of Energy

Don W. Steeples and Sandra A. Stavnes, editors
Don W. Steeples, Principle Investigator
Kansas Geological Survey
Lawrence, Kansas

June, 1982

VOLUME II - APPENDICES
TABLE OF CONTENTS

# KANSAS GEOLOGICAL SURVEY

**Office of the Director**

Environmental Geology and Geophysics Section
913-864-4991

1930 Avenue "A", Campus West
The University of Kansas
Lawrence, Kansas 66044
913-864-3965


November 18, 1982

Carl Ruscetta
University of Utah
Research Institute
420 Chipeta Way, Suite 120
Salt Lake City, Utah 84108

Dear Carl:

Enclosed is Dave Blackwell's final report for his subcontract on our contract #DE-AS07-79ET27204.

As per your memo of 2 August 1982 to Susan Prestwich, this completes our contractural obligation. We will continue to send you updated versions of maps and publications related to geothermal energy.

Thank you for your assistance and cooperation on this project for the past couple or three years. It has immensely enhanced our knowledge of Kansas geological, geophysical, and geothermal attributes.

Sincerely,

Don W. Steeples, Chief
Environmental Geology
Geophysics Section

DWS:ep
Enc.

cc: Susan Prestwich
Leon Lehr
Marshall Reed
Carolyn Hallenbeck

# TEMPERATURE LOGS OF DEEP HOLES IN KANSAS

by

David D. Blackwell

and

John L. Steele

Department of Geological Sciences

Southern Methodist University

Dallas, Texas 75275

Final Report for Kansas State Agency Contract #949

November, 1982

# TEMPERATURE LOGS OF DEEP HOLES IN KANSAS

Precise temperature logs were made in seven deep holes in the state of Kansas and one deep hole in Oklahoma near the southwestern corner of Kansas for this contract. Equipment used consisted of a semi-conductor temperature sensor logging tool connected electrically to the surface and recorded digitally. The precision of the temperature recording is approximately ±0.001°C and the accuracy is ±0.1°C. The temperatures were digitized at either 1 or 0.5 meter intervals.

The locations of the holes which were logged are shown in Figure 1 along with holes which were logged during a previous contract (Blackwell and Steele, 1981). The data from the previous contract have been discussed in some detail and heat flow values calculated. The purpose of this contract was to obtain additional supplemental deep temperature logs. These logs were obtained in shut-in oil wells so there is not an extensive data base of logs and cuttings available as was the case with the four USGS Water Resources Division holes which were the primary focus of the study by Blackwell and Steele (1981). Temperature-depth plots and .5 meter interval gradient plots for the holes which were logged are shown in Figure 3-10. The detailed data digitized at .5 meter intervals can be obtained from either the Kansas Geological Survey, University of Kansas, 1930 Avenue A,, Campus West, Lawrence, Kansas, or SMU Geothermal Laboratory, Southern Methodist University, Dallas, Texas 75275.

In order to give some estimation of the subsurface temperatures in Kansas, temperatures at a depth of 500 meters from the deep holes were contoured as shown in Figure 2. There are two areas of higher temperature: the southeastern part of the state and the northwestern part of the state. These temperature variations

are related to the lithologic section present in each place and not to subsurface fluid motions. Whether or not there are variations in the contribution from basement radioactivity to the surface heat flow and temperatures has not yet been deciphered as there is not enough data on either the heat flow or the basement to make such an assessment. The high gradients in the southeastern part of the state are in the area where the Pennsylvanian section is thick. The Pennsylvanian section is composed of a sequence of thin limestone and much more abundant shales with some lignite and sand. The lignite and shale have low thermal conductivities and thus for an average heat flow, higher than average gradients. In the Paleozoic rocks below the Pennsylvanian, gradients decrease drastically because the thermal conductivity of the predominantly limestone and dolomite section is much higher so the higher gradients characteristic of the upper 500 meters will not persist all the way to the basement. In areas where the Pennsylvanian is thin or is buried beneath a thick Permian section, the temperatures at 500 meters are somewhat lower. The Pennsylvanian section is thin in the extreme eastern part of the state whereas it is deeply buried in most of the central part of the state. The Permian section is predominatly sand and evaporites with only a minor amount of shale. The mean gradients are quite low because of the very high thermal conductivity of the sand and evaporitic rocks. In the far western part of the state, the temperatures increase to the highest values seen because of the presence of the low conductivity Cretaceous shale sequence. Temperatures in the Dakota aquifer in this part of the state will be in the order of 40° to 50°C. Below the Cretaceous section the thick sequence of Permian rocks will have fairly low gradients so temperatures will not increase as rapidly. Below the Permian rocks, high gradient will occur again in the underlying Penn-

sylvanian rocks. So temperatures in the lower Paleozoic carbonate aquifers of western Kansas may be well above those required for low temperature applications. However, the great depth of these carbonate aquifers may make exploitation not cost effective.

## Reference

Blackwell, D.D. and J.L. Steele, Heat flow and geothermal potential of Kansas, USDOE Report, 69, 69 p., 1981.

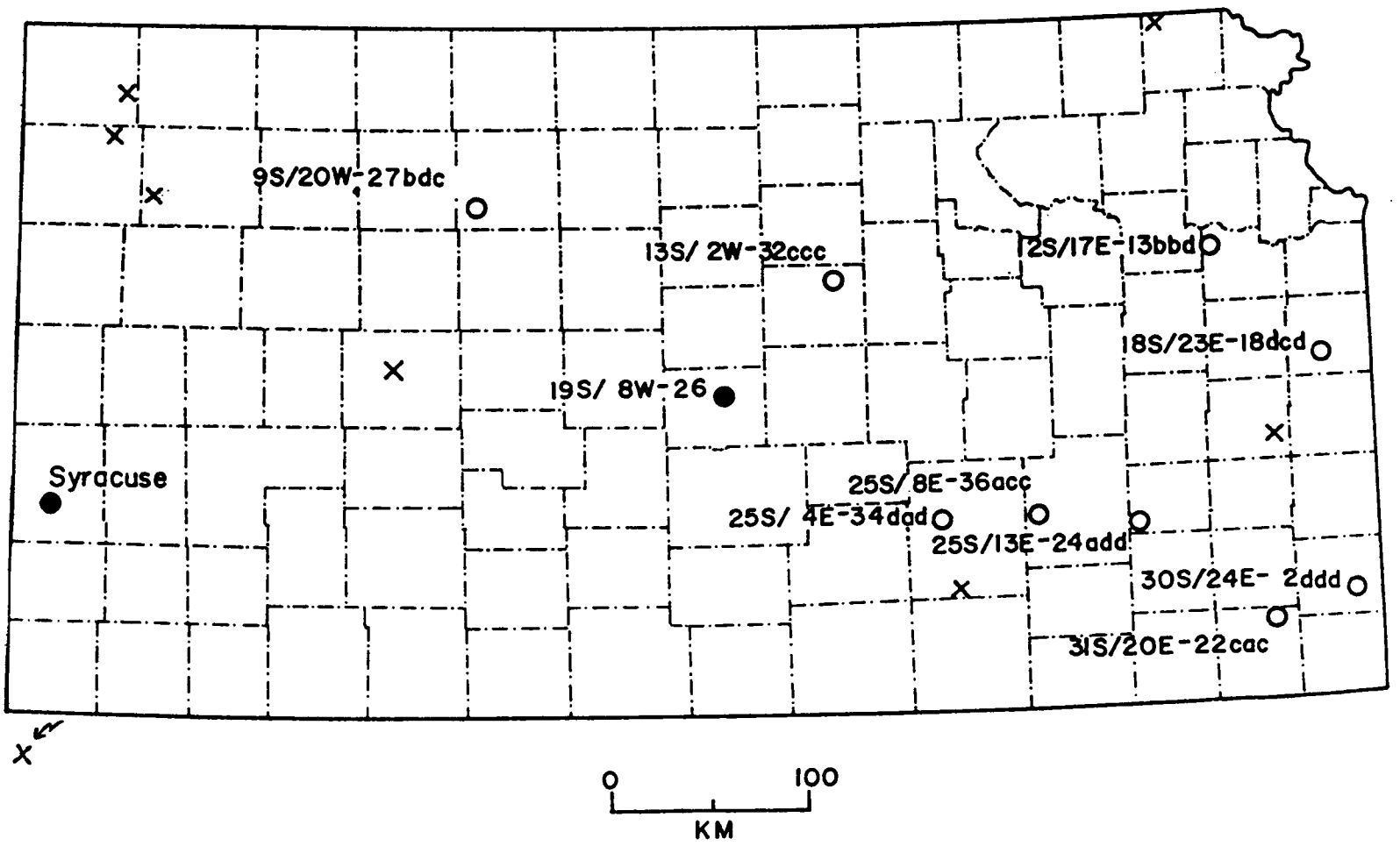



FIGURE 1. Index map of sites of published heat flow values (solid circles), sites of holes discussed in Blackwell and Steele (open circles), and sites of holes logged for this contract (X's).

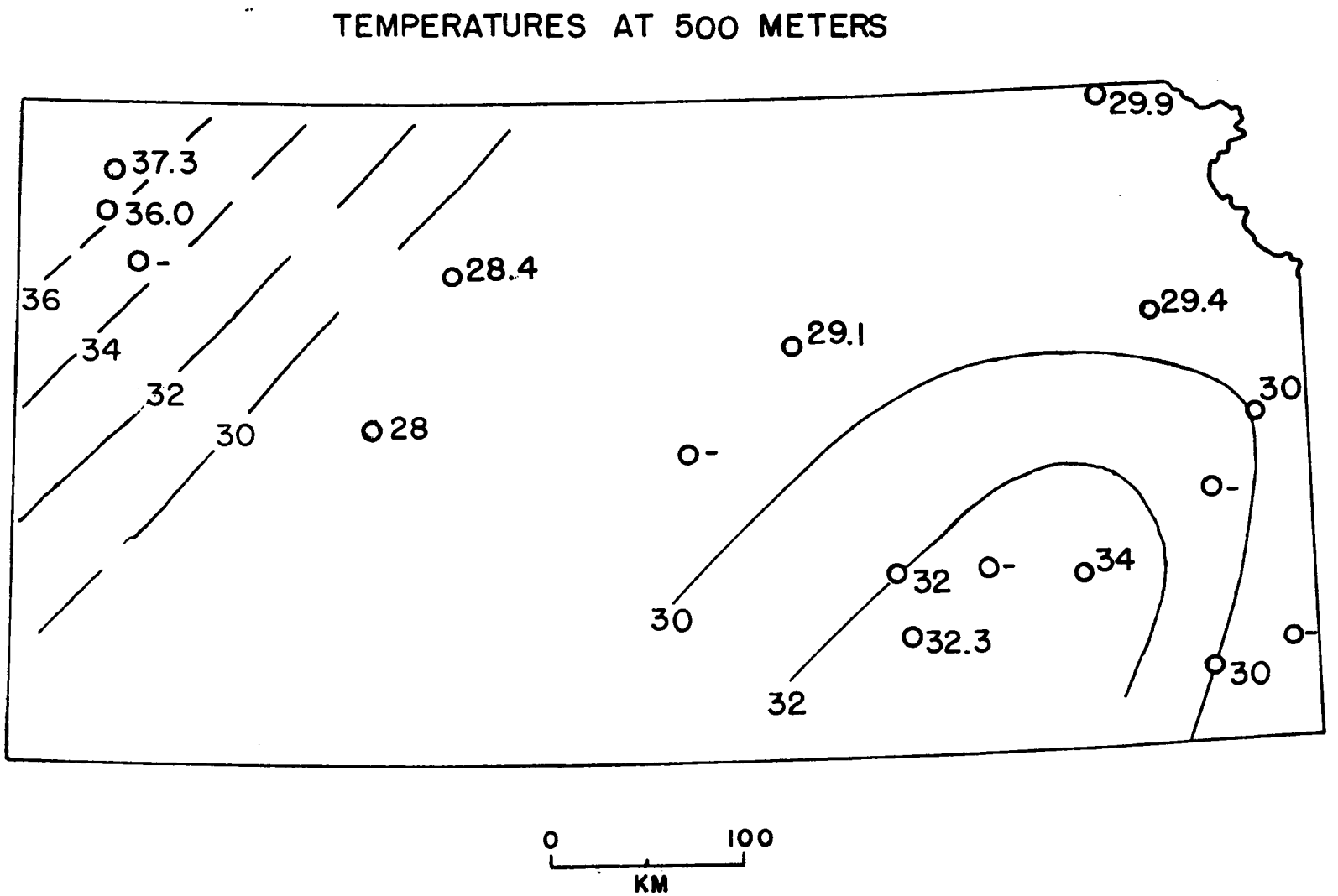



FIGURE 2. Isotherms at 500 meters. Temperatures are in °C.

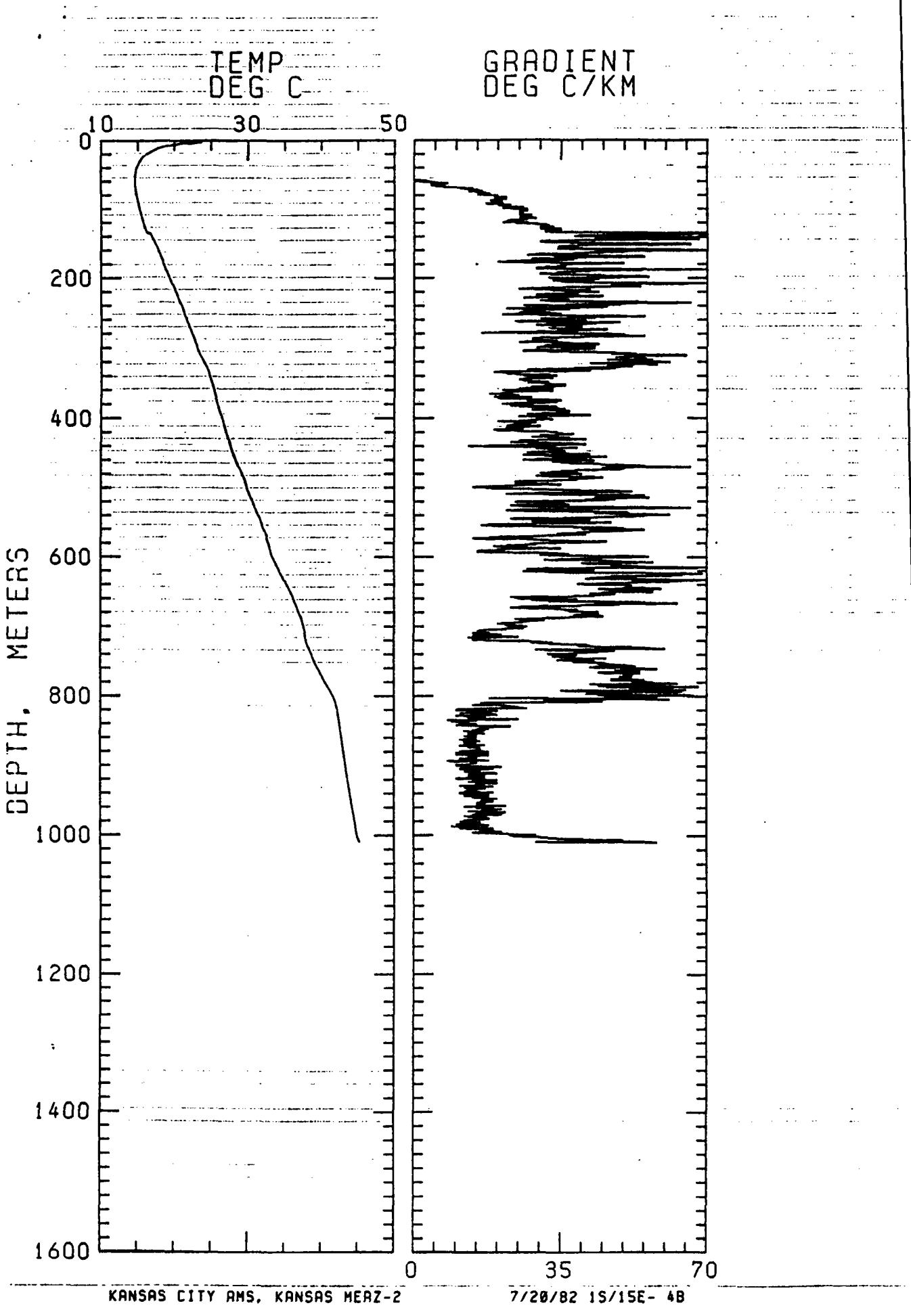

TEMP
DEG C
10
30
50
GRADIENT
DEG C/KM
0
200
400
600
800
1000
1200
1400
1600
DEPTH, METERS
0
35
70
KANSAS CITY AMS, KANSAS MERZ-2
7/20/82 1S/15E- 4B

FIGURE 3

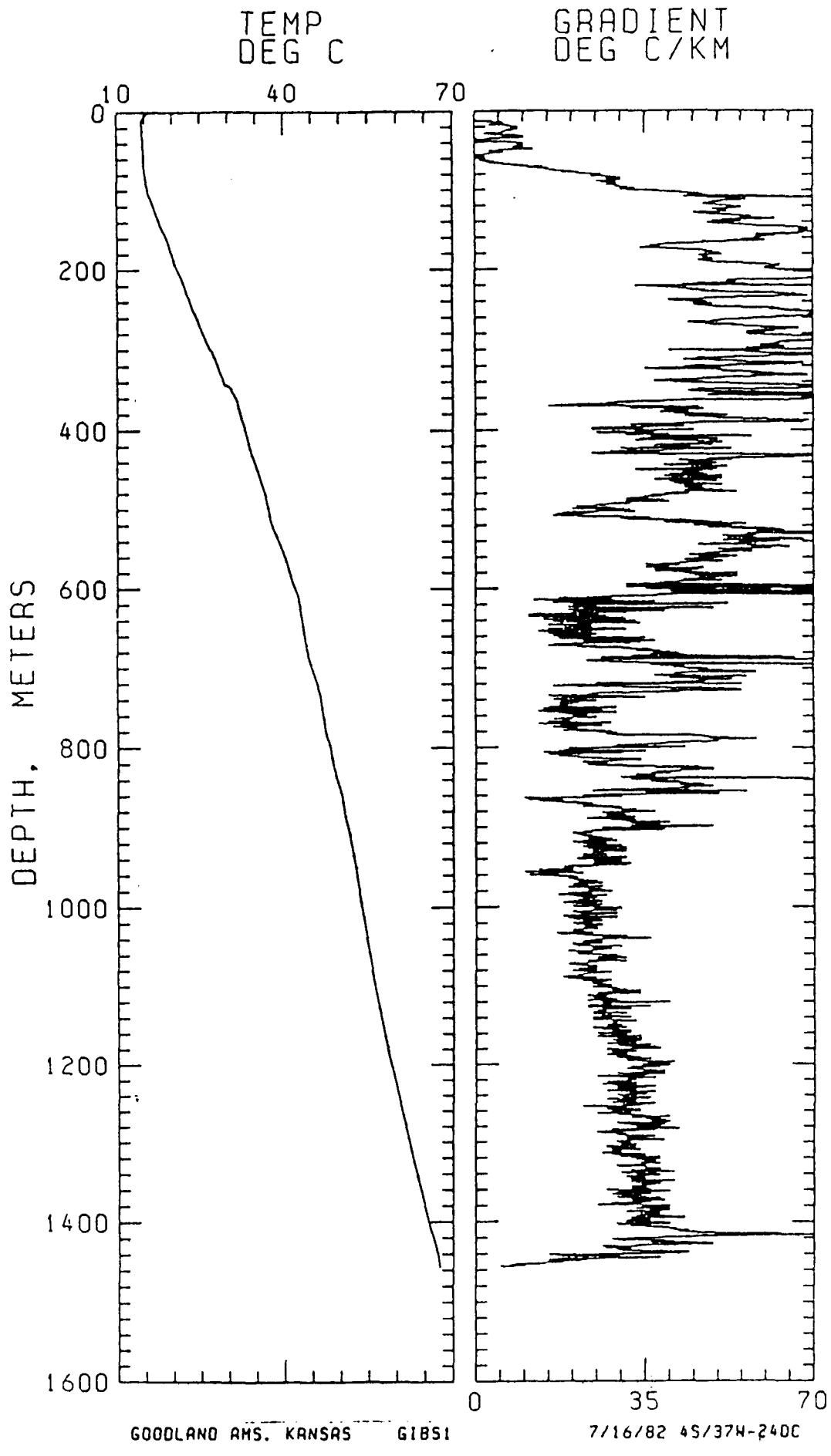

TEMP
DEG C
GRADIENT
DEG C/KM
10
40
70
0
200
400
600
800
1000
1200
1400
1600
DEPTH, METERS
0
35
70
GOODLAND AMS. KANSAS GIBSI
7/16/82 4S/37W-24DC

FIGURE 4

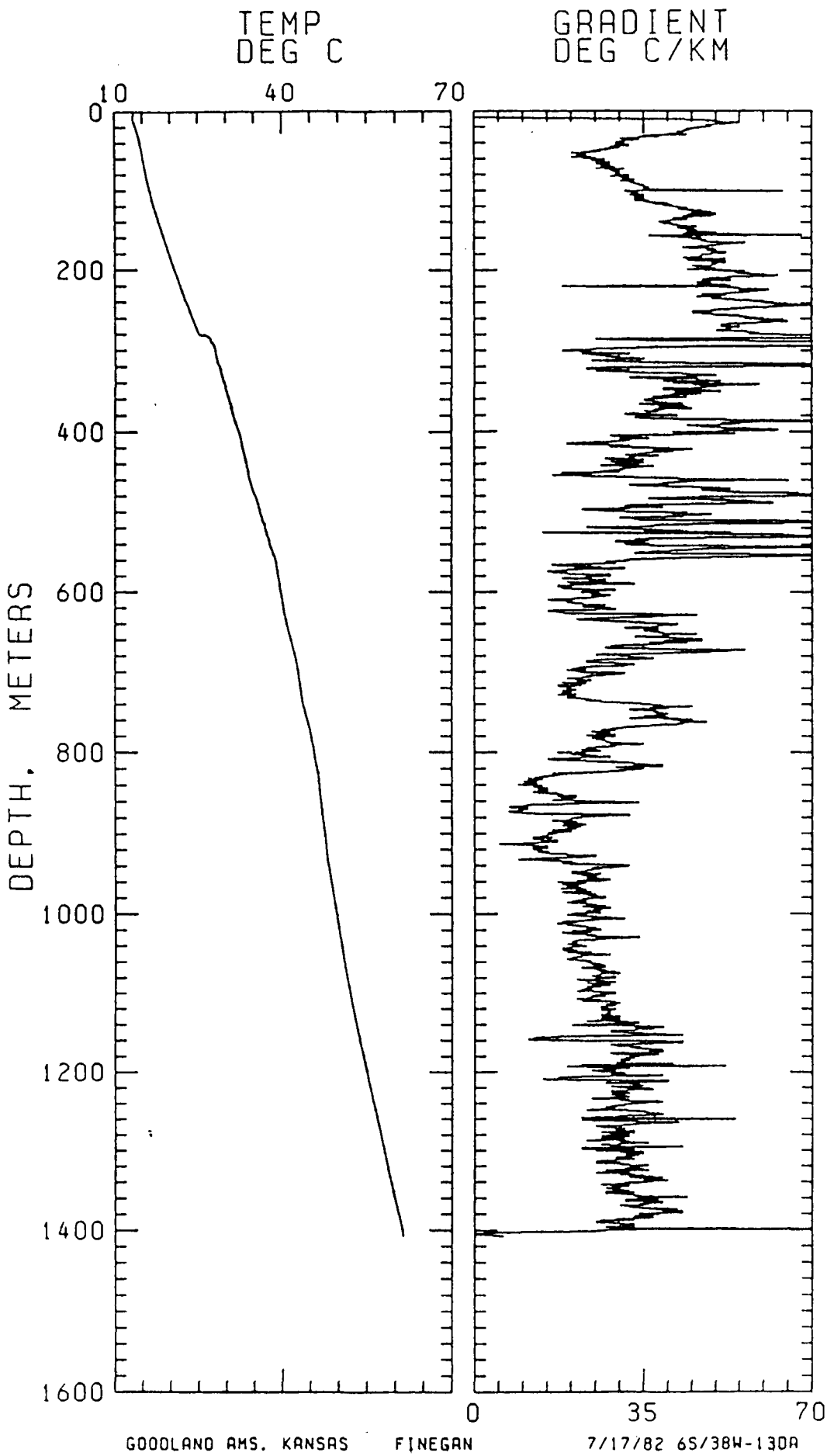

TEMP
DEG C
GRADIENT
DEG C/KM
10
40
70
0
200
400
600
800
1000
1200
1400
1600
DEPTH, METERS
0
35
70
GOODLAND AMS, KANSAS FINEGAN
7/17/82 6S/38W-13DA

FIGURE 5

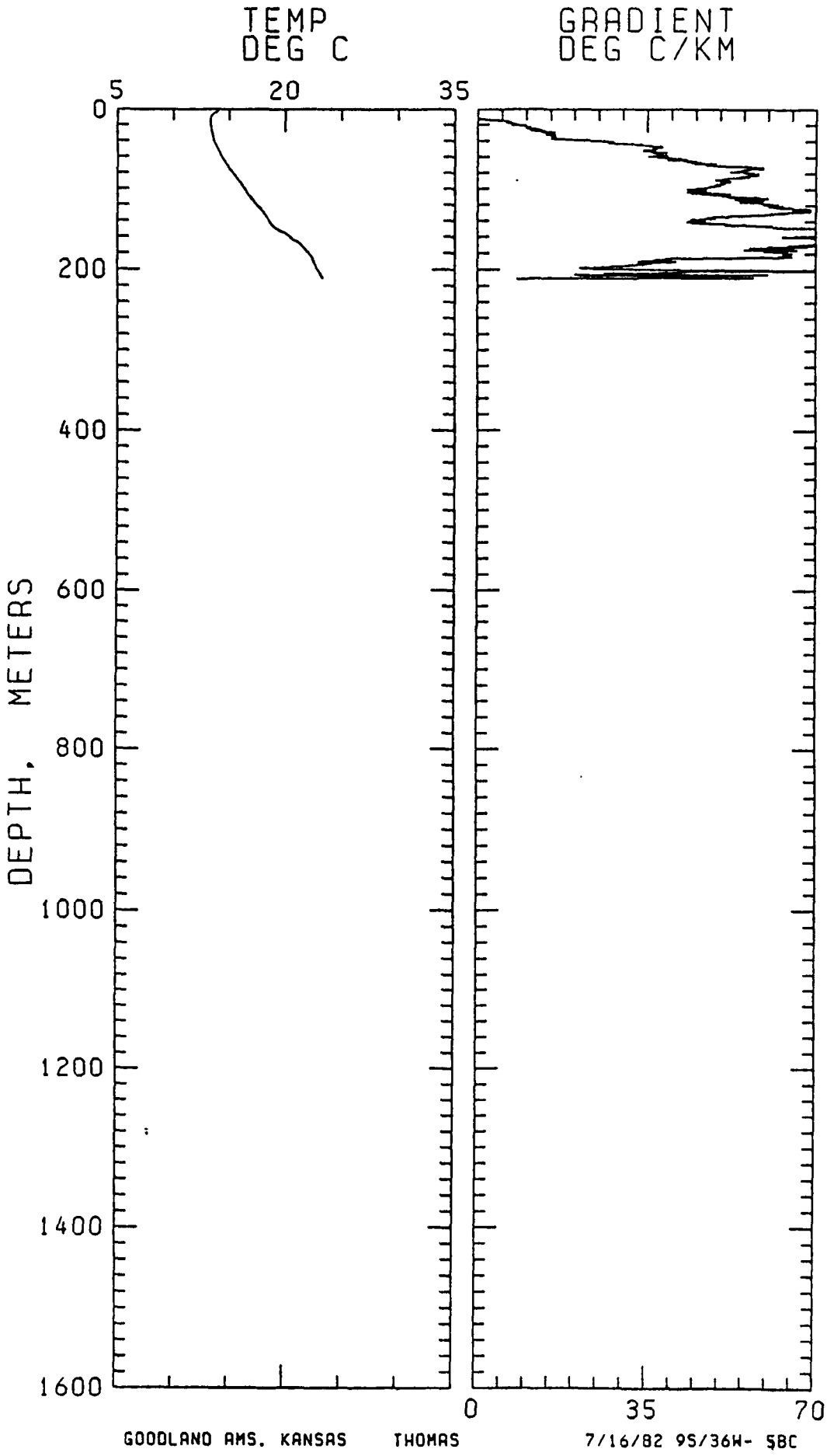

TEMP
DEG C
GRADIENT
DEG C/KM
5
20
35
0
200
400
600
800
1000
1200
1400
1600
DEPTH, METERS
0
35
70
GOODLAND AMS, KANSAS
THOMAS
7/16/82 9S/36W- SBC

FIGURE 6

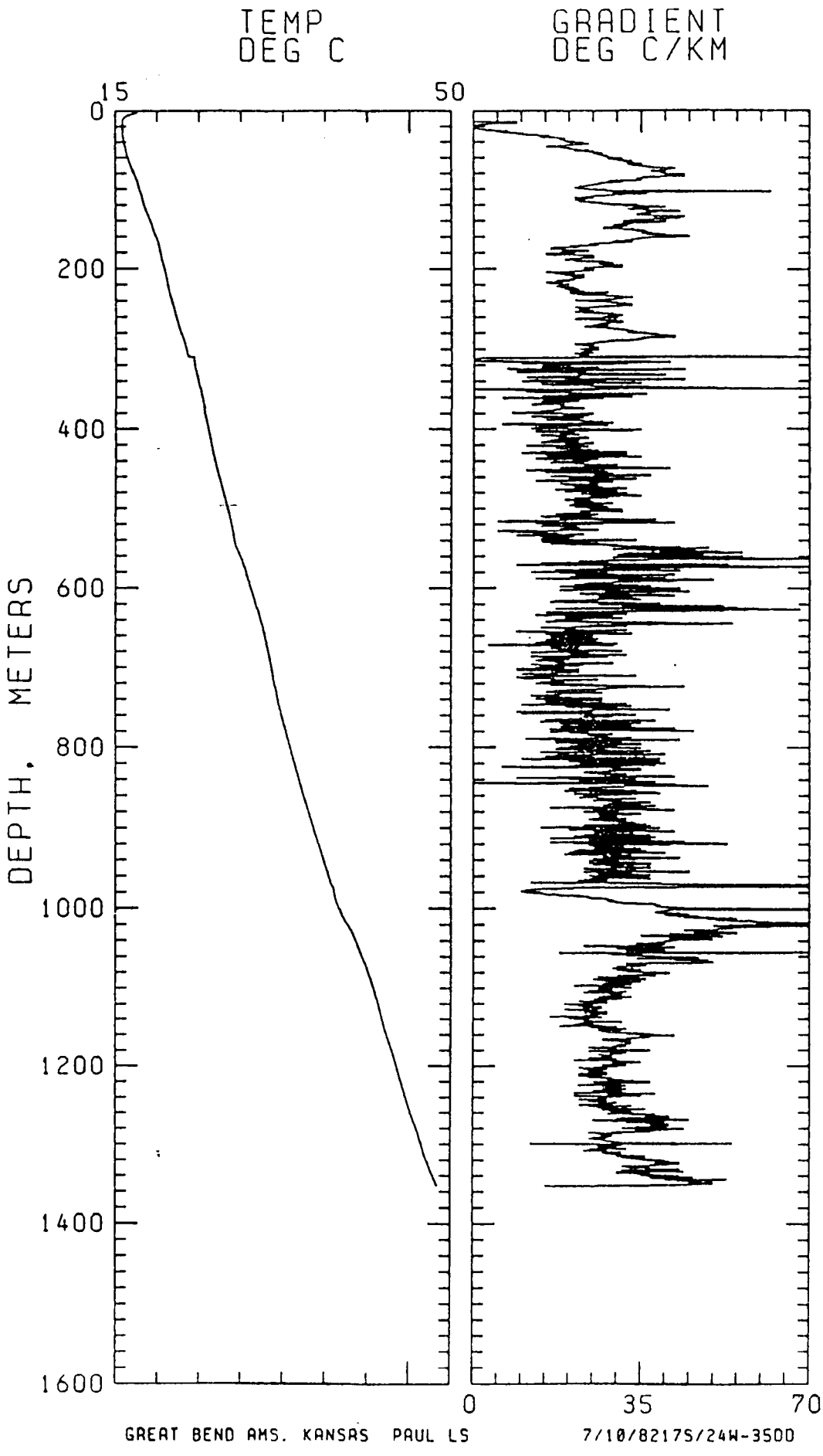
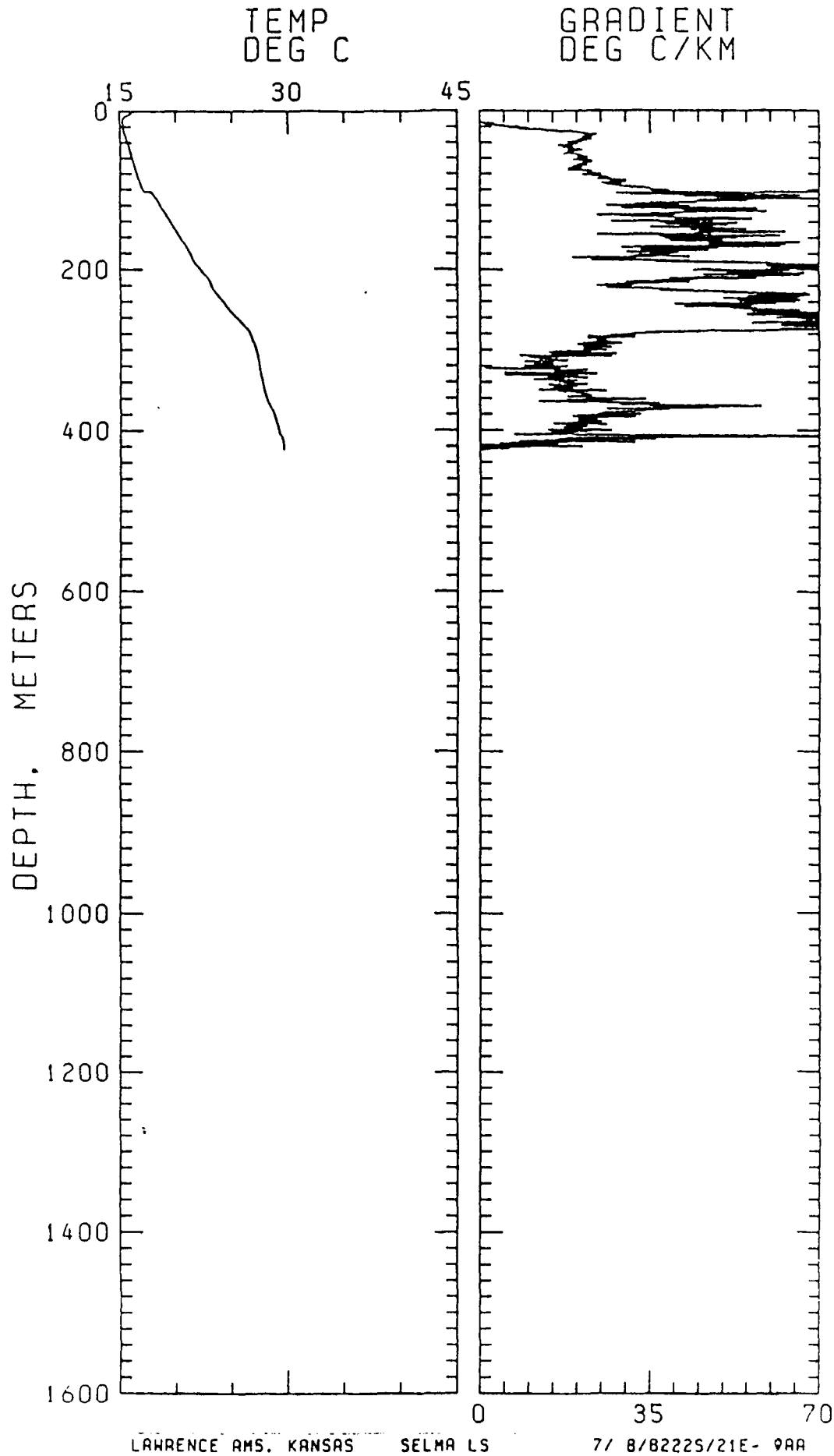

TEMP
DEG C
GRADIENT
DEG C/KM
15
50
0
200
400
600
800
1000
1200
1400
1600
DEPTH, METERS
0
35
70
GREAT BEND AMS. KANSAS PAUL LS
7/10/8217S/24W-3500

FIGURE 7


TEMP
DEG C
GRADIENT
DEG C/KM
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30
45
0
200
400
600
800
1000
1200
1400
1600
DEPTH, METERS
0
35
70
LAWRENCE AMS. KANSAS
SELMA LS
7/ 8/822S/21E- 9AA

FIGURE 8

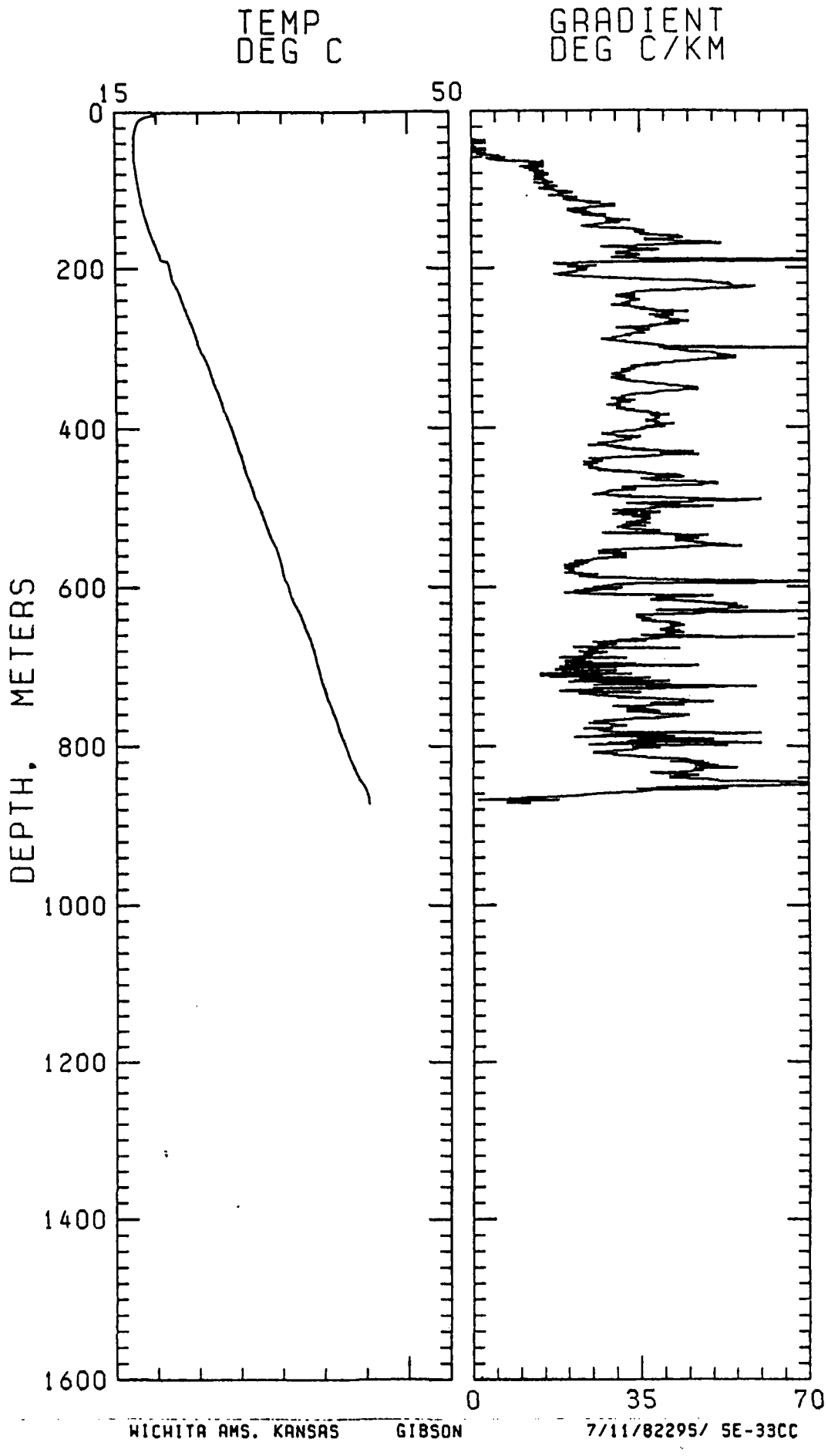
TEMP
DEG C
GRADIENT
DEG C/KM
15
50
0
200
400
600
800
1000
1200
1400
1600
DEPTH, METERS
0
35
70
WICHITA AMS. KANSAS
GIBSON
7/11/82295/ SE-33CC

FIGURE 9

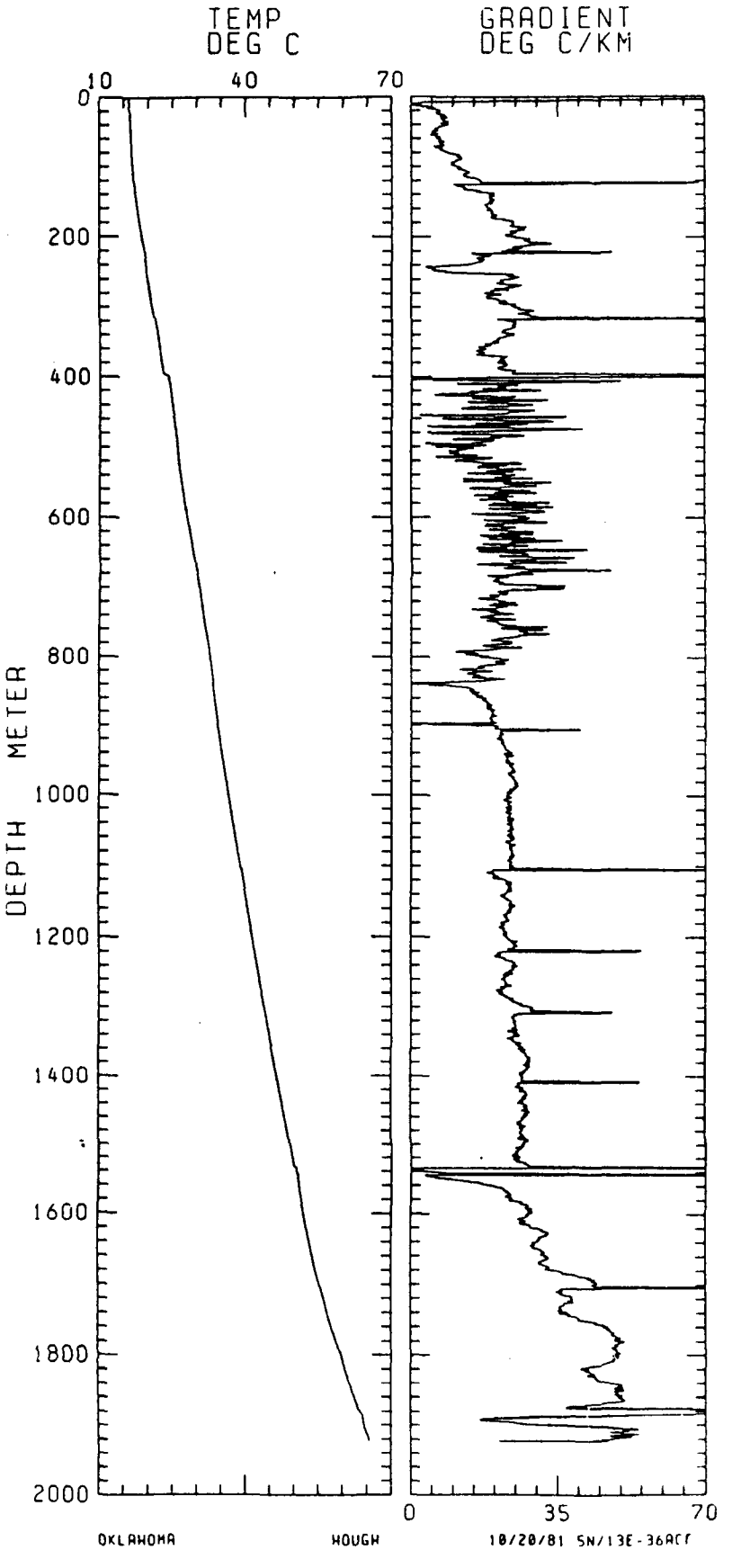
TEMP
DEG C
10
40
70
GRADIENT
DEG C/KM
0
200
400
600
800
1000
1200
1400
1600
1800
2000
DEPTH METER
0
35
70
OKLAHOMA
HOUGH
10/20/81 5N/13E-36ACC

FIGURE 10

| TASK | PERCENT COMPLETE | PRESENT ACTIVITY | REMARKS |
|---|---|---|---|
| Geothermal Resources Map for Kansas | 98 | Final corrections on proof. | Final revision sent to NOAA in April, 1982. |
| Log temperatures in holes | 75 | Reducing data. | Blackwell will log several holes greater than 400 meters deep, in July. |
| Geothermal assessment for Kansas: Final Report | 60 | Components of final report:<br>done 1. Blackwell and Steele (Heat Flow and geothermal potential for Kansas)<br>done 2. Kodama (Paleomagnetic results from Osawatomie core and Big Springs core, Kansas)<br>3. Whittemore (Geochemical analysis of water in western Kansas)<br>done 4. Yarger (Interpretation of aeromagnetic data for Kansas)<br>done 5. Stavnes (Portion of thesis including geothermal gradient data from bottom hole temperatures and logging)<br>6. Yarger (Interpretation of gravity data. Technical and report in preparation).<br>done 7. Sophocleous (Development of a low-cost thermal conductivity probe),<br>done 8. Introduction and Regional Geology.<br>9. Assessment and prognosis. | Expected completion date in early June, 1982.<br><br>Expected completion by middle of May, 1982. ✓ In Final Report<br><br>Expected completion by middle of May, 1982. ✓ In Final Report |

5-13-82

7/29 Final report rec'd. 7/26/82 and Reviewed

GL00970

UNIVERSITY OF UTAH RESEARCH INSTITUTE

UURI

EARTH SCIENCE LABORATORY
420 CHIPETA WAY, SUITE 120
SALT LAKE CITY, UTAH 84108
TELEPHONE 801-581-5283

MEMORANDUM

December 14, 1982

TO: Susan Prestwich, Program Manager

FROM: Carl A. Ruscetta, Technical Program Coordinator

SUBJECT: State Coupled Low-Temperature Resource Assessment Program Completion of Deliverables Requirements - Kansas State Team Contract DE-AS07-79ET27024, Mods 001 thru 006.

Enclosed is the updated contract summary for the referenced Kansas contract. A copy of the transmittal letter and cover page of a report, "Temperature Logs of Deep Holes in Kansas" by D. D. Blackwell and J. L. Steele is also enclosed. This report describes work done on sub-contract for the Kansas Geological Survey in connection with the DOE state-coupled program, and it represents the final deliverable due on the Kansas contract. The final project report for the subject contract was received at ESL on July 26, 1982 (see C. Ruscetta letter of August 2, 1982 to S. Prestwich). The Kansas geothermal map was printed and distributed during September, 1982.

In my opinion, all requirements of DOE contract DE-AS-07-79ET27024 with the Kansas Geological Survey have been met in a fully satisfactory manner.

Carl A. Ruscetta

CAR:jp

enclosure

cc: D. Foley

# TEMPERATURE LOGS OF DEEP HOLES IN KANSAS

by

David D. Blackwell

and

John L. Steele

Department of Geological Sciences

Southern Methodist University

Dallas, Texas 75275

Final Report for Kansas State Agency Contract #949

November, 1982

KANSAS GEOLOGICAL SURVEY
Office of the Director

Environmental Geology and Geophysics Section
913-864-4991

1930 Avenue "A", Campus West
The University of Kansas
Lawrence, Kansas 66044
913-864-3965

November 18, 1982

Carl Ruscetta
University of Utah
Research Institute
420 Chipeta Way, Suite 120
Salt Lake City, Utah 84108

Dear Carl:

Enclosed is Dave Blackwell's final report for his subcontract on our contract #DE-AS07-79ET27204.

As per your memo of 2 August 1982 to Susan Prestwich, this completes our contractural obligation. We will continue to send you updated versions of maps and publications related to geothermal energy.

Thank you for your assistance and cooperation on this project for the past couple or three years. It has immensely enhanced our knowledge of Kansas geological, geophysical, and geothermal attributes.

Sincerely,

Don W. Steeples, Chief
Environmental Geology
Geophysics Section

DWS:ep
Enc.

cc: Susan Prestwich
Leon Lehr
Marshall Reed
Carolyn Hallenbeck

STATE: Kansas

ORGANIZATION: Kansas Geological Survey PHONE: 913-864-4991

PRINCIPAL INVESTIGATOR/CONTACT: Don Steeples/Sandy Stavnes

CONTRACT NO.: DE-AS07-79ET27204 DATE: ≈ 8/6/79

EST. COMPLETION: 3/31/80 ORIGINAL AMOUNT OBLIGATED DOE: $85,642

CONTRACTOR: 6,251

TOTAL: $91,893

MODIFICATIONS:

| NUMBER | DATE | DESCRIPTION | AMOUNT DOE | AMOUNT CONTRACTOR |
|---|---|---|---|---|
| 001 | 4/1/80: | N.C.T.E. to 8/30/80 | - | - |
| 002 | 4/1/80: | T.E. to 3/31/81. Add Tasks | $123,835 | - |
| 003 | 7/8/80: | List Government Propery ($34,960) | - | - |
| 004 | 4/10/81: | N.C.T.E. to 6/15/81. | - | - |
| 005 | 9/22/81: | Add Tasks. T.E.to 6/30/82. Inc. Funds | $164,009 | $22,301 |
| 006 | 5/5/82: | N.C.T.E. to 9/20/82 | - | - |
| | | TOTALS | $373,486 | $22,301 |
| | | | $395,787 | |

DELIVERABLE STATUS:

| TASK NO. | DESCRIPTION | DATE DUE | RECEIVED |
|---|---|---|---|
| 1A/Mod 0: | Revise and Update KS Geoth. Grad. Map | 3/31/80 | 6/15/82 |
| B/Mod 0: | Conduct Aeromag. Survey. Northwest KS. | 3/31/80 | " |
| C/Mod 0: | Correlate major geol. feature w/geoth. anomalies. | 3/31/80 | " |
| D/Mod 0: | Design/Construct thermal conductivity probes | 3/31/80 | " |
| 2 /Mod 0: | Coop. w/USGS-2 research holes into Arbuckle Formation Basement - assess hydroth. potential | 3/31/80 | " |
| 1/Mod 2: | Statewide Thermal Gradient Map | 3/31/81 | " |
| 2/Mod 2: | Statewide Contour Map - Aeromag Study interpreted. | 3/31/81 | " |
| 3/Mod 2: | Gravity Survey 2-3000 points. Southeastern KS. | 3/31/81 | " |
| 4/Mod 2: | Tabulate Geochem. data. Analyze new samples | 3/31/81 | " |
| 5/Mod 2: | Provide Data to GEOTHERM | 3/31/81 | " |
| 6/Mod 2: | Reports per DOE Form CF-537 | | |
| Mod 4 | N.C.T.E. to - - - - - - - - - - - - - - - - | 6/15/81 | " |

(Cont'd on P. 2)

CONTRACT COMPLETION DATE: _____

TOTAL FUNDS EXPENDED DOE: _____

CONTRACTOR: _____

TOTAL: _____

STATE: Kansas CONTRACT NO.: DE-AS07-79ET27204

DELIVERABLES STATUS (CONT'D)

| TASK NO. | DESCRIPTION | DATE DUE | DATE RECEIVED |
|---|---|---|---|
| 1/Mod 5: | Thermal Gradient Studies: Log wells in Southwestern and Northwestern KS. | 6/30/82 | 6/15/82 |
| 2/Mod 5: | Gravity Surveys: Northwestern corner KS and extention of FY80 work in Southcentral KS. | 6/30/82 | " |
| 3/Mod 5: | Survey Geochemical Data on file. Complete FY80 analysis. | 6/30/82 | " |
| 4/Mod 5: | Coop. with SMU: Temp. meas. on holes too deep for KS equipment. Complete HT Flow/Grad. work. | 6/30/82 | See below |
| 5/Mod 5: | Geothermal User Map w/NOAA Assistance | 6/30/82 | See below |

Final Report: "Assessment of the Geothermal Resources of Kansas" Volume I, Text (3 Sections) and Volume II - Appendices (5 sections), Steeples, D.A. and Stavnes, S.A., Editors, Kansas Geological Survey, Lawrence, KS, June, 1982. Received June 15, 1982, at ESL and DOE/Idaho Falls, ID.

KS Geothermal Map, Task 5 Mod 005, Bid Opening 7/30/82.
To be printed and distributed early September 1982.
Map printed and distributed Sept. 1, 1982

Task 4 Mod 005: Blackwell work (SMU Sub-contract) to be completed July and August 1982 and added to data base prior to 9/20/82 contract completion date.
Report received Dec. 1, 1982

All deliverable requirements satisified 12/1/82

C. A. Ruscetta

KANSAS

COPY COMPLETE FILE.

12/7/81.

~~NEED MOD 004~~ COPY ALSO OF

MOD 5 NC Extension to ~~JUN 30 82~~ JUN 30 82

COMPLETION
06-30-82
NCTE TO 09-20-82
MOD 006

SEP 28 1979



Kansas Geological Survey
University of Kansas
103 Avenue, "A", Campus West
Lawrence, Kansas 66044

Attention: Don W. Steeples

Subject: SUBCONTRACTING FOR HEAT FLOW MEASUREMENTS - SRC NO. DE-AS07-79ET27204

Gentlemen:

This confirms September 10, 1979 telephone discussions regarding the subcontracting of the heat flow measurements for the recovery and analysis of core from two deep boreholes in Kansas. We noted in your original proposal that this work was to be performed by Dr. David Blackwell of the Southern Methodist University and DOE's acceptance of your unsolicited proposal was in part based on heat flow measurement as proposed. Any deviation from this proposal must have DOE's prior approval. You are reminded that Article A-II, Paragraph (d) requires submission of all subcontracts and consultant agreements to DOE for review and approval.

Very truly yours,

Original Signed by
J. P. Anderson

J. P. Anderson, Chief
Contract Administration Branch
Contracts Management Division

bcc: L. L. Mink

| | | | |
|---|---|---|---|
| CNB | CAB | RD | CAB |
| KRHastings:ak | RTNelson | LLMink | JPAnderson |
| 9-11-79 | | | |

AUG - 1979

bcc w/encl:
L. L. Mink
J. P. Anderson
Mary Parks

Kansas Geological Survey
University of Kansas
103 Avenue "A", Campus West
Lawrence, Kansas 66044

**Attention:** Don W. Steeples

**Subject:** SPECIAL RESEARCH CONTRACT NO. DE-AS07-79ET27204

Gentlemen:

We are enclosing three copies of the subject contract which have been signed on behalf of DOE. If satisfactory to you, please have the three copies signed by an authorized official of the University, have this signature witnessed by two persons, affix your legal seal, and return two fully executed copies to this office. The third fully executed copy is for your retention.

All consultant agreements and subcontracts must be submitted to this office for review and approval prior to execution.

In accordance with applicable statutes and DOE regulations (41 CFR 9-9.109-6), the University has the right to request within 30 days of the effective date of this contract an advance waiver of all or any part of the rights of the United States in subject inventions.

Please complete two copies of the attached Form DOE 538 and return to this office for submission to the Oak Ridge Technical Information Center. Reports should be numbered in accordance with the attached instructions.

J. P. Anderson, Chief of the Contract Administration Branch, and his designee, R. T. Nelson, will administer this contract, and all questions should be directed to Mrs. Nelson on telephone 208-526-1498.

Very truly yours,

Nick C. Aquilina, Assistant Manager
for Administration

Enclosures:
As stated

| | | |
|---|---|---|
| CNB | CAB | CMD/AMA |
| KRHastings:mh | JPAnderson | NCAquilina |
| LDAnderson 8/2/79 | | |

Contract No. DE-AS07-79ET27204

CONTRACT BETWEEN

KANSAS GEOLOGICAL SURVEY, UNIVERSITY OF KANSAS

AND

THE DEPARTMENT OF ENERGY

THIS AGREEMENT, entered into the _____ day of _____ 1979 by and between the UNITED STATES OF AMERICA (hereinafter called the "Government"), acting through the DEPARTMENT OF ENERGY (hereinafter called "DOE"), and KANSAS GEOLOGICAL SURVEY, UNIVERSITY OF KANSAS (hereinafter called the "Contractor") an organization of the State of Kansas, with its principal office at Lawrence, Kansas 66044;

WITNESSETH THAT:

WHEREAS, DOE desires to have the Contractor perform certain research work, as hereinafter provided; and

WHEREAS, this contract is authorized by Section 302(c)(5) of the Federal Property and Administrative Services Act of 1949, as amended, and the Department of Energy Organization Act of 1977 (Public Law 95-91), and other applicable laws;

NOW, THEREFORE, the parties hereto agree as follows:

ARTICLE I - THE RESEARCH TO BE PERFORMED

A. The Contractor shall, to the best of its ability, furnish personnel facilities, equipment, materials, supplies, and services, except such as are furnished by the Government, necessary for the performance of the research provided for in Appendix A hereto, and shall perform the research and report thereon pursuant to the provisions of this contract. It is understood that Appendix A, a guide to the performance of this contract, may be deviated from by the Contractor subject to the specific requirements of this contract.

B. This work shall be conducted under the direction of Don W. Steeples or such other member(s) of the Contractor's staff as may be mutually satisfactory to the parties.

ARTICLE II - THE PERIOD OF PERFORMANCE

~ Aug 6, 1979

The period of performance under this contract shall commence on the "entered into" date and expire on March 31, 1980. Performance may be extended for additional periods by the mutual written agreement of the parties.

ARTICLE III - CONSIDERATION

A. In full consideration of the Contractor's performance hereunder, DOE shall furnish the equipment, supplies, materials, and services, if any, listed in Article A-II B., and pay the Contractor the sum of Eighty-Five Thousand Six Hundred Forty-Two Dollars ($85,642.00) [$65,642 for Task A-1(a)(1) and $20,000 for Task A-1(a)(2)], hereinafter called the "Support Ceiling," which sum shall be subject to adjustment as hereinafter provided. The Contractor will pay direct labor, fringe benefits and applicable indirect costs for full-time Kansas Geological Survey staff for Task A-1(a)(1). DOE will pay all other costs of performance of Task A-1(a)(1) and of Task A-1(a)(2) as identified in Article A-II.

B. Payments to the Contractor shall equal the "Cumulative Support Cost" of the performance of this contract, as the term "Cumulative Support Cost" is defined in Article B-V of Appendix B; Provided, however, and notwithstanding any other provisions of this contract, that the Government's monetary liability under this contract shall not exceed the Support Ceiling specified in paragraph A. above. DOE shall not pay more than the Support Ceiling or an amount equal to the Cumulative Support Cost, whichever is less. The Contractor shall be obligated to perform under this contract throughout the agreed-upon period of performance, and to bear all costs which DOE has not agreed to pay; Provided, however, that the Contractor shall have the right to cease to perform the research provided for in this contract, upon written notice to DOE to that effect, at any time when or after the Cumulative Support Cost equals or exceeds the Support Ceiling.

C. The Support Ceiling specified in paragraph A. above, may be increased unilaterally by DOE by written notice to the Contractor and may be increased or decreased by written agreement of the parties (whether or not by formal modification to this contract). In the event the stated period of contract performance is extended, the Support Ceiling may be revised to reflect any increased DOE support for the extended period or periods.

D. Upon termination, or expiration of the total period of performance, the Contractor shall promptly refund to DOE (or make such disposition as DOE may in writing direct) any sums paid by DOE to the Contractor under this contract, through direct payment or under letter of credit, in excess of the Cumulative Support Cost incurred in performance under the contract.

ARTICLE IV - GOVERNMENT PROPERTY

The following items of property procured or fabricated by the Contractor are hereby listed as "Government property":

| | |
|---|---|
| Intelligent Graphics Terminal | 10,000 |
| Borehole Thermal Logger | 5,000 |
| | $15,000 |

ARTICLE V - ADDITIONAL CONTRACT PROVISIONS

Appendix B attached hereto and made a part hereof, sets forth additional general contract provisions of this contract.

IN WITNESS WHEREOF, the parties hereto have executed this contract as of the day and year first above written.

THE UNITED STATES OF AMERICA

BY THE DEPARTMENT OF ENERGY

By _____
J. P. Anderson, Chief, Contract Administration Branch
Contracts Management Division
Idaho Operations Office
Contracting Officer

Contract No. DE-AS07-79ET27204

KANSAS GEOLOGICAL SURVEY, UNIVERSITY OF KANSAS

By _____

_____
(Name Typed)

Witnesses as to signature of Contractors:

_____
(Signature)

Title _____

_____
Name (typed)

_____
(Business Address)

_____
(Address)

_____
(Signature)

_____
Name (typed)

_____
(Address)

I, _____, certify that I am the _____ of the Contractor named under this document, that _____, who signed this document on behalf of the Contractor, was then _____ _____ of said Contractor; that said document was duly signed for and in behalf of said Contractor by authority of its governing body, and is within the scope of its legal powers.

IN WITNESS WHEREOF, I have hereunto affixed my signature and the seal of said Contractor this _____ day of _____ 1979.

_____

(SEAL)

Contract No. DE-AS07-79ET27204

CONTRACTOR: KANSAS GEOLOGICAL SURVEY, UNIVERSITY OF KANSAS

APPENDIX A

For the contract period from the "entered into" date through March 31, 1980.

Article A-1 - RESEARCH TO BE PERFORMED BY CONTRACTOR

(a) The scope of work under this contract is unclassified, and the Contractor under this contract with the Department of Energy will perform research consisting of the following:

(1) Assess the geothermal resources of Kansas by:

A. Revising and updating the geothermal gradient map of Kansas;

B. Conducting an aeromagnetic survey of Northwest Kansas;

C. Conducting a preliminary correlation of major geologic features with geothermal anomalies; and

D. Designing and constructing thermal conductivity probes.

(2) Cooperate with the USGS to drill and core two research holes into basement to analyze the hydrothermal potential of the Arbuckle Formation in Kansas.

Article A-II - WAYS AND MEANS OF PERFORMANCE

(a) The items to be supported and source of support include the following:

| Task A-1(a)(1) | DOE | Contractor | Total |
|---|---|---|---|
| Salaries | $ 6,000 | $ 3,634 | $ 9,634 |
| Fringe Benefits 17% salaries, 7% summer, 0.5% school year | 342 | 618 | 960 |
| Indirect cost @ 55% of salaries | 3,300 | 1,999 | 5,299 |
| Travel | 3,500 | --- | 3,500 |
| Van - mileage @ 20¢/mi | 3,500 | --- | 3,500 |
| Equipment: | | | |
| Borehole Thermal Logger | 5,000 | --- | 5,000 |
| Intelligent Graphics Terminal | 10,000 | --- | 10,000 |

Article A-II - WAYS AND MEANS OF PERFORMANCE (Cont'd)

| Task A-1(a)(1) (Cont'd) | DOE | Contractor | Total |
|---|---|---|---|
| Expendable parts and components of temperature and heat flow apparatus | $ 5,000 | --- | $ 5,000 |
| Subcontracts: | | | |
| Aeromagnetic survey | 25,000 | --- | 25,000 |
| Geothermal Data Points | 6,000 | --- | 6,000 |
| | $65,642 | $ 6,251 | $71,893 |
| Task A-1(a)(2) | | | |
| Subcontracts: | | | |
| Douglas County hole: | | | |
| Rig time | $ 1,500 | --- | $1,500 |
| Contractual coring | 2,750 | --- | 2,750 |
| Summer County hole: | | | |
| Rig time | 3,000 | --- | 3,000 |
| Contractual coring | 2,750 | --- | 2,750 |
| Heat flow measurements | 10,000 | --- | 10,000 |
| | $20,000 | --- | $20,000 |
| TOTAL | $85,642 | $ 6,251 | $91,893 |

(b) Items, if any, significant to the performance of this contract, but excluded from computation of Support Cost and from consideration in proportioning costs:

None

(c) Time or effort of Principal Investigator(s) including indirect cost and fringe benefits contributed by the Contractor but excluded from computation of Support Cost and consideration in proportioning costs:

None

(d) All subcontracts and consultant agreements require the review and written approval of the Contracting Officer.

Article A-III - FUNDING

The total estimated cost of items under A-II(a) above, for the contract period stated in this Appendix A is $85,642.00; DOE will pay actual costs of the items in A-II(a) above incurred during the contract period stated in

Article A-III - FUNDING (Cont'd)

this Appendix A, subject to the provisions of Article III and Article B-V. The estimated DOE Support Cost for the contract period stated in this Appendix is $85,642.00.

The estimated DOE Support Cost is funded as follows:

(a) Estimated unexpended balance from prior period(s) $ -0-

(b) New funds for the current period $85,642.00

Article A-IV - ADMINISTRATION AND REPORTS

(a) Principal Investigator - Don W. Steeples
Kansas Geological Survey
University of Kansas
Lawrence, Kansas
Telephone: (913) 864-4991

Technical Administrator - Dr. Leland L. Mink
(DOE's Project Manager) DOE-ID
Energy & Technology Division
Resource Definition Branch
Telephone: (208) 526-0638

The Principal Investigator shall be responsible for directing the work within the scope of Article A-I above as outlined in discussions and in periodic letters from the Technical Administrator.

(b) The Principal Investigator is responsible for the preparation and submission of reports to the Technical Administrator in accordance with Appendix D, DOE Form CR-537, which is made a part hereof by this reference.

CONTRACT NO.
DE-AS07-79ET27204

| ADDRESSEES: | MANAGEMENT PLAN | HOT LINE REPORT | CONFERENCE REPORT | ENERGY R&D PROJECT STATUS REPORT | CLINICAL WORK IN PROGRESS REPORT | COST PLAN | COST MANAGEMENT REPORT | FUNDS RECONCILIATION REPORT | MANPOWER PLAN | MANPOWER MANAGEMENT REPORT | MILESTONE PLAN AND MANAGEMENT REPORT | CONTRACT MANAGEMENT SUMMARY REPORT | EARNED VALUE PERFORMANCE REPORT | FINAL TECHNICAL REPORT | TOPICAL REPORT | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NO. OF REPORT COPIES | | | | | | | | | | | | | | | |
| Dr. Gerald P. Brophy<br>Program Manager<br>DOE/Division of Geothermal Energy<br>M/S 3122C, 20 Massachusetts Avenue, NW<br>Washington, D.C. 20545 | | | | | | | 1 | | 1 | | | | | | 1 | 1 |
| S. M. Hansen, Chief<br>Management Coordination Branch<br>DOE/Div. of Program Resource Management<br>M/S 404, 600 E. Street, NW<br>Washington, D.C. 20545 | | | | | | | 1 | | 1 | | | | | | 1 | 1 |
| L. L. Mink, Resource Engineer<br>Resource Definition Branch<br>Energy and Technology Division<br>U.S. Department of Energy<br>Idaho Operations Office<br>550 Second Street<br>Idaho Falls, Idaho 83401 | | | | | | | 2 | 2 | 2 | | | | | | 2 | 10 |
| Judith A. Florance<br>Geothermal/EES Support Section<br>Division of Resource Management<br>M/S 3122C<br>U.S. Department of Energy<br>Washington, D.C. 20545 | | | | | | | 1 | | | | | | | | 1 | |

STANDARD FORM 30, JULY 1966
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.101

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

PAGE 1 OF

| 1. AMENDMENT/MODIFICATION NO. | 2. EFFECTIVE DATE | 3. REQUISITION/PURCHASE REQUEST NO. | 4. PROJECT NO. (If applicable) |
|---|---|---|---|
| M001 | 4/1/80 | | |

5. ISSUED BY CODE

Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, ID 83401

6. ADMINISTERED BY (If other than block 5) CODE

File M.2.21

7. CONTRACTOR NAME AND ADDRESS (Street, city, county, state, and ZIP Code) CODE FACILITY CODE

Kansas Geological Survey
University of Kansas
103 Avenue "A", Campus West
Lawrence, Kansas 66044

8.
☐ AMENDMENT OF SOLICITATION NO. _____,
DATED _____ (See block 9)
☒ MODIFICATION OF CONTRACT/ORDER NO. DE-AS07-79ET27204
DATED 8/15/79 (See block 11)

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods: (a) By signing and returning _____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA (If required)

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) ☐ This Change Order is issued pursuant to _____
The Changes set forth in block 12 are made to the above numbered contract/order.

(b) ☐ The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) ☒ This Supplemental Agreement is entered into pursuant to authority of Article II - The Period of Performance

It modifies the above numbered contract as set forth in block 12.

12. DESCRIPTION OF AMENDMENT/MODIFICATION

Article II "The Period of Performance" is hereby revised to read as follows:

"The period of performance under this contract shall commence on the 'entered into' date and expire on August 30, 1980. Performance may be extended for additional periods by the mutual written agreement of the parties."

This is a "no-cost time extension" only.

Except as provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

13. ☐ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT ☐ CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN _____ COPIES TO ISSUING OFFICE

| 14. NAME OF CONTRACTOR/OFFEROR | 17. UNITED STATES OF AMERICA |
|---|---|
| BY _____ (Signature of person authorized to sign) | BY J P Anderson (Signature of Contracting Officer) |
| 15. NAME AND TITLE OF SIGNER (Type or print) / 16. DATE SIGNED | 18. NAME OF CONTRACTING OFFICER (Type or print): J. P. Anderson, Chief Contract Administration Branch / 19. DATE SIGNED: 3/5/80 |

30-101-01

STANDARD FORM 30, JULY 1966
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.101

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

PAGE 1 OF

| 1. AMENDMENT/MODIFICATION NO. | 2. EFFECTIVE DATE | 3. REQUISITION/PURCHASE REQUEST NO. | 4. PROJECT NO. (If applicable) |
|---|---|---|---|
| A002 | 4/1/80 | | |

5. ISSUED BY — CODE

Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, ID 83401

6. ADMINISTERED BY (If other than block 5) — CODE

File M.2.21

7. CONTRACTOR NAME AND ADDRESS (Street, city, county, state, and ZIP Code) — CODE — FACILITY CODE

Kansas Geological Survey
University of Kansas
103 Avenue "A", Campus West
Lawrence, Kansas 66044

8.
☐ AMENDMENT OF SOLICITATION NO. _____
DATED _____ (See block 9)
☒ MODIFICATION OF CONTRACT/ORDER NO. DE-AS07-79ET27204
DATED 8/15/79 (See block 11)

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods: (a) By signing and returning _____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKOWLEDGMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA (If required)

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) ☐ This Change Order is issued pursuant to _____
The Changes set forth in block 12 are made to the above numbered contract/order.

(b) ☐ The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) ☒ This Supplemental Agreement is entered into pursuant to authority of Public Law 95-91, and other applicable laws

It modifies the above numbered contract as set forth in block 12.

12. DESCRIPTION OF AMENDMENT/MODIFICATION

(a) ARTICLE I - THE RESEARCH TO BE PERFORMED is amended by adding a new paragraph as follows:

"Appendix A1, attached to this Supplemental Agreement and made a part hereof, provides for the research to be performed by the Contractor during the contract period specified therein."

(b) ARTICLE II - THE PERIOD OF PERFORMANCE is amended as follows:

"The period of performance for the work performed under this Supplemental Agreement shall commence on April 1, 1980, and expire on March 31, 1981. The period of time for performing the research work under Appendix A1 may be extended for additional periods by the mutual written agreement of the parties."

(Cont'd)

RECEIVED
JUN 19 1980
GEOTHERMAL ENERGY
BRANCH

Except as provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

13. ☐ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT ☒ CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN 3 COPIES TO ISSUING OFFICE

| 14. NAME OF CONTRACTOR/OFFEROR | 17. UNITED STATES OF AMERICA |
|---|---|
| BY Carolyn A. Hubbard (Signature of person authorized to sign) | BY J. P. Anderson (Signature of Contracting Officer) |
| 15. NAME AND TITLE OF SIGNER (Type or print) | 16. DATE SIGNED 5/22/80 |
| 18. NAME OF CONTRACTING OFFICER (Type or print) J. P. Anderson, Chief Contract Operations Branch | 19. DATE SIGNED 6/4/80 |

30-101-01

☆ U.S. GOVERNMENT PRINTING OFFICE: 1967—266-808

(c) ARTICLE III - CONSIDERATION, paragraph A. is hereby revised to increase the contract Support Ceiling by One Hundred Twenty-Three Thousand Eight Hundred Thirty-Five Dollars ($123,835.00) to a new total Support Ceiling of Two Hundred Nine Thousand Four Hundred Seventy-Seven Dollars ($209,477.00).

(d) ARTICLE IV - GOVERNMENT PROPERTY is revised to read as follows:

"The following items of property procured or fabricated by the Contractor are hereby listed as 'Government property':

| | |
|---|---|
| Intelligent Graphics Terminal | $10,000 |
| Borehole Thermal Logger | 5,000 |
| Gravimeter | 20,000 |
| | $35,000" |

(e) ARTICLE VI - DATE OF INCURRENCE OF COSTS is hereby added to the contract work added by this Supplemental Agreement:

"ARTICLE VI - DATE OF INCURRENCE OF COSTS

The Contractor shall be entitled to reimbursement for costs incurred in an amount not to exceed $37,500 on or after April 1, 1980, which, if incurred after this modification had been entered into, would have been reimbursable under the provisions of this modification."

CONTRACTOR: KANSAS GEOLOGICAL SURVEY, UNIVERSITY OF KANSAS

APPENDIX A1

For the contract period April 1, 1980 through March 31, 1981

Article A-1 - RESEARCH TO BE PERFORMED BY CONTRACTOR

(a) The scope of work under this modification is unclassified, and the Contractor under this modification will perform research consisting of the following:

(1) Thermal Gradient Map - Data accumulated during FY'79 will be field checked for accuracy and finalized for the production of a State-wide thermal gradient map. "Holes-of-Opportunity" will be measured for heat flow and thermal gradients throughout this modification period.

(2) Aeromagnetic Studies - Data collected during FY'79 will undergo data reduction, and a State-wide contour map will be produced. A report of the preliminary interpretation of the aeromagnetics for Western Kansas will be completed.

(3) Gravity Survey - A gravity survey consisting of 2,000 - 3,000 points will be conducted in Southeastern Kansas over an area of approximately 10,000 square miles. These data will be reduced and contoured at the 1 milligal level on a preliminary map of the study area. Preliminary interpretations of the gravity data will be presented in the final report for this work.

(4) Geochemistry - A tabulation of existing geochemical information will be performed. Emphasis will be placed on the extraction of useful information for the geothermal assessment in the State. Additional water samples will be collected, where attainable, and analysed during this period. A preliminary interpretation of the State-wide geochemical expression, as it relates to the location of geothermal resources, will be produced.

(5) USGS GEOTHERM File - This file will be updated on all significant geothermal information of the State of Kansas.

(6) Reporting Requirements - Reports will be prepared and submitted in accordance with DOE Form CF-537, which is attached.

Article A-II - WAYS AND MEANS OF PERFORMANCE

(a) Items to be supported and source of support include the following:

| | DOE | KGS | Total |
|---|---|---|---|
| (1) Salaries, Wages and Benefits | | | |
| Steeples - 10% FTE - 1 yr. | | $ 2,400 | |
| Yarger - 10% FTE - 1 yr. | | 2,400 | |
| Sophocleous - 10% FTE - 1 yr. | | 2,000 | |
| Macfarlane - 10% FTE - 1 yr. | | 1,700 | |
| Spitz - 10% FTE - 1 yr. | | 2,400 | |
| Rothe - 2 months FTE | $ 4,450 | | |
| Grad. Res. Asst. (geology) | 6,000 | | |
| " " " (computation) | 6,000 | | |
| " " " (heat flow) | 6,000 | | |
| " " " (magnetics) | 6,000 | | |
| " " " (gravity) | 6,000 | | |
| Electronics Technician | 7,500 | | |
| Student hourly, summer gravity survey | 2,000 | | |
| Benefits (17% professionals, 7% GRA summer, 0.5% GRA school yr.) | 2,059 | 1,853 | |
| Subtotal | $46,009 | $12,753 | $58,762 |
| (2) Computation | | | |
| Aeromagnetic data processing | $ 8,000 | | |
| Gravity data processing | 1,000 | | |
| Thermal map data processing | 3,000 | | |
| Subtotal | $12,000 | | 12,000 |
| (3) Capital Equipment | | | |
| Gravimeter | $20,000 | | |
| Subtotal | $20,000 | | $20,000 |

Article A-II - WAYS AND MEANS OF PERFORMANCE (Cont'd)

| | DOE | KGS | Total |
|---|---|---|---|
| (4) Travel | | | |
| Mileage at 20¢/mi (gravity and heat flow surveys) | $ 5,000 | | |
| In-State per diem ($28/day) | 4,480 | | |
| Out-of-State (transportation + $38-$50/day) | 4,000 | | |
| Subtotal | $ 13,480 | | $ 13,480 |
| (5) Miscellaneous | | | |
| Maintenance supplies, expendable materials, repairs | $ 2,000 | | |
| Publication | 2,000 | | |
| Geochemistry lab supplies and repairs | 2,000 | | |
| Subtotal | $ 6,000 | | 6,000 |
| (6) Indirect Costs (calculated at 34% of Total, except capital equipment item) | $ 26,346 | | 26,346 |
| TOTAL | $123,835 | $12,753 | $136,588 |

(b) Items, if any, significant to the performance of this contract, but excluded from computation of Support Cost and from consideration in proportioning costs:

None

(c) Time or effort of Principal Investigator(s) including indirect cost and fringe benefits contributed by the Contractor but excluded from computation of Support Cost and consideration in proportioning costs:

None

(d) All subcontracts and consultant agreements require the review and written approval of the Contracting Officer.

Article A-III - FUNDING

The total estimated cost of items under A-II(a) above, for the contract period stated in this Appendix A1 is $123,835.00; DOE will pay actual costs of the items in A-II(a) above incurred during the contract period stated in this Appendix A1, subject to the provisions of Article III and Article B-V. The estimated DOE Support Cost for the contract period stated in this Appendix A1 is $123,835.00.

The estimated DOE Support Cost is funded as follows:

| | | |
|---|---|---|
| (a) | Estimated unexpended balance from prior period(s) | $ -0- |
| (b) | New funds for the current period | $123,835.00 |

Article A-IV - ADMINISTRATION AND REPORTS

(a) Principal Investigator - Don W. Steeples
Kansas Geological Survey
University of Kansas
Lawrence, Kansas 66044
Telephone: (913) 864-4991

Technical Administrator - Margaret A. Widmayer
(DOE's Project Manager) DOE-ID
Energy & Technology Division
Resource Definition Branch
Telephone: (208) 526-1466

The Principal Investigator shall be responsible for directing the work within the scope of Article A-I above as outlined in discussions and in periodic letters from the Technical Administrator.

(b) The Principal Investigator is responsible for the preparation and submission of reports to the Technical Administrator in accordance with the attached DOE Form CR-537.

STANDARD FORM 30, JULY 1966
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.101

# AMENDMENT SOLICITATION/MODIFICATION OF CONTRACT

PAGE 1 OF

| 1. AMENDMENT/MODIFICATION NO. | 2. EFFECTIVE DATE | 3. REQUISITION/PURCHASE REQUEST NO. | 4. PROJECT NO. (If applicable) |
|---|---|---|---|
| M003 | | | |

5. ISSUED BY CODE
U. S. Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, Idaho 83401

6. ADMINISTERED BY (If other than block 5) CODE

M.2.21

7. CONTRACTOR NAME AND ADDRESS (Street, city, county, state, and ZIP Code)
CODE FACILITY CODE
Kansas Geological Survey
University of Kansas
103 Avenue "A" Campus West
Lawrence, Kansas 66044

8.
☐ AMENDMENT OF SOLICITATION NO. _____
DATED _____ (See block 9)
☒ MODIFICATION OF CONTRACT/ORDER NO. DE-AS07-79ET27204
DATED 8/15/79 (See block 11)

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods: (a) by signing and returning _____ copies of this amendment; (b) by acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKOWLEDGMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA (If required)

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) ☐ This Change Order is issued pursuant to _____
The Changes set forth in block 12 are made to the above numbered contract/order.

(b) ☐ The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) ☒ This Supplemental Agreement is entered into pursuant to authority of Public Law 95-91, and other applicable laws.
It modifies the above numbered contract as set forth in block 12.

12. DESCRIPTION OF AMENDMENT/MODIFICATION

Article IV - GOVERNMENT PROPERTY is revised as follows:

The following items of property or fabricated by the Contractor are hereby listed as 'Government Property:'

| | |
|---|---|
| - Intellignet Graphics Terminal | $10,000 |
| Borehole Thermal Logger | 5,000 |
| File Manager plus two floppy disc drives | 9,150 |
| Matrix Line Printer | 4,315 |
| Graphics Plotter | 4,495 |
| 32 K bytes additional memory | 2,000 |
| | $34,960 |

Except as provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

13. ☒ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT ☐ CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN _____ COPIES TO ISSUING OFFICE

| 14. NAME OF CONTRACTOR/OFFEROR | 17. UNITED STATES OF AMERICA |
|---|---|
| BY _____ (Signature of person authorized to sign) | BY Nell W. Fraser (Signature of Contracting Officer) |
| 15. NAME AND TITLE OF SIGNER (Type or print) | 16. DATE SIGNED |
| 18. NAME OF CONTRACTING OFFICER (Type or print) Nell W. Fraser | 19. DATE SIGNED 7/8/80 |

30-101-01

☆ U.S. GOVERNMENT PRINTING OFFICE: 1966—205-048

STANDARD FORM 30, JULY 1966
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.101

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

PAGE 1 OF 1

| 1. AMENDMENT/MODIFICATION NO. | 2. EFFECTIVE DATE | 3. REQUISITION/PURCHASE REQUEST NO. | 4. PROJECT NO. (If applicable) |
|---|---|---|---|
| M004 | | | |

5. ISSUED BY CODE
U. S. Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, Idaho 83401

6. ADMINISTERED BY (If other than block 5) CODE

7. CONTRACTOR NAME AND ADDRESS (Street, city, county, state, and ZIP Code) CODE FACILITY CODE

Kansas Geological Survey
University of Kansas
103 Avenue "A" Campus West
Lawrence, Kansas 66044

8.
☐ AMENDMENT OF SOLICITATION NO. _____,
DATED _____ (See block 9)
☒ MODIFICATION OF CONTRACT/ORDER NO. DE-AS07-79ET27204
DATED 8-15-79 (See block 11)

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods: (a) By signing and returning _____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA (If required)

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) ☐ This Change Order is issued pursuant to _____
The Changes set forth in block 12 are made to the above numbered contract/order.

(b) ☐ The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) ☒ This Supplemental Agreement is entered into pursuant to authority of Article II of the Contract
It modifies the above numbered contract as set forth in block 12.

12. DESCRIPTION OF AMENDMENT/MODIFICATION

ARTICLE II - THE PERIOD OF PERFORMANCE is hereby amended to extend the contract term through June 15, 1981.

Except as provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

13. ☒ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT ☐ CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN _____ COPIES TO ISSUING OFFICE

14. NAME OF CONTRACTOR/OFFEROR
15. _____ (Signature of person authorized to sign)

17. UNITED STATES OF AMERICA
BY William C Drake (Signature of Contracting Officer)

| 16. NAME AND TITLE OF SIGNER (Type or print) | 16. DATE SIGNED | 18. NAME OF CONTRACTING OFFICER (Type or print) | 19 DATE SIGNED |
|---|---|---|---|
| | | William C. Drake | 4/10/81 |

30-101

☆ U.S.GPO:1979-0-281-187/5001

STANDARD FORM 30, JULY 1966
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.101

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

PAGE 1 OF 2

| 1. AMENDMENT/MODIFICATION NO. | 2. EFFECTIVE DATE | 3. REQUISITION/PURCHASE REQUEST NO. | 4. PROJECT NO. (If applicable) |
|---|---|---|---|
| A005 | | 07-81ET27204.505 | |

5. ISSUED BY CODE
U. S. Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, Idaho 83401

6. ADMINISTERED BY (If other than block 5) CODE

7. CONTRACTOR NAME AND ADDRESS (Street, city, county, state, and ZIP Code)
CODE FACILITY CODE
Kansas Geological Survey
University of Kansas
103 Avenue "A", Campus West
Lawrence, Kansas 66044

8.
☐ AMENDMENT OF SOLICITATION NO. _____,
DATED _____ (See block 9)
☒ MODIFICATION OF CONTRACT/ORDER NO. DE-AS07-79ET27204
DATED 8-15-79 (See block 11)

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods:

(a) By signing and returning _____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA (If required)

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) ☐ This Change Order is issued pursuant to _____

The Changes set forth in block 12 are made to the above numbered contract/order.

(b) ☐ The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) ☒ This Supplemental Agreement is entered into pursuant to authority of Public Law 95-91, and other applicable laws.

It modifies the above numbered contract as set forth in block 12.

12. DESCRIPTION OF AMENDMENT/MODIFICATION

(a) Article I - THE RESEARCH TO BE PERFORMED is amended by adding a new paragraph as follows:

"Appendix A5, attached to this Supplemental Agreement and made a part hereof, provides for the research to be performed by the Contractor during the contract period specified therein."

(b) Article II - THE PERIOD OF PERFORMANCE is amended as follows:

"The period of performance for the work performed under this Supplemental Agreement shall commence immediately, and expire on June 30, 1982. The period of time for performing the research work under Appendix A5 may be extended for additional periods by the mutual written agreement of the parties."

CONTINUED.....

Except as provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

13. ☐ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT ☒ CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN 3 COPIES TO ISSUING OFFICE

| 14. NAME OF CONTRACTOR/OFFEROR | 17. UNITED STATES OF AMERICA |
|---|---|
| BY _____ (Signature of person authorized to sign) | BY William C. Drake (Signature of Contracting Officer) |

| 15. NAME AND TITLE OF SIGNER (Type or print) | 16. DATE SIGNED | 18. NAME OF CONTRACTING OFFICER (Type or print) | 19. DATE SIGNED |
|---|---|---|---|
| Frances Degen Horowitz<br>Vice Chancellor | | William C. Drake | 9/22/81 |

30-101

☆U.S.GPO:1980-0-311-153/5520

(c) Article III - CONSIDERATION, paragraph A. is hereby revised to increase the contract Support Ceiling by One Hundred Sixty-Four Thousand Nine Dollars ($164,009.00) to a new total Support Ceiling of Three Hundred Seventy-Three Thousand Four Hundred Eighty-Six Dollars ($373,486.00).

(d) Article IV - GOVERNMENT PROPERTY is revised to add the following:

40 Mbyte Disc Drive for Tektronix 4052
Digitizer Table for Tektronix 4052

(e) Article VII - DATE OF INCURRENCE OF COSTS is hereby added to the contract work added by this Supplemental Agreement:

"Article VII - DATE OF INCURRENCE OF COSTS

The Contractor shall be entitled to reimbursement for costs incurred in an amount not to exceed $75,000 on or after May 7, 1981, which, if incurred after this modification had been entered into, would have been reimbursable under the provisions of this modification."

CONTRACTOR: KANSAS GEOLOGICAL SURVEY, UNIVERSITY OF KANSAS

APPENDIX A5

For the contract period April 1, 1981 through June 30, 1982.

Article A-1 - RESEARCH TO BE PERFORMED BY CONTRACTOR

(a) The scope of work under this modification is unclassified, and the Contractor under this modification will perform research consisting of the following:

Task 1 - Thermal Gradient Studies

Wells in southwestern and northeastern Kansas will be logged for thermal gradient data to add to the data base for the thermal gradient work for the state. Once these measurements have been collected, the thermal gradient work for the state will be essentially complete. All gradient information will be published on maps showing temperatures throughout the state at a depth of 300 meters below the surface. Maps showing temperatures at the tops or bottoms of at least two pertinent geologic formations will also be produced. A geothermal interpretation of the data base will be developed and included in the final report.

Task 2 - Gravity Surveys

Gravity surveys will be conducted in two areas of the state. The first area will include approximately 10,000 square miles in the northwestern corner of Kansas. The second area will be an extention of FY 1980 gravity work in the southcentral portion of the state. Up to ten thousand square miles of gravity data will be collected in the second area. All available gravity data will be incorporated in a preliminary gravity map for the state. A preliminary interpretation of the gravity data will be part of the final report.

Task 3 - Geochemistry Survey

Water quality data for Kansas is on file with the Kansas Geological Survey and the United States Geological Survey. An examination of exiting data will be performed to extract useful geochemistry information for potential geothermal aquifers in the state. Results of the geochemistry survey will be presented in the final report. Chemical analyses of samples obtained during the drilling project in FY 1980 will be completed and findings will be reported in discussions of the drilling project results.

Task 4 - Southern Methodist University Subcontract

Heat flow determinations and temperature gradient measurements will be obtained for holes too deep for the equipment used by the Kansas Geological Survey. This work will be performed on an "as needed" basis through a subcontract with Southern Methodist University. All data and interpretations will be incorporated into the geothermal data base for the state.

Task 5 - Geothermal Map of Kansas

All pertinent geothermal data for the state of Kansas will be used to produce a geothermal map of the state. The contractor will be responsible for the technical accuracy and completeness of the data sets; graphical depiction and coordination of the map production will be accomplished by coordination with NOAA.

Article II - WAYS AND MEANS OF PERFORMANCE

(a) Items to be supported and sources of support include the following:

| | DOE | KGS | Total |
|---|---|---|---|
| (1) Salaries, Wages, and Benefits | | | |
| Sophoscleous 10% FTE - 1 yr. | | $2,300 | |
| Steeples 10% FTE - 1 yr. | | 2,700 | |
| Yarger 10% FTE - 1 yr. | | 2,700 | |
| Whittemore 10% FTE - 1 yr. | | 2,700 | |
| Rothe 3 mo. FTE | $ 7,200 | | |
| Grad. Res. Asst. (Heat Flow, 1/2-time 10-1/2 mo.; Full-time 4-1/2 mo.). | 8,453 | | |
| Grad. Res. Asst. (Gravity, 1/2-time 10-1/2 mo.; Full-time 4-1/2 mo.). | 8,453 | | |
| Grad. Res. Asst. (Geochem., 1/2-time 10-1/2 mo.). | 4,550 | | |
| Two Grad. Res. Assts. (Programming and data processing) | 16,906 | | |
| Electronics Technician (1/2-time 10-1/2 mo.; Full-time 4-1/2 mo.). | 10,503 | | |
| Student hourly (gravity survey, heat flow, Summer) | 6,500 | | |
| Benefits (19% Professionals, 7% GRA Summer, 0.5% GRA School Year | 3,398 | 1,976 | |
| Subtotal | $ 65,990 | $12,375 | $ 78,366 |

| | | DOE | KGS | Total |
|---|---|---|---|---|
| (2) | Computation | | | |
| | Geothermal gradient data processing | 3,000 | | |
| | Gravity data processing | 4,000 | | |
| | Subtotal | $ 7,000 | | |
| (3) | Travel | | | |
| | Mileage @ 21¢/mi. (gravity, heat flow surveys) | 9,000 | | |
| | In-state per diem ($32/day) | 12,480 | | |
| | Out-of-state (transportation + $38-$60/day) | 4,000 | | |
| | Subtotal | $ 25,480 | | |
| (4) | Miscellaneous | | | |
| | Maintenance supplies, expendable materials, repairs | 3,000 | | |
| | Publication | 4,000 | | |
| | Geochemistry lab supplies and repairs | 2,000 | | |
| | Heat Flow subcontract-- Blackwell | 5,000 | | |
| | Subtotal | $ 14,000 | | |
| | Total Less Indirect Costs | $112,470 | | |
| (5) | Indirect Costs | | | |
| | Calculated @ 37% of total items above | 41,614 | | |
| | Total | $154,084 | $12,376 | $166,460 |
| (6) | Capital Equipment | | | |
| | 40 Mbyte disc drive for Tektronix 4052 microcomputer | 5,750 | 5,750 | |
| | Digitizer table for Tektronic 4052 microcomputer | 4,175 | 4,175 | |
| | Subtotal | $ 9,925 | $ 9,925 | $ 19,850 |
| | Total | $164,009 | $22,301 | $186,310 |

(b) Items, if any, significant to the performance of this contract, but excluded from computation of Support Cost and from consideration in proportioning costs:

None.

(c) Time or effort of Principal Investigator(s) including indirect cost and fringe benefits contributed by the Contractor but excluded from computation of Support Cost and consideration in proportioning costs:

$22,301.

(d) All subcontracts and consultant agreements require the review and written approval of the Contracting Officer.

Article III - FUNDING

The total estimated cost of items under A-II(a) above, for the contract period stated in this Appendix A5 of $164,009.00; DOE will pay actual costs of the items in A-II(a) above incurred during the contract period stated in this Appendix A5, subject to the provisions of Article III and Article B-V. The estimated DOE Support Cost for the contract period stated in this Appendix A5 is $164,009.00.

The estimated DOE Support Cost is funded as follows:

| | | |
|---|---|---|
| (a) | Estimated unexpended balance from prior period(s) | $ -0- |
| (b) | New funds for the current period | $164,009 |

Article A-IV - ADMINISTRATION AND REPORTS

(a) Principal Investigator -
Don W. Steeples
Kansas Geological Survey
University of Kansas
Lawrence, Kansas 66044
Telephone: (913) 864-4991

Technical Administrator -
(DOE's Project Manager)
Dr. L. L. Mink
DOE-ID
Energy and Technology Division
Resource Definition Branch
Telephone: (208) 525-0638

The Principal Investigator shall be responsible for directing the work within the scope of Article A-I above as outlined in discussions and in periodic letters from the Technical Administrator.

(b) The Principal Investigator is responsible for the preparation and submission of reports to in accordance with the attached DOE Form CR-537.

U. S. DEPARTMENT OF ENERGY

# REPORTING REQUIREMENTS CHECKLIST

DOE Form CR-537 (1-78)

*(See Instructions on Reverse)*

FORM APPROVED OMB NO. 38R-0190

| 1. IDENTIFICATION Geothermal Resource Assessment in Kansas | 2. OBLIGATION INSTRUMENT: Modification No. A005 to Contract No. DE-AS07-79ET27204 |
|---|---|

3. REPORTING REQUIREMENTS

| A. PROJECT MANAGEMENT | Frequency | B. TECHNICAL INFORMATION REPORTING | Frequency |
|---|---|---|---|
| 1. ☐ Management Plan | | 1. ☐ Notice of Energy RD&D Project (SSIE) | |
| 2. ☐ Milestone Schedule & Status Report | | 2. ☐ Technical Progress Report | |
| 3. ☐ Cost Plan | | 3. ☒ Topical Report | A |
| 4. ☐ Manpower Plan | | 4. ☒ Final Technical Report | Y |
| 5. ☒ Contract Management Summary Report | M | C. PMS/MINI-PMS | |
| 6. ☒ Project Status Report | M | 1. Cost Performance Report | |
| 7. ☐ Cost Management Report | | ☐ Format 1 WBS | |
| 8. ☐ Manpower Management Report | | ☐ Format 2 Functional | |
| 9. ☐ Conference Record | | ☐ Format 3 Baseline | |
| 10. ☐ Hot Line Report | | ☐ Format 5 Problem Analysis | |
| | | 2. ☐ Cost/Schedule Status Report | |
| | | 3. ☐ Management Control System Description | |
| | | 4. ☐ Summary System Description | |
| | | 5. ☐ WBS Dictionary | |

FREQUENCY CODES:

A – As Required
C – Contract Change
F – Final (End of Contract)
M – Monthly
O – One Time (Soon After Contract Award)
Q – Quarterly
S – Semi-Annually
X – Mandatory for Delivery with Proposals/Bid
Y – Yearly or Upon Contract Renewal

4. SPECIAL INSTRUCTIONS

A.5., A.6. - Copies are due within fifteen days after end of the calendar month.

B.3. - Submit in draft after completion of work as indicated in Statement of Work. After DOE approval is received, submit copies as required on attached "Report Distribution List."

B.4. - Submit 2 copies in draft forty-five days prior to completion date of contract term. After DOE approval is received, submit in final including one camera-ready copy.

5. ATTACHED HEREWITH:

☒ Report Distribution List
☐ WBS/Reporting Category
☐
☐

| 6. PREPARED BY (Signature and date): | 7. REVIEWED BY (Signature and date): |
|---|---|
| | |

# REPORTING REQUIREMENTS CHECKLIST

## PURPOSE

A checklist to identify and communicate additional reporting requirements which are not otherwise set forth in the General Purpose clauses of DOE contracts and agreements. It will be included as part of the contract or agreement. This form will be completed for each proposed contract or agreement and can be modified as required in Special Instructions to adapt it to a specific situation.

## INSTRUCTIONS

*Item 1* – Enter the title as indicated in the Procurement Request, Interagency Agreement, or initiating memorandum.

*Item 2* – Enter the identification number of the Procurement Request or Interagency Agreement, the date of the memorandum, and contract number after award.

*Item 3* – Check spaces to indicate plans and reports required. For each reporting requirement checked, indicate frequency of delivery in column provided using one of the frequency codes shown.

3.A.1 *Management Plan* – The contractor's plan to manage the effort described in the statement of work or similar document. It will contain management methodologies, control systems, and procedures he will use. Includes milestones and other planning schedules, organizational identification and descriptions, and special and critical plans, such as test plans, plans for handling of Government owned property. Work breakdown structures, key personnel identification, and methods for monitoring progress toward objectives may be required.

3.A.2 *Milestone Schedule and Status Report* – The contractor's milestone schedule for all work breakdown structure items, line items, or deliverables specified in the contract. Updated periodically (usually monthly) with status, progress toward completion, and percent completion of each line item and of the total contract.

3.A.3 *Cost Plan* – A baseline plan for incurring costs on a contract or agreement to measure progress in terms of cost; update and forecast contract fund requirements; plan funding changes; and develop fund requirements and budget estimates.

3.A.4 *Manpower Plan* – A baseline plan to allocate manpower to each reporting category identified in the contract or agreement.

3.A.5 *Contract Management Summary Report* – A single-page graphic presentation of integrated cost, major milestones, and manpower for rapid visual analysis and trend forecasting.

3.A.6 *Project Status Report* – A periodic report to communicate to DOE management an assessment of contract status, to explain variances and problems, and to discuss any other areas of concern or achievements.

3.A.7 *Cost Management Report* – A periodic report of the status of costs compared to the Cost Plan. Data is used to: report actual and projected accrued costs; evaluate performance against plan; identify actual and potential problem areas; construct cost experience for projects and budgeting efforts; and, to verify the reasonableness of contractors' invoices.

3.A.8 *Manpower Management Report* – A periodic report of the status of actual and projected manpower expenditure against the Manpower Plan. Data is used to evaluate performance against plan; identify actual and potential problem areas; and to construct manpower experience for projections and planning efforts.

3.A.9 *Conference Record* – Documentation of the contractor's understanding of significant decisions, direction or redirection or required actions resulting from any meeting with DOE representatives.

3.A.10 *Hot Line Report* – A hardcopy report by the fastest means available, (TWX, etc) documenting critical problems, emergency situations, and important technical breakthroughs.

3.B.1 *Notice of Energy R&D Project* – A formatted, two-page report to provide information on unclassified DOE R&D projects for dissemination to the scientific, technical, and industrial communities and to the public. Also provides information to the Smithsonian Scientific Information Exchange.

3.B.2 *Technical Progress Report* – A formal, structured technical report, submitted periodically to communicate project results for dissemination to Government agencies, the scientific, technical and industrial communities and the public.

3.B.3 *Topical Report* – A special technical report prepared when a project has reached a point at which a major milestone or a significant phase has been completed, when unexpected results have been achieved, when it is logical to summarize results achieved, or when a new scientific or technological finding is deemed to warrant prompt publication.

3.B.4 *Final Technical Report* – Technical Progress Report reporting final results of DOE supported RD&D and scientific projects.

3.C *PMS/Mini-PMS*

1) *Cost Performance Report (PMS Application)*

Format 1 – Reports current period and cumulative budget, actual costs and earned value data by work breakdown structure elements. Identifies cost and schedule variances and provides contractor's estimate to complete comparisons to budgets.

Format 2 – Reports current period and cumulative budget, actual costs, and earned value data by contractor functional elements.

Format 3 – Provides periodic updating to the established performance measurement baseline. Incorporates authorized contract changes and internal re-planning into the performance measurement baseline.

Format 5 – Provides a narrative analysis of contract variances.

2) *Cost/Schedule Report (Mini-PMS Application)* – Periodic, usually monthly, report of cumulative budget, actual costs and earned value by summary work breakdown structure elements. Identifies cost and schedule variances and provides contractor's estimate to complete comparisons to budgets.

3) *System Description (PMS Application)* – Contractor's description of the management control system to be used in performing contract work. Must address all elements of the PMS criteria.

4) *Summary System Description (Mini-PMS Application)* – Contractor's summarized description of the management control system to be used in performing contract work.

5) *WBS Dictionary* – Lists and defines work breakdown structure. For more detailed instructions see PMS Manual.

*Frequency Codes* – Each code must have an identified time period (i.e., As Required – 5 days after event occurrence). These time periods are suggested in the solicitation and negotiated at contract award.

*Item 4* – Identify any special reporting requirements not indicated in Item 3 and/or qualifiers to those selected. (Use additional sheets as necessary.)

*Item 5* – Check appropriate blocks.

*Report Distribution List* – A comprehensive informative listing of reports by frequency of submission, addresses and number of copies for each addressee.

*Reporting Categories (level of detail)* – An identification by WBS level of task elements for which reporting will be required by DOE.

*Item 6* – Signature of person or persons preparing the checklist and the date prepared. Preparation is by person or persons responsible for preparation of Procurement Request or Statement of Work.

*Item 7* – Signature of the person reviewing the checklist and date reviewed.

• U.S. GOVERNMENT PRINTING OFFICE: 1978-- 281-130/ 514

ID F-129 (Rev. 08-79)
Ref. DOE 13302
(use with DOE CR-537)

U.S. DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE

# REPORT DISTRIBUTION LIST

Contract No.

DE-AS07-79ET27204

Modification No. A005

| Addressees | Milestone Schedule & Status Report | Management Plan | Cost Plan | Manpower Plan | Project Summary Report | Cost Management Report | Manpower Management Report | Conference Record | Notice of Energy RD&D Project (SSIE) | Hot Line Report | Technical Progress Report | Topical Report | Final Technical Report | Cost Performance Report | Cost/Schedule Status Report | Management Control System Description | Summary System Description | WBS Dictionary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of Report Copies | | | | | | | | | | | | | | | | | |
| U. S. Department of Energy<br>Idaho Operations Office<br>550 Second Street<br>Idaho Falls, Idaho 83401 | | | | | | | | | | | | | | | | | | |
| Attn: L. L. Mink, Chief<br>Geothermal Energy Branch | | | | | | 2 | 2 | | | | | | | 2 | 2 | | | |
| Attn: Nell W. Fraser, Director<br>Contracts Management Division | | | | | | 1 | 1 | | | | | | | 1 | 1 | | | |
| Attn: E. G. Jones, Director<br>Financial Management Division | | | | | | 1 | 1 | | | | | | | | | | | |
| Bob Gray<br>U. S. Department of Energy, DGE<br>MS 3344, Federal Building<br>12th and Penn. N.W.<br>Washington, DC 20461 | | | | | | 2 | 2 | | | | | | | 2 | 2 | | | |
| Duncan Foley<br>UURI<br>420 Chipeta Way, Suite 120<br>Salt Lake City, UT 84108 | | | | | | 1 | 1 | | | | | | | 1 | 1 | | | |

Special Instructions

# UNIFORM DOE CONTRACTOR SCIENTIFIC, TECHNICAL AND ENGINEERING REPORT NUMBERING SYSTEM

Effective with the implementation of the Procurement/Contract numbering system as shown in the example below, the following guidelines are established for identifying scientific and technical reports (progress, interim, final topical, etc.) conference papers, proceedings, theses, and translations.

1. All DOE contractors now applying uniquely identifying codes and systems approved by TIC are to continue using such codes and systems.

2. DOE Field Office codes such as ALO, IDO, COO, HCP, NVO, ORO, RLO, SAN, and SRO: and program codes such as FE, DSE, etc., are no longer approved for use by contractors.

3. Contractors having no approved unique codes are to number information products as shown below. All contractors in this category should create unique report numbers by (a) identifying the report with a DOE code, (b) selecting the final seven characters from the applicable contract number (two alphabetic and five numerals), and (c) adding suffix numbers sequentially for each report generated under the contract. For new contracts, the sequential number should begin with 1. For existing contracts the established sequence should continue. Slash marks and hyphens should be applied as shown in the examples.

   Examples: Report numbers generated from contract number DE-AC03-79ET01834.M001:

   DOE/ET/01834-1; DOE/ET/01834-2; DOE/ET/01834-3; etc.

   Note: It is essential that both the final five-digit numeral and the two preceeding alphabetical characters be extracted from the contract number as shown. The modification number, if any, normally shown as M001, etc., following the basic five-digit number is NOT used in the report number.

4. Reports issued in more than one binding, or reissued as revisions or later editions, are to be identified by adding the following aditional suffixes to the basic number: Rev. - Revision; Vol. -Volume; Pt. - part: Add. - Addenda; Ed. - Edition, etc.

   Examples: DOE/ET-01834-1 Rev.
   DOE/ET/01834-1 Rev. 2

   DOE/ET-01834-1 Pt. 1
   DOE/ET/01834-1 Pt. 2

It is intended that report numbers be structured exactly as specified in the examples insofar as possible. If modification to this basic format is essential, it is to be approved through normal channels before being used.

KANSAS

MAY 11 1982

Kansas Geological Survey
University of Kansas
103 Avenue "A" Campus West
Lawrence, Kansas 66044

ATTENTION: Ann M. Steeples

SUBJECT: MODIFICATION NO. M006 TO CONTRACT NO. DE-AS07-79ET27204

Gentlemen:

Enclosed for your retention and files is one fully executed copy of the subject modification.

Very truly yours,

Original Signed By:
Kent R. Hastings

Kent R. Hastings
Contracting Officer
R&D Contracts Branch
Contracts Management Division

Enclosure

bcc: Earl Jones, w/encl
Sue Prestwich, w/encl
Janet Crafts, w/encl
Carl Buscetta, UURI, w/encl

R&DCB
KRHastings:db
5/11/82

STANDARD FORM 30, JULY 1966
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.101

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

PAGE 1 OF 1

| 1. AMENDMENT/MODIFICATION NO. | 2. EFFECTIVE DATE | 3. REQUISITION/PURCHASE REQUEST NO. | 4. PROJECT NO. *(If applicable)* |
|---|---|---|---|
| M006 | | 07-82ET27204.501 | |

5. ISSUED BY CODE
U. S. Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, Idaho 83401

6. ADMINISTERED BY *(If other than block 5)* CODE

7. CONTRACTOR NAME AND ADDRESS CODE FACILITY CODE

*(Street, city, county, state, and ZIP Code)*
Kansas Geological Survey
University of Kansas
103 Avenue "A" Campus West
Lawrence, Kansas 66044

8.
☐ AMENDMENT OF SOLICITATION NO. _____
DATED _____ *(See block 9)*
☒ MODIFICATION OF CONTRACT/ORDER NO. DE-AS07-79ET27204
DATED 8/15/79 *(See block 11)*

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods:

(a) By signing and returning _____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA *(If required)*

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) ☐ This Change Order is issued pursuant to _____

The Changes set forth in block 12 are made to the above numbered contract/order.

(b) ☐ The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) ☒ This Supplemental Agreement is entered into pursuant to authority of Article II of the Contract.

It modifies the above numbered contract as set forth in block 12.

12. DESCRIPTION OF AMENDMENT/MODIFICATION

ARTICLE II - THE PERIOD OF PERFORMANCE is hereby amended to extend the contract term through September 20, 1982.

Except as provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

13. ☒ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT ☐ CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN _____ COPIES TO ISSUING OFFICE

| 14. NAME OF CONTRACTOR/OFFEROR | | 17. UNITED STATES OF AMERICA | |
|---|---|---|---|
| BY _____ *(Signature of person authorized to sign)* | | BY Original Signed By: Kent R. Hastings *(Signature of Contracting Officer)* | |
| 15. NAME AND TITLE OF SIGNER *(Type or print)* | 16. DATE SIGNED | 18. NAME OF CONTRACTING OFFICER *(Type or print)* | 19. DATE SIGNED |
| | | Kent R. Hastings | 5/11/82 |

30-101

☆U.S.GPO:1980-0-311-153/5520

Mod DE-AS07-79ET27220 KANSAS

DOE FORM PR-799A (TEST)
30 AUGUST 1978

# U. S. DEPARTMENT OF ENERGY

## PROCUREMENT/FINANCIAL ASSISTANCE REQUEST-AUTHORIZATION

1. TO CMD

2. FROM INITIATING OFFICE E&T Geothermal

3. INITIAL: [X] UPDATE: [ ] 4. PROCUREMENT: [ ] FINANCIAL ASSISTANCE: [ ]

5. PR NUMBER: _____ 6. PR CORRECTION LETTER: _ 7. RELATED PR NUMBER: _____

**ACTION IDENTIFICATION**

8. TITLE: Kansas Resource Assessment DE-AS07-79ET27204 Modification for No Cost Time Extension

9. UNSOLICITED PROPOSAL NO: _____ 10. PROJECT NO: _____ 11. CFDA NO: _____

12. PRODUCT OR SERVICE:* ____ 13. SUPPORT SERVICES: YES [ ] NO [ ] 14. CONSULTANT AWARD: YES [ ] NO [ ]

15. CONTROLLED DELIVERABLE:* ___ 16. REPORT/DRAWING REQ: YES [ ] NO [ ] IF YES, ATTACH DETAILS.

17. CLASSIFICATION OF MATERIALS/WORK: _ U — UNCLASSIFIED C — CONFIDENTIAL S — SECRET T — TOP SECRET

18. GOVERNMENT PROPERTY: _ F — FURNISHED P — PURCHASED N — NOT INVOLVED IF CODE F OR P, ATTACH DETAILS.

**AWARD PLANNING**

19. AWARD AS ORDER UNDER BIN: _____

20. DESIRED AWARD DATE: __ __ __ (MONTH DAY YEAR) 21. KIND OF AWARD ACTION:* 10 22. TYPE OF AWARD:* T IF CODE T, ATTACH DETAILS.

23. IF MULTI-YEAR AWARD, INDICATE NUMBER OF YEARS: _ 24. TYPE SOLICITATION INSTRUMENT: * __

25. EXTENT OF COMPETITION:* __ IF COMPETITIVE, ATTACH TECHNICAL EVALUATION PLAN. IF NON-COMPETITIVE, ATTACH JUSTIFICATION. REF: DOE-PR 9-3.805.51 or 9-4.909(f).

26. SOURCE SELECTION PROCEDURE: _ 1 — A-E 2 — SEB 3 — OTHER 4 — NONE

27. FOR A-E, SHOW ESTIMATED CONSTRUCTION COST IN DOLLARS: _____

**AWARDEE**

IF COMPETITIVE, HAS LIST OF SOURCES BEEN ATTACHED? YES [ ] NO [ ] IF NON-COMPETITIVE, COMPLETE 28 - 31.

28. NAME: Kansas Geological Survey 29. ADDRESS: 1930 Ave "A" Campus West Lawrence, Ks 66044

30. DIVISION: Univ. of Kansas

31. GOCO/LAB: _ A — GOCO/LAB B — GOCO/NON-LAB C — NON-GOCO/LAB D — NOT APPLICABLE

**FINANCIAL**

AWARD VALUE

| | DOLLAR AMOUNT |
|---|---|
| 32. GOV'T SHARE | -0- |
| 33. TOTAL | |

34. CONSIDERATION IN KIND, LOAN, OR LOAN GUARANTEE DATA REPORTED ON PR-799C: [ ]

35. PROJECT PERIOD: FROM 6 30 82 (MONTH DAY YEAR) THRU 9 20 82 (MONTH DAY YEAR)

CURRENT FY FUNDS COMMITTED

| 36. B&R NUMBER | 37. FUND CLASS | 38. DOLLAR AMOUNT |
|---|---|---|
| _____ | _ | _____ |
| _____ | _ | _____ |
| _____ | _ | _____ |

39. FROM PR-799B (PART A) _____

40. TOTAL THIS PR -0-

41. FUNDING PERIOD: FROM __ __ __ (MONTH DAY YEAR) THRU __ __ __ (MONTH DAY YEAR)

42. APPROPRIATION SYMBOL: _____

43. ALLOTMENT SYMBOL: _____

44. OBJECT CLASS: ____

* SEE BACK OF FORM FOR CODES

**PROJECT MANAGER**

45. NAME: S.M. Prestwich

46. SIGNATURE: S.M. Prestwich

47. DATE: 5 5 82 (MONTH DAY YEAR) 48. OFFICE CODE: _____

49. FTS TELEPHONE NUMBER: _____

**PROGRAM OFFICIAL**

50. NAME: R E Wood

51. SIGNATURE: _____

52. DATE: __ __ __ (MONTH DAY YEAR)

**CERTIFYING OFFICIAL**

53. NAME: F. S. Smith

I HEREBY CERTIFY THAT THE FUNDS CITED IN ITEM 40 ARE AVAILABLE.

54. SIGNATURE: _____

55. DATE: __ __ __ (MONTH DAY YEAR)

KANSAS GEOLOGICAL SURVEY
Environmental Geology Section

1930 Avenue "A", Campus West
The University of Kansas
Lawrence, Kansas 66044
913-864-4991

April 19, 1982

Ms. Susan Prestwich
DOE/DGE
550 2nd Street
Idaho Falls, Idaho 83401

Dear Susan:

This letter will confirm our conversation of 7 April in Salt Lake City. I respectfully request a no-cost time extension from 30 June '82 to 20 September '82 for our contract DE-AS0779 ET27204. The reasons for this request are:

1. Dr. David Blackwell needs some extra time as per attached letter.

2. We have fallen behind in digitizing gravity station locations because of hardware problems with our digitizer.

Thank you for your consideration.

Sincerely,

Don W. Steeples
Principal Investigator
Chief, Environmental Geology
and Geophysics Section

DWS:ep

cc: Dr. David Blackwell, SMU
Carolyn Hallenbeck, KU

SOUTHERN METHODIST UNIVERSITY
DALLAS, TEXAS

April 13, 1982

Dr. Don Steeples
Kansas Geological Survey
1930 Ave. "A," Campus West
University of Kansas
Lawrence, Kansas 66044

Dear Don:

This letter is to formally request an extension of our contract with the state of Kansas (#949) to do geothermal studies in deep wells in Kansas. I would like to extend this contract through the 31st of August, 1982, with no additional increase in funding level. This extension will allow us time to obtain logs during the summer and to properly complete the report.

I sent to you on Friday copies of 4 logs that we obtained during our first logging run. These included a deep hole in the Oklahoma Panhandle, one in western Kansas and 2 holes in central Kansas. For some reason we weren't able to get below 1050 meters in the Salinas hole, which is very disappointing. I hope the hole hasn't plugged there as we still don't have any measurements for the bottom couple hundred meters of the hole. From looking at Sandy's thesis, there are several holes that are fairly deep and which we would like to log this summer. I will make a list of these holes and maybe you can send them to her so we can find out if any of these holes might still be available for logging this summer. We will be in the field to do the logging during the month of July.

Sincerely yours,

David D. Blackwell
Professor of Geophysics

DDB/eg

INSTITUTE FOR THE STUDY OF EARTH AND MAN
GEOTHERMAL LABORATORY / 214 • 692-2745
SOUTHERN METHODIST UNIVERSITY / DALLAS, TEXAS 75275