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PROPOSAL FOR SUPPORT FOR SCIENTIFIC RESEARCH

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SUBMITTED TO:

U. S. Department of Energy
Division of Geothermal Energy

INSTITUTION:

Board of Regents

University of Nevada System

Nevada Bureau of Mines and Geology

University of Nevada - Reno

Reno, Nevada 89557

PRINCIPAL INVESTIGATOR:

Dennis T. Trexler

Nevada Bureau of Mines and Geology

TITLE OF RESEARCH:

LOW- TO MODERATE-TEMPERATURE GEOTHERMAL RESOURCE ASSESSMENT FOR NEVADA - SITE SPECIFIC STUDIES

SUPPORT REQUESTED FOR

PERIOD:

SUPPORT REQUESTED:

May 1, 1979 to April 30, 1981

Year 1

Option I \$140,630

Year 2 \$136,469

Option II \$205,585

\$.208,704

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Graduate Dean,

Research Coordinator

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INTRODUCTION

The Nevada Bureau of Mines and Geology (NBMG) proposes to extend its investigation of low- to moderate-temperature geothermal resources by examining four sites, over a two year period, where geothermal resource development has been favorably assessed. These areas include the northern Big Smoky Valley, the Carson City area, and two areas from the following list of possibilities: Carlin, Moana, Wells, Gerlach, Wabuska, Smith Creek Valley, Crescent Valley, Golconda, and Hawthorne. All of these areas contain a significant number of hot springs and wells and were recently designated as high potential areas for geothermal resource development in the U.S.G.S. Circular 790. In addition, the areas were selected on the basis of a numerical technique, recently formulated at NBMG, that evaluates data from several distinct geothermal parameters and yields a semi-quantitative probability function. The value of the probability function is used to determine resource development favorability.

The basic program will combine geological mapping, physical measurements, geophysical surveys, and geochemical surveys to identify and place limits on the reservoir boundaries of the hydrothermal resource. An option, which involves drilling at selected sites within each of the study areas, is included.

The scope of the investigation is briefly outlined below: Option ${\rm I}$

- Task 1. Review pertinent geological and geophysical literature and construct preliminary surface manifestation maps as well as subsurface cross-sections.
- Task 2. Geological field checking of stratigraphic units in hydrographic basin.
- Task 3. Fly low sun-angle photographic reconnaissance of hydrographic basin to delineate lineaments.
- Task 4. Conduct leveling survey and gravity survey at selected intervals across the hydrographic basin.
- Task 5. Conduct resistivity surveys in areas adjacent to hot springs.

- Task 6. Conduct a one-meter temperature survey in areas adjacent to hot springs.
- Task 7. Sample surface waters for chemical analysis.
- Task 8. Prepare maps, diagrams, and cross-sections of traversed areas.
- Task 9. Prepare final report and critique of scientific methods used in the investigation.
- Task 10. Submit all pertinent data to USGS GEOTHERM data file, including information gathered in the continuing State-wide Geothermal Assessment.

Option II

- Task 11. Select one drill site at each study area and drill aproximately 600 feet for temperature gradient and reservoir confirmation.
- Task 12. Log wells during drilling.
- Task 13. Prepare detailed lithologic logs from drill chips.
- Task 14. Analyze selected intervals of drill chips both petrographically and by X-ray diffraction.
- Task 15. Measure temperature profile and collect water samples for chemical analysis.

RATIONALE

The Rocky Mountain - Basin and Range Regional Hydrothermal Commercialization Plan has identified the "lack of adequately tested reservoirs" as one of the "most critical barriers to accelerating the development of hydrothermal resources." In addition, the Plan outlines the objectives of the State-Coupled Direct Heat program. These objectives include: assisting the U.S.G.S. data compilation of low- to moderate-temperature resources; publishing maps and reports detailing these resources; and testing the highest priority areas for reservoir confirmation. The NBMG proposes a two year, multi-task reservoir-confirmation program for four sites of high potential for direct utilization of geothermal resources.

Several factors influenced the choice of the four sites. They are all within the Battle Mountain Heat-Flow High and also contain a number of thermal springs and wells. Twenty-seven broad regions, which include the selected sites, were outlined by U.S.G.S. and NBMG personnel as areas of high potential for direct utilization and included in U.S.G.S. Circular 790. In addition, a numerical scheme has been developed at the NBMG for ranking areas with regard to potential for direct utilization. The scheme evaluates physical, chemical, and demographical parameters for specific sites. On the basis of this scheme, the Carson City, Carlin, Moana, Hawthorne, and Wells areas were rated high for development of geothermal residential space heating and the Big Smoky Valley, Gerlach, Golconda, Wabuska, Crescent Valley, and Smith Creek Valley areas rated high for the development of geothermal industrial process heat. These areas are also favored because adequate baseline data exists in the form of topographic, geologic, and regional gravity maps, as well as chemical analyses of tnermal waters.

The site-specific tasks, outlined in the introduction, and discussed in the following sections, are designed to provide sub-surface information and to place limits on the boundaries of the geothermal reservoir. The need for this information is based on the premise that "a very substantial increase in direct utilization is possible by 1985 if reservoir confirmation efforts . . . are extensive enough", as outlined in the Regional Hydrothermal Commercialization Plan.

The information provided by the program will be used in many ways by several agencies (Federal, State, and local) and by the private sector (companies and individuals). The results of this proposed investigation will provide information to:

- 1) support the DOE funded Nevada Department of Energy's Operations
 Research and Outreach programs;
- 2) supplement and update data to the U. S. Geological Survey's GEOTHERM computer data file;
- eliminate uncertainties attendant to resource exploitation by potential developers and,
- 4) define site-specific resource characteristics.

The Option II investigation will provide more detailed subsurface information that will further enhance credibility of the reservoir characteristics as determined in Option I.

The final report will include a critical evaluation of the geothermal exploration techniques used in this study and will suggest, on the basis of the developed criteria, future site-specific reservoir studies.

PROPOSED PROGRAM

The NBMG is presently completing work on the low- to moderate-temperature geothermal assessment program for Nevada, Contract No. ET-78-S-08-1556.

During the course of this work, the NBMG identified sites where detailed geological and geophysical investigations could be carried out to delineate geothermal reservoir boundaries (fig. 1). Most of these sites are already well known because of the numerous hot springs and wells in these areas. The USGS has also broadly outlined 27 such sites, in Nevada, in Circular 790.

In the first year of the program, the investigation will focus on the northern half of the Big Smoky Valley and the Carson City area. In the second year, two other areas will be selected from the following possible sites:

Areas rated high for Industrial Process Heat Applications

- 1. Crescent Valley
- 2. Golconda
- 3. Gerlach
- 4. Smith Creek Valley
- 5. Wabuska

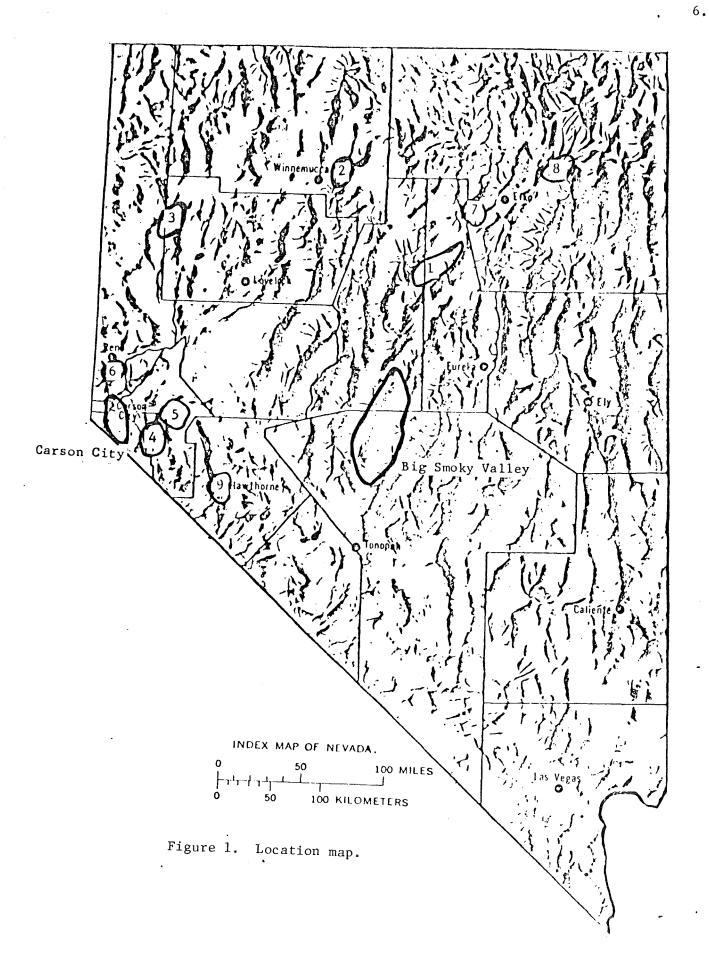
Areas rated high for Residential Space Heating Applications

- 6. Moana
- 7. Carlin
- 8. Wells
- 9. Hawthorne

The selection will be based on information gained during the first year and on availability of suitable topographic base maps.

Description of the areas

The Big Smoky Valley is one of the largest in central Nevada, encompassing nearly 3000 square miles. It extends from the city of Tonopah, north, approximately 100 miles, to the city of Austin (fig. 1). The Toiyabe Range, to the west, and the Toquima Range, to the east, rise to over 6000 feet above the valley floor. A slight structural high, near the town of Round Mountain, bisects the valley into two smaller drainage basins.



The basin to the north contains a number of geothermal occurrences including: Spencer's Hot Spring (73°C), McCleod Ranch Hot Springs (82°C), and Darrough Hot Springs (97°C). The average elevation of these springs is 5500 ft. The point of discharge is apparently related to permeable sands and gravels of Quaternary age.

The adjacent ranges consist of Paleozoic sediments, both clastic and carbonates, that have been intruded by Mesozoic igneous rocks. Tertiary volcanics cover many of the older rocks. The Quaternary valley fill has been estimated at 3000 to 5000 feet thick (John Erwin, 1979, personal commun.).

Access to the area includes a major north-south highway (Nevada 8A) and many additional secondary roads and trails.

Based on the numerical technique that was previously described, this area was rated very high for industrial process heat applications.

The Carson City site (fig. 1) is a moderately urbanized area, and includes the City of Carson City (population 25,000) and the community of Gardnerville-Minden (population 1500). The investigation will be limited to the northern part of the physiographic basin that is bordered on the north by the Virginia Range, on the east by the Pine Nut Mountains, on the south by the Sierra Nevada, and on the west by the Carson Range. The site encompasses approximately 300 square miles and the work will be concentrated on areas that surround the five major thermal springs: Carson Hot Springs (50°C); Nevada State Prison Springs (24°C); Saratoga Hot Springs (50°C); Hobo Hot Springs (45°C); and Wally's Hot Springs (50°C). In addition, geothermal wells, which are used for residential space heating, are common in the Pine Nut Mountains, immediately adjacent to the Carson City municipal limits.

The oldest rocks at this site consist of Jurassic and Triassic metavolcanics. The granitic rocks of the Cretaceous Sierra Nevada Batholith are exposed in the Carson Range, to the west, and at other locations scattered throughout the basin. An extensive sequence of Cenozoic volcanics and interbedded sedimentary rocks overlies the older metavolcanics and granites. The basin is filled with recent and Quaternary alluvium. This site lies entirely within the Basin and Range Province and the mountain ranges are bounded on one or both sides by range-bounding normal faults (Moore, 1969).

Access to this area includes a major north-south highway (U. S. 395), as well as numerous secondary roads.

Based on the numerical technique, this area was rated high for the development of geothermal space heating.

Detailed statement of work

The investigation for OPTION I consists of ten functionally interwoven tasks which will be applied to each area of investigation. The incorporation of these tasks into the program is derived, in part, from Goldstein (1977), in which geothermal exploration techniques for northern Nevada were semiquantitatively evaluated on the basis of cost/benefit. The NBMG anticipates varying degrees of success as these techniques are applied to the different sites. That information will itself be valuable to future geothermal reservoir site-specific studies.

The investigation will begin with a thorough compilation of all available maps (7½' and 15' topographic maps, geologic maps, and regional gravity maps) air photos, well logs, and any additional information from the literature that may be useful in constructing the geologic baseline for each area. The USGS data file GEOTHERM will be used extensively for spring and well locations, water chemistry, and flow rates. Special attention will be given to rock type and age, range-bounding faults, and valley fill components. These baseline data will be projected onto the available topographic maps and selected cross-valley traverses. Five traverses in the Big Smoky Valley and three in

the Carson City area will be delineated for detailed geological and geophysical surveys.

The first detailed survey will consist of checking the lithology/mineralogy, stratigraphy, and structure, in the bordering ranges and, to an extent limited by the number of exposures, the valley fill. Special attention will be given to the stratigraphic units at the tops of the ranges. The presence of similar units detailed prior to the Basin and Range Faulting would likely imply the presence of that same unit in the valley subsurface. Unit correlation may also be useful in the interpretation of the geochemical data for hot springs. Chemical variations within the same drainage may be due to the effects of mineralogically different stratigraphic units.

To augment the geological investigation, low sun-angle photography (LSAP) of both sites will be flown to provide information on the spatial relationship between surface faulting and hot spring activity. Relationships between geothermal anomalies in western and north-central Nevada and geologic structures have been shown to be important in the localization of hot spring activity (Trexler and others, 1978). The surface fault patterns provide pertinent information on subsurface structural controls. Special attention will be given to the relationship between and influence of regional structural trends, in these site-specific areas, and their adherence to the patterns recognized in the Winnemucca AMS sheet (Trexler and others, 1978). The structural interpretation provided by enhancement of surface faults by low sun-angle photography (Walker and Trexler, 1977) will provide information on the subsurface controls of the reservoirs under investigation.

Regional gravity data is available for all sites (Erwin and Berg, 1977; Erwin and Bittleston, 1977; Healy, 1967; Oliver and Robbins, 1973), but only at a scale of 1:250,000. The aim of the gravity survey proposed here is to

provide more detailed information along the same transects as the geological surveys. The information derived will give a reasonable indication of the depth of the valley fill and may resolve the configuration of the basement below the fill. Elevations will be determined by the stadia-transit technique and gravity measurements will be tied to existing stations of previous surveys. Samples will be collected for density determination in the laboratory.

No shallow depth (1 meter) temperature survey information is available at the proposed sites. Heat flow measurements received high ratings (Goldstein, 1977) in both scales of geothermal exploration, 2500 and 100 square mile areas. A technique that was developed by Olmsted (1977) and used with some success in Nevada, will be applied, in a modified version, to these sites. The technique consists of the temporary installation of a 30 station expandable rectangular grid. The holes will be augered, to a depth of one meter, in the vicinity of suspected reservoirs. Temperatures will be measured periodically and the resulting isotherm configuration will be plotted on the base maps. The iostherm configuration could be useful in determining the extent of the structural controls, as determined from LSAP interpretation, on heat flow. Radial symmetry may indicate a point source for the hot water, possibly the intersection of two faults. Linear or elongate patterns, on the other hand, would almost certainly indicate a single deep fault as the responsible structure.

Since depth to the resource is an important parameter governing the economics of the direct-use of geothermal energy, an electric resistivity survey, at selected sites, has also been incorporated with the field work. The shape of the top of the water table will define the possible upper limits of the geothermal reservoir. The distribution of sediments saturated with highly conductive brines, geothermal waters, may also indicate the extent of near-surface geothermal aquifers. An example of this may be

evident in the Big Smoky Valley, where the average elevation of discharge of the springs is related to the spatial distribution of Lake Lahontan (late Quaternary) beach sands and gravels.

The final field task consists of sampling the surface waters, measuring the temperature and pH in situ, and determining the specific conductance and alkalinity at 25°C. In addition, water samples will be chemically analyzed for major anions and cations and, to a limited extent, for stable light isotopes. These data will be used to identify areas that are geochemically similar and possibly structurally related. Certain geochemical signatures may also be used to identify the source of recharge.

Option II is included here because it is field oriented. The objective of the task is to extend the surface and near-surface investigations by providing detailed lithologic, geochemical, and temperature data from several drill holes. The plan includes drilling one hole, 600 feet deep, at each site. This task constitutes reservoir confirmation and will be based wholly on data gathered from the previous tasks. Should one of the holes penetrate a significant reservoir, arrangements will be made to leave the hole open for more testing.

The final tasks include data interpretation, map and final report preparation, and submission of all pertinent information to GEOTHERM. A final report at the end of the first year of the investigation will be limited to the Carson City/Big Smoky Valley investigations. Likewise, the second year's final report will be limited to two areas. Data interpretation will be aided by the use of the NBMG's Tectronix 4014 graphic display in conjunction with PDP 11/34 and CDC 6400 computers. The final product will include a map that outlines known or suspected geothermal reservoir boundaries. Structures responsible for these boundaries will be included along with temperature

distributions, water table configuration, and chemical compositions of the water. The final report will also include a critical evaluation of the exploration techniques used in this study and a projection of those techniques that could be successfully applied to site-specific studies at the remaining high-potential areas in Nevada.

The data on the suitability of the sites for particular applications will be forwarded to the Nevada Department of Energy for use in the ongoing Outreach Program. This information will also be presented at regional technical sessions, as well as local, user-oriented meetings.

PROPOSED SCHEDULE OF ACTIVITIES

During the first year of funding, the investigation will be limited to two sites (the Big Smoky Valley site and the Carson City site). Should OPTION I be selected, the investigation will include Tasks 1 through 10, outlined below and shown in figure 2. Should OPTION II be selected instead, the investigation will consist of Tasks 1 through 10 and will also include Tasks 11 through 16, reservoir confirmation by drilling. With the OPTION II plan, Task 11 would be staggered, pending data compilation, and would begin six months after the initiation of Task 1. All work efforts will have been completed one year after the initiation of the program and the contents of the final product will depend on the OPTION selected. The final report under OPTION I will consist of surface and near surface geological surveys. Under OPTION II, the surface and near surface survey report would be supplemented by detailed subsurface information.

The second year would employ a similar strategy in two other areas of geothermal potential. This research will expand the knowledge of reservoir properties and aid the development of direct utilization of geothermal energy.

OPTION I (Surface and near-surface investigation)

- Task 1. Review all pertinent geological and geophysical literature sources. Construct base maps on topographic sheets by projecting stratigraphic units and geologic structures from larger scale maps. Project available geophysical data onto base maps. Construct preliminary cross-sections of valleys at delineated areas of traverse.
- Task 2. Field check stratigraphic units in both basin and range. Note especially age relations of superjacent units on each range; sample where appropriate. Estimate thickness and note sense of offset in fractures and faults.
- Task 3. Conduct a low sun-angle photographic reconnaissance of basin and range-margins. Field check lineaments, verify fault trace and sense of displacement. Plot data on base maps.

MONTHS 2 10 11 12 3 4 5 7 8 TASK 6 mmm 1. Collect Baseline Data 2. Geologic Mapping 3. Low Sun-Angle Photography 柳 4. Detailed Gravity Survey 5. Electrical Resistivity Surveys IIII 7111 THE IIII 6. Shallow Temperature Surveys 100 7. Geochemical Sampling 8. Integration of Data Products 9. Reporting Quarterly Progress mmmi Final 10. Collection of Data for Updating Nevada Geotherm File (Statewide)

Figure 2. Tentative Program Schedule Option I

IIII Northern Big Smoky Valley

Carson City

MONTHS

TASK	11	2	3	4	5	6	7	8	9	10	11	12
ll. Site Selection and Drilling								1111111111	111111111	# W M	* 3	
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12. Logging and Sampling												
13. Preparation of Log From												
Cuttings												
14. Petrographic Analysis of					·						1111	
Alteration				•								ļ
15. Measure Temperature Profiles									11			Œ.
and Collect Water Samples												
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Figure 3. Tentative Program Schedule. Option II
Reservoir Confirmation

- Task 4. Conduct stadia and transit leveling along the selected traverses. Set up gravity stations and conduct a detailed gravity survey along transects, with high resolution in areas of faults and hot springs. Plot data on base maps.
- Task 5. Conduct resistivity surveys in areas adjacent to hot springs along the selected traverses. Plot depth to top of ground water on base maps. Continue survey areally, if warrented.
- Task 6. Construct an expandable grid of 30 stations (one-meter holes) in the vicinity of hot springs along the line of traverse.

 Install thermistor probes, allow time for equilibration, measure temperature periodically. Plot isotherms on base maps; continue areally if warranted.
- Task 7. Collect water samples for bulk chemical and isotopic analysis.

 Measure, in field: temperature, pH, specific conductance, and
 carbonate/bicarbonate. Analyze appropriate samples for stable
 light isotopes, analyze all for major and minor anion and cation
 constituents.
- Task 8. Prepare maps and diagrams including: detailed geologic maps and cross-sections along the selected traverses; isotherm configuration; depth to basement; and depth to ground water.
- Task 9. Prepare final report indicating cost/benefit of the techniques used and an estimation of the probable effectiveness for other site-specific studies in Nevada.
- Task 10. Continue to collect geothermal data on a statewide basis. Submit new data to the U. S. Geological Survey's GEOTHERM data file.

OPTION II (Reservoir Confirmation)

Option II will include tasks 1-10 of Option I and the following tasks associated with the drilling program.

- Task 11. Drill one hole 600 feet deep at each area of investigation (total 2 holes).
- Task 12. Log well during drilling.
- Task 13. Prepare a detailed lithologic log from drill chips and selected spot cores.
- Task 14. Select intervals for X-ray and petrographic identification of unaltered mineral assemblages and alteration products.
- Task 15. Measure temperature profile in the well bore and collect water samples for chemical analysis, bulk chemistry, and stable light iostopes.
- Task 16. Integrate data derived in Tasks 11-15 with data obtained in OPTION I.

PROJECT ORGANIZATION

The Nevada Bureau of Mines and Geology is a research and public service division of the Mackay School of Mines, one of the several colleges of the University of Nevada, Reno. Research includes all phases of Nevada's geology and mineral resources: basic geologic mapping and laboratory studies, geophysical and geochemical surveys, engineering geology, earth-environmental considerations in urban and rural planning, the preparation of educational guides and boolkets, statewide investigations of mineral commodities, the geology of ore deposits, and the exploration, development, mining, processing, utilization, and conservation of metal ores, industrial minerals, fossil and nuclear fuels, geothermal power, and water.

The proposed research is a two year program, OPTION I will utilized 3 senior agency professional staff members, two on full time and one on part time. Personnel for OPTION II will include those already listed for OPTION I plus an additional part-time research associate. The principal staff members to be involved in the program are:

First Year

OPTION I

Dennis T. Trexler, Research Associate/Geologist - 6 months

Brian Koenig, Research Associate/Geologist - 12 months

Thomas Flynn, Research Associate/Geologist - 12 months

OPTION II

OPTION I personnel - 30 months

Research Associate/Geologist - 6 months

Second Year

OPTION I

Dennis T. Trexler, Research Associate/Geologist - 6 months

Brian Koenig, Research Associate/Geologist - 12 months
Thomas Flynn, Research Associate/Geologist - 12 months
OPTION II

OPTION I personnel - 30 months

Research Associate/Geologist - 6 months

FACILITIES AND EQUIPMENT

The Nevada Bureau of Mines and Geology occupies parts or all of three floors in the west wing of the Scrugham-Engineering and Mines building on the University of Nevada-Reno campus. Office, laboratory, and drafting room space for the research program will be made available by the University of Nevada-Reno. In addition, a graphite crystal monochrometer-equipped Norelco radiation diffraction unit, and International Scientific Instruments model Super IIIA scanning electron microscope/microprobe, and a fully-equipped thin-section laboratory are also available for detailed examination of drill core minerals. The Bureau maintains a Tectronix 4014 computer terminal, with hard-copy capabilities, that can access either a DEC PDP-11/34 or a Control Data Corporation 6400 computer; a high speed, large storage-capacity disc drive can interface directly with the DEC PDP-11/34.

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APPENDIX A

Resumes of Principal 'Staff Members

DENNIS THOMAS TREXLER

Born: August 6, 1940

Registered Geologist - State of California - #2382

Education:

B.S. Geology - University of Southern California - 1965, Los Angeles, California 90007 M.S. Geology - University of Southern California - 1968, Los Angeles, California 90007

Experience:

Dec. 1974present Nevada Bureau of Mines and Geology, University of Nevada, Reno Title: Research Associate
I have been involved as principle investigator or co-principle investigator in numerous research programs concerned with Earthquake Hazard Reduction (USGS), National Uranium Resource Evaluation (LLL, DOE) and Geothermal Evaluation (DOE). These projects have required both direct research participation, administrative and research direction of research assistants.

Feb. 1971-Dec. 1974 Mackay School of Mines, University of Nevada, Reno. Title: Research Associate. Duties included coordination and interpretation of remote sensing data acquired by high altitude aircraft and Skylab in relation to natural resources in the Great Basin. Interpretation included evaluating Skylab photographic imagery for lithologic, structural and geomorphic data and the costbenefits derived. Also performed research in applications of remote sensing techniques to the solution of geologic and natural resources problems. Techniques employed included the use of the visual, infrared and microwave portions of the electromagnetic spectrum. Computer programming for utilization of geologic parameters in interpretation techniques.

Aug. 1970-Feb. 1971 Microwave Sensor Systems Division of Spectran, Inc. Title: Manager Earth Resources Applications. At Microwave Sensor Sustems I conducted investigations on the detection and discrimination of oil spills using multispectral photography, 8-13.5 micron infrared imagery and multifrequency microwave radiometer data.

May 1968-July 1970 Aerojet-General Corporation, Space Division, Azuza, California. Title: Member of the Staff, Geologist. At Aerojet I was engaged in development of passive microwave techniques for earth resources. I participated as either Project Engineer or Program Manager on the following investigations:

- 1. Microwave Emissions of Snowpacks (U. S. Geological Survey).
- 2. Passive Microwave Measurements of Snow, Ice and Ocean-ography (Office of Naval Research).
- 3. Feasibility of using Microwave Techniques as Applied to Geologic Problems (U. S. Geological Survey).

Nov. 1967-May 1968 Geolabs, Inc. Santa Ana, California. Title: Engineering Geologist. Duties entailed site evaluation for engineered structures and preparation of geologic reports for Los Angeles and Orange Counties, California.

- Blinn, J. C., 111, Quade, J. G. and Trexler, D. T. (1975) Microwave Geothermal Exploration prepared for Jet Propulation Laboratory, Pasadena, CA.
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TREXLER cont.

Sept. 1966State of California, Dept. of Water Resources Los Angeles,
California. Title: Engineering Geologist. While assigned to
the planning and special investigations branch, duties included
interpretation of ground water basin characteristics from
exploratory drilling, preparation of ground water basin simulization by digital computer models and a survey of the impact

of degradation of water quality on industry.

Memberships: Geological Society of Nevada, Sigma XI, American Association of Petroleum Geologists, Geothermal Resources Council.

Bibliography

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 Microwave Radiometric Studies and Ground Truth of the NASA/USGS Southern
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- Edgerton, A. T., and Trexler, D. T. (1969) Oceanographic Applications of Remote Sensing with Passive Microwave Techniques, Proceedings of the Sixth International Symposium on Remote Sensing of Environment, Ann Arbor, Michigan.
- Edgerton, A. T., and Trexler, D. T. (1970) Oil Slick Detection, Aerojet-General Corp. Final Report SD 1335-1.
- Auckland, J. C., Trexler, D. T. and Orthlieb, F. (1971) Multi-Sensor Oil Spill Detection, Proceedings of the Seventh International Symposium on Remote Sensing of Environment, Ann Arbor, Michigan.
- Quade, J. G. and Trexler, D. T. (1974) Geologic investigations in the Basin and Range of Nevada using Skylab/EREP data; final report prepared for National Aeronautics and Space Administration.
- Trexler, D. T. and Bingler, E. C. (1975) Landslide and Debris Flow Potential map, Cold Springs Valley, Nevada; prepared for the Regional Planning Commission of Reno, Sparks and Washoe County.
- Bingler, E. C. and Trexler, D. T. (1975) Liquefaction Potential and Quaternary fault map Cold Springs Valley, Nevada; prepared for the Regional Planning Commission of Reno, Sparks and Washoe County.
- Melhorn, W. N. and Trexler, D. T. (1975) Preliminary Stratigraphy of the Tripple "T" Archeological site, Nye County, Nevada; prepared for American Museum of Natural History.
- Melhorn, W. N. and Trexler, D. T. (1975) Stratigraphy of the Gatecliff Rock Shelter, Nye County, Nevada; prepared for American Museum of Natural History.

BRIAN ALFRED KOENIG

Born: December 14, 1944

Education:

1

B.S. Geology - University of Wisconsin - 1973, Madison,

Wisconsin 53706

M.S. Geosciences - University of Arizona - 1978, Tucson,

Arizona 85721

Experience:

Apr. 1978present Nevada Bureau of Mines and Geology, University of Nevada, Reno Title: Research Associate

Current project includes cataloging and examining low- to moderate-temperature geothermal resources in the State of Nevada with regard to updating the USGS file Geotherm and producing a map detailing the location and other data pertinent to the direct utilization of the resources. On site checks of specific locations for temperature and chemical data are required.

Apr. 1976-Jul. 1977 Department of Geosciences, University of Arizona, Tucson

Title: Research Assistant

Carried out research leading to a detailed description of mineralogical and chemical changes with depth in a weathered porphyry copper deposit. The data gathered formed the basis for an interpretation of the weathering processes and controls on these processes.

Aug. 1973- Ray-O-Vac Division of ESB Inc., Madison, Wisconsin

Aug. 1975

Title: Chemical Technician Duties included routine wet chemical analyses of battery components and method development. A method I developed provides a high degree of accuracy in the analysis of mixtures of MnO_2 , Ag_2O , and graphite.

Oct. 1965-

U. S. Army

Aug. 1968

Title: Artillery Meteorological Team Chief Duties included the acquisition and reduction of data from radiosonde flights and the supervision of 5-7 team members.

Special training:

Additional skills include: scientific computer programing with courses in FORTRAN, assembly language programing, and numerical analysis; experience with atomic absorption spectrophotometry, polarography, and x-ray diffraction; and photography.

Thesis:

Oxidation-Leaching, and Enrichment Zones of a Porphyry Copper Deposit - a Mineralogic and Quantitative Chemical Study, University of Arizona, Tucson. ١

The contract under which I am currently employed, Assessment of Low- to Moderate-Temperature Geothermal Resources in Nevada (DOE/DGE Contract No. ET-78-S-08-1556) has provided me with the opportunity to familiarize myself with the location and nature of geothermal resources in Nevada. During field investigations I have measured parameters such as in situ pH and specific conductance, prepared samples for chemical analysis, performed field alkalinity titrations, and participated in the reduction and quality control of analytical data.

My academic background has emphasized chemical and physical chemical aspects of hydrothermal systems as well as practical experience with X-ray diffraction and whole rock geochemical analysis in altered rocks. I have used and am familiar with the computer programs used to convert input fluid chemistry to equilibrium chemical (mineralogical) assemblages. Familiarity with programming allows me to design software as needed to augment our study.

Applicable Meetings: GSA Penrose Conference, Heat Transport Processes in the Earth, Vail, CO, 1978.

Abstract submitted to GSA Cordilleran Section for April 1979 meeting:

Compositional change and chemical mass transport as a result of supergene processes at the San Xavier north porphyry copper deposit, Arizona.

THOMAS FLYNN

Born: May 15, 1948

Education:

ì

B.S. Geology - State University College at New Paltz - 1971,

New Paltz, New York

M.S. Geology - State University of New York at Binghamton - 1976,

Binghamton, New York

Experience:

May 1978present Nevada Bureau of Mines and Geology, University of Nevada, Reno. Title: Research Associate/Geologist. Duties include geologic assessment and evaluation of energy-related resources in Nevada. Presently working on update and revision of U.S. DOE Geotherm Data File for geothermal resource assessment in Nevada. Additional duties include preparation of research proposals and editing of geological research manuscripts prior to publication.

Feb. 1976-May 1978 Engineering Index, Inc., United Engineering Center, 345 East 47th Street, New York, New York 10017. Title: Editor. Duties included technical evaluation of energy-related literature and preparation of the literature for input to the U.S. DOE (Oak Ridge, Tennessee) Energy Data Base. Preparation included both abstract writing and descriptive indexing; indexing based on 20K controlled vocabulary.

Sept. 1972-May 1975 S.U.N.Y.-Binghamton, Hydrothermal Laboratory. Title: Research Assistant. Duties included operation and maintenance of advanced hydrothermal laboratory for an experimental investigation of high-temperature, high-pressure metamorphism of common sedimentary rocks. Master's thesis was derived from these investigations.

Membership:

American Geophysical Union

Bibliography

Flynn, T., (1977) Filter pressed partial metls: an experimental formation of migmatites, (abs.), American Geophysical Union, Spring Meeting, Washington, D.C.

Flynn, T., (1976) Filter pressed partial melts, an experimental formation of migmatites, (Master's Thesis).

Reports

Trexler, D., Flynn, T., and Koenig, B. A. (1978)

Assessment of Low- to Moderate-Temperature Geothermal Resources of Nevada, First and Second Quarter Progress Reports; Prepared for the U. S. Department of Energy, Division of Geothermal Energy, under Contract ET-78-S-08-1556.

APPENDIX B

Cost Estimate

EXPLANATION OF COSTS

All costs presented on Optional Form 60 are self explanatory, except the purchase of a vehicle and an explanation of the cost sharing provided by the Nevada Bureau of Mines and Geology.

The second year program costs are estimated on an 8% salary increase for professional staff members and a 10% inflationary increase for all other costs.

Vehicle Purchase

A four-wheeled drive pickup truck with camper is included as a capitol equipment purchase for the first year of the proposed two year program. As a result of a shortage of 4-WD vehicles at the University of Nevada all funded research projects are required to provide their own vehicles. Rental costs for a 4-WD vehicle from commercial rental companies @ \$500/mo., \$.23/mi. plus fuel at an estimated \$.75/gallon are presented in tabular form below:

Rental

Second year using same strategy as Option I

First year and allowing 10% increase total vehicle rental would be \$8980

Total rental for 4-WD vehicle (18 month) = \$17,140

Purchase

If a vehicle is purchased during first year and used for a similar amount of mileage and time throughout the duration of the proposed program a savings is indicated:

First year;

Purchase price	4-WD pickup w/camper	\$ 8800
Mileage charge	first year 12,000 @ \$.20	2400

Second year;

Monthly charge \$80/month for 9 months	720
Mileage 12,000 miles @ \$.22/mile	2640
Total vehicle cost for proposed two year study	\$14,560

As shown in the previous two examples (rental vs. purchase) a savings of more than \$2000 can be realized by purchase of a vehicle over the two year duration of the proposed investigation. If the Geothermal Assessment Programs extends beyond the anticipated two years, greater savings in field transportation costs will be realized.

Cost Sharing

Materials and services to be provided by the University of Nevada through the Nevada Bureau of Mines and Geology include clerical, secretarial, and drafting services, computer time, and X-ray analytical work. These materials and services represent 5% of the total cost of OPTION I and include:

Drafts person	½ person-month at \$1500/mo.	\$ 750
X-ray analysis		400
Secretarial/cle 2 person-mo	rical services nths at \$1044/mo.	2088
Computer time	50 hrs. at \$75/hr.	3750
Total		\$6988

CONTRACT PRICING PROPOSAL Office of Management and Budget Approval No. 29-RO184 (RESEARCH AND DEVELOPMENT) NO. OF PAGES PAGE NO. This form is for use when (i) submission of cost or pricing data (see FPR 1-3.807-3) is required and (ii) substitution for the Optional Form 39 is authorized by the contracting officer. 5 SUPPLIES AND/OR SERVICES TO BE PURNISHED NAME OF OFFICE Board of Regents Low- to Moderate-Temperature University of Nevada System Geothermal Assessment for Nevada: HOME OFFICE ADDRESS University of Nevada, Reno Site Specific Studies - OPTION I, Reno, Nevada 89557 Year 1 TOTAL AMOUNT OF PROPOSAL DIVISIONIS AND LOCATIONIS WHERE WORK IS TO BE PERFORMED GOV'T SOUCITATION NO. Nevada Bureau of Mines and Geology ,140,630 DETAIL DESCRIPTION OF COST ELEMENTS TOTAL RFFF9. EST COST (\$ 1. DRECT MATERIAL (Inmite on Exhibit A) EST COST ENCE: 10.000 . PURCHASED PARTS 0/1/1/19 S. SUSCONTRACTED ITEMS C. OTHER-(1) RAW MATERIAL water state of (2) YOUR STANDARD COMMERCIAL ITEMS (3) INTERDIVISIONAL TRANSFERS (At white them cost) TOTAL DIRECT MATERIAL 8. 18. 3. 14. 34. 14 ×XS best=) 2. MATERIAL OVERHEAD' (Rate ESTIMATED RATE/ 3. DIRECT LABOR (Sprify) HOURS HOUR COST (\$) 1000 1040 12.82 13.326 (Geologist) Trexler #11.00**6**,1073 2080 9.61 19.992 (Geologist) Flynn_ 19,992 (Geochemist) 2080 9.61Koenie 1754 PAS es Gerca (C. 16.00 (LOO) | 60 (LOO) (16.00) 74 (12 mm) TOTAL DIRECT LABOR 53,310 4. LABOR OVERHEAD (Specify Department or Cost Center) O.H. RATE X BASE = EST COST (\$) 8% 53,310 4,265 Retirement gramarian) Nevada Industiral Commission, Health Insurance, unemployment 4% 53,310 2,132 $6,3\overline{97}$ TOTAL LABOR OVERHEAD 5. SPECIAL TESTING (Including field work at Government installations) EST COST (S) CH (CO. NO. 16) 10000 TOTAL SPECIAL TESTING 8,8001 6. SPECIAL EQUIPMENT (If direct charge) (Itemize on Exhibit A) $\mathbf{E}\mathbf{x}_{-}$ est cost (s) 7. TRAVEL (If direct charge) (Give details on attached Schedule) 12. . TRANSPORTATION 5,455 . PER DIEM OR SUBSISTENCE 47 480 200 7,945 TOTAL TRAVEL 13,400 EST COST (S) B. CONSULTANTS (Identify - purpou-rate) ACT WITH OFFIXY #423447 To hall do TOTAL CONSULTANTS 22,806 P. OTHER DIRECT COSTS (Itemite on Exhibit .4) Ex. A TOTAL DIRECT COST AND OVERHEAD 104,713 35,917 11. GENERAL AND ADMINISTRATIVE EXPENSE (Rute 34.3 % of cost element Nos. 3, 4, 6, 719 12. ROYALTIES . 140,630 TOTAL ESTIMATED COST 13. 14. PER OR PROFIT TOTAL ESTIMATED COST AND FEE OR PROFIT 13.

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PLOME OF 11		· ·	THE OF SUPPLIES			
		EXHIBIT A-SUPPORTING SCHEDULE (Specify. If more space is needed, u	se reverse)			
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9	Eq	uipment rental				
		Rock coring equip. rental · 10 days @ \$30/day		300		
		Vehicle mounted drill 2 wks. @ \$300/wk.		600		
			OTAL	900		
9	Eq	uipment ·		700		
		Portable drilling equipment		700		
		Walkie talkies 3 @ \$100 20 thermistor probes @ \$48 ea.		300 960		
		2 digital thermometers @ \$300 ea.		600		
		PVC pipe 100 ft. @ 20¢/ft.				
				20		
		2 Brunton compasses @ \$100	OTAL	200		
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7	NO	n-expendable supplies		548		
		Existing airphotos 200 @ \$4 ea.		800		
		Topo geophysical, geological maps		175		
		Low sun-angle photography: Big Smoky Valley		3,276		
		. Carson City		1,966		
		. TO	TAL	6,765		
9	Ex	pendable supplies				
		Film, flagging, stakes, notebooks, batteries, etc.		500		
		Drafting supplies		· 250		
		Sample bottles, chemicals, glassware		436		
		TOT	AL	1,186		
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	_	PRIME CONTRACT OR SUBCONTRACT WITHIN THE PAST TWELVE MONTHS?				
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HAME AND ADDRESS OF REVIEWING OFFICE AND INDIVIDUAL TELEPHONE NUMBER/EXTENSION						
B. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS PROPOSED CONTRACT?						
YES NO (If yes, identify on reverse or separate page)						
III. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM. THIS PROPOSED CONTRACT? YES NO (1) yes, identify.): ADVANCE PAYMENTS PROGRESS PAYMENTS OR GUARANTEED LOANS						
IN. DO YOU HOW HOLD ANY CONTRACT (Or, do you have any independently financed (IRGD) projects) FOR THE SAME OR SIMILAR WORK CALLED FOR BY THIS PROPOSED CONTRACT?						
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	Sulfate Isotopes	5	60	Isochron Lab.	300		
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This proposal is submitted for use in connection with and in response to	• (Describe RIP. etc.)		•			
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Heavy duty suspension						
Extra fuel tank						
Power steering						
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Rear barden bumper						
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YES NO (If no, expluse on recerse or separate page)						

This proposal is submitted for use in connection with and in response to (Duttibe RIP, etc.) Low- to Moderate-Temperature Geothermal Assessment for Nevada: Site Specific Studies - OPTION I, Year 1					
	and reflects our best estimates as of this date, in accordance with the Instructions to Offerers and the Foutnotes which follow.				
John E. Nellor					
Graduate	Dean and Research Coordinator	lllov :			
HAME OF FIRM	University of Nevada System	DATE OF SUMIS	3, 1979		
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-	Map preparation Thin sections 15 @ \$5.00		75		
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CONTRACT PRICING PROPOSAL

(RESEARCH AND DEVELOPMENT)

Office of Management and Budget Approval No. 29-RO184

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This form is for use when (i) submission of cost or pricing data (see FPR 1-3.807-3) is required and (ii) substitution for the Optional Form 39 is authorised by the contracting officer.					OF PAGES 5
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University of Nevada	Geothermal Assessment for Nevada:				
HOME OFFICE ADDRESS University of Nevada, Reno Site Specific Studies - OPTION					
Reno, NEvada 89557			voir Confi		
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Nevada Bureau of Mines and Geology	205,585		10011	JOGGI ATION NO	•
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Flynn (Geologist)	2080	9.61	19,992		
Koenig (Geochemist)	2080	9.61	19,992	(2000 CO	
Unnamed (Geologist)	1040	9.61	9,996	100000000000000000000000000000000000000	
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7. TRAVEL (If direct charge) (Give details on attached Schedule)			EST COST (S)	8,800	Ex. A
d. TRANSPORTATION			6,055	200 A	
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11. GENERAL AND ADMINISTRATIVE EXPENSE (Rule 34, 3 % of cost element.	Nov. 3,4,6,73	<u>'9</u>		52,506	
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OPTIONAL FORM 60 October 1971 General Services Administration FPR 1-16.806 3060-101

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TYPED NAME AND	nite	SIGNATURE	
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MARIE TO SMALM	•	DAIR OF	SUBMISSION
	EXHIBIT A-SUPPORTING SCHEDULE (Specify. If more space is needed, use res	erse)
COST EL NO.	ITEM DESCRIPTION		EST COST (S)
9 Equ	ipment rental		
	Rock coring equip. rental 10 day	ys @ \$30/day	300
· ·	Vehicle mounted drill 2 wks @ \$		600
		TOTAL	900
9 Equ	ipment		
	Portable drilling equipment		700
	Walkie talkies 3 @ \$100		300
	20 thermistor probes @ \$48 ea.		960
	2 digital thermometers @ \$300 ea		600
	PVC pipe 100 ft. @ 20¢/ft.		20
	2 Brunton compasses @ \$100		200
		TOTAL	2,780
9 Non	expendable supplies		
	Mylar base maps 16 @ \$34.25		548
	Existing airphotos 200 @ \$4 ea.		800
	Topo geophysical, geological maps Low sun-angle photography: Big S		175
		on City	3,276 1,966
	, darse	. TOTAL	6,765
9 5	3-11	. IOIM	0,703
Exp	endable supplies	hattania	500
	Film, flagging, stakes, notebooks Drafting supplies	, batteries, etc.	500
	Sample bottles, chemicals, glassw	227A	250
	Dample bottles, chemicals, glassw	TOTAL	436 1,186
		TOTAL	1,100
		PAGE TOTAL	11,631
I. HAS ANY EXEC GOVERNMENT	UTIVE AGENCY OF THE UNITED STATES GOVERNMENT PERFORMED PRIME CONTRACT OR SUBCONTRACT WITHIN THE PAST TWELVE	ANY REVIEW OF YOUR ACCOUNTS OR RECORDS IN COMMISS	
YES [NO (If yes, identify below.)		
NAME AND ADDRE	SS OF REVIEWING OFFICE AND INDIVIDUAL	TELEPHONE NUMBER	s/extension
H. WHL YOU REOL	IIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMAN	CE OF THIS PROPOSED CONTRACT?	
T YES T	NO (If yes, identify on reverse or separate page)		
III. DO YOU REQUI	RE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPO		
YES	NO (If yes, identify.): ADVANCE PAYMENTS P		
IV. DO YOU HOW PROPOSED CO	HOLD ANY CONTRACT (Or. do you have uny independently with act?	nnunced (IRGD) projects) FOR THE SAME OR SIMILAL	1 WORK CALLED FOR BY THIS
	NO (If yes, identify.):		
	T SUMMARY CONFORM WITH THE COST PRINCIPLES SET FORTH IN A	GENCY REGULATIONS?	
Ves [NO (If no, explain on recerse or separate page)		

This proposal is submitted for use in connection with and in response to [Describe RIP, etc.]					
			•		
	best estimates as of this date, in accor-	dance with the Instru T	sceiuns to Offerors an	d the Footnotes which follow.	
DHA SMAN DESTE	1116	į	PIONATURE		
					·
HAME OF FIRM				DATE OF SUB	MISSION
	EXHIBIT A—SUPPORTING	G SCHEDULE (S)	pecify. If more sp	bace is needed, use revers	()
COST EL NO.		ITEM DESCRIPTION	See footnote 3)		EST COST (S)
9 Che	nical analyses				
	Anal. Type	# Samples	\$/Anal.	Lab.	
Whole	rock samples				
	Major-Minor	12	125	Teledyne	1,500
	Sulfide Isotopes	5	40	Isochron Lab.	200
	Sulfur Isotopes	5	60	Isochron Lab.	300
				TOTAL	2,000
Geothe	rmal fluids				
	Major-Minor	40	125	Amtec	5,000
	O Isotopes	10	75	Hebrew Univ.	750
	H Isotopes	10	75	Hebrew Univ.	750
	S Isotopes .	10	.60	Isochron Lab.	600
			•	TOTAL	7,100
Travel	10.000	3.4 AA/ :			
7a	Mileage 12,000 mi. (φ \$.20/m1.			2,400
/a	Air transportation				3,055
7b	Per Diem 227 days (a \$35/day		•	7.945
				TOTAL	13,400
				pr : 1	
		tigan anna an de l'article de l			•
I, HAS ANY EXEC GOVERNMENT	UTIVE AGENCY OF THE UNITED STATES GO PRIME CONTRACT OR SUBCONTRACT WITH	VERNMENT PERFORMED IN THE PAST TWELVE M	SLOY TO WILVER YHA SCHTHO	ACCOUNTS OR RECORDS IN CONF	RECTION WITH ANY OTHER
vis	NO (If yes, identify below.)				
NAME AND ADORE	55 OF REVIEWING OFFICE AND INDIVIDUAL			TELEPHONE HUMBER/EX	TENSION
	THE THE OF THE COURT WEST BROWN	TV IN THE BERES	E OF THE ADDROSS S	201141613	
	UIRE THE USE OF ANY GOVERNMENT PROPER		COF THIS PROPOSED CO	JNIKACIY	
	NO (If yes, identify on reverse or set government contract financing to		IIO cours es		
	THE GOVERNMENT CONTRACT FINANCING TO			[] GUARANTEED LOANS	
					004 6.1110 102 2.112
N. DO YOU HOW	HOLD ANY CONTRACT (Or, do you hard HIRACT?	i any independently fi	nunced (IRGD) proje	COLD FOR THE SAME OR SIMILAR W	ORK CALLED FOR BY THIS
785	HO (If yes, identify.):	Contract to the contract to			
	IT SUMMARY CONFORM WITH THE COST PRINT HO (If Bo. expluin on receive or sep-		SENCY #EGULATIONS?		
[] 463 [JAU (I) BO. EXPLUIT ON PETERS OF 109.	ruse page)			

This proposal i	submitted for use in connection with and in response t	o (Deurske RIP, m.)		•
		•		
THE BANK DITT	best estimates as of this date, In accordance with the Institute	SIGNATURE	Inotes which follow.	,
ł				•
HIME OF FIRM	**.		DATE OF SULM	HOUZE
	EXHIBIT A-SUPPORTING SCHEDULE (.		reeded, use reverse	· /
COST EL NO.	ITEM DESCRIPTION	(See Sootnote 3)		EST COST (S)
6 Spec	al equipment			
	3/4 ton SWB 4 WD pickup truck	with following:		
l	Heavy duty suspension			
	Extra fuel tank			
	Power steering A/C		•	
	AM Radio			
	Rear barden bumper			
	4 speed transmission			
	Locking hubs			
	Phone quote Jones-We	est Ford Reno 1 Mar	79	8,000
	Camper for above vehicle	}		800
	•		TOTAL	8,800
		•		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	•			
		, ,		•
I. HAS ANT EXEC	UTIVE AGENCY OF THE UNITED STATES GOVERNMENT PERFORMED PRIME CONTRACT OR SUPCONTRACT WITHIN THE PAST TWELVE	D ANY REVIEW OF YOUR ACCOUNTS MONTHS?	OR RECORDS IN CONNE	CTION WITH ANY OTHER
	NO (If yes, identify below.)			
HAME AND ADOSE	S OF REVIEWING OFFICE AND INDIVIDUAL		TELEPHONE HUMBER/EXTE	HSIOH
H. WHE YOU K.O.	IRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMAN	ICE OF THIS PROPOSED CONTRACT?		
	NO (If yes, identify on reverse or separate page)			
III DO TOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? TES NO (1/ yes, identife) D ADVANCE PAYMENTS PROGRESS FAYMENTS OF GUARANTEED LOANS				
N. DO YOU HOW	M. DO TOU HOW HOLD ANT CONTRACT (Or. do you have way indifferdially financed (IRGD) projectly FOR THE SAME OR SIMILAR WORK CALLED FOR BY THIS proposed Contract?			
	NO (If yes, identify).			
V (K)(5 1m3 (O)	SUMMARY CONTORM WITH THE COST PRINCIPLES SET FORTH IN A	AGENCY REGULATIONS?	**************************************	
	NO (If so, explain on reverse or reparate page)			

			
This proposal	is submitted for use in connection with and in response to (Describe RFP, etc.)		•
	•		
	best estimates as of this date, in accordance with the Instructions to Offerors and the Foutnot	vs which follow.	
TYPED HAME AND	TITLE SIGNATURE .		
HAME OF FIRM	,	DATE OF SUBM	SSION
	EVIDER A CURRENT COURSE (C)	<u> </u>	
	EXHIBIT A—SUPPORTING SCHEDULE (Specify. If more space is need	led, use reverse,	
COST EL NO.	ITEM DESCRIPTION (See footnote 5)		EST COST (5)
	OPTION II		
9 Dri	lling costs		22 000
····	2 holes total footage 1300 @ \$26/ft.	TOTA T	33,800
		TOTAL	33,800
0 61			<u> </u>
9 Che	mical analyses		1 050
	Major-Minor 10 @ \$125		1,250
	O Isotopes 2 @ \$75		150
	H Isotopes 2 @ \$75		150
	S Isotopes 2 @ \$60		120
		TOTAL	1,670
9 Mis	cellaneous		
	Sample bags 500 @ \$15/100		75
	Thin sections 30 @ \$5.00		150
		TOTAL	225
Travel	•		
7a	Mileage 3000 mi. @ \$.20/mi.		600
7b	Per diem 25 days @ \$35/day		875.
		TOTAL	1,475
	•		
I. HAS ANY EXEC	UTIVE AGENCY OF THE UNITED STATES GOVERNMENT PERFORMED ANY REVIEW OF YOUR ACCOUNTS OR PRIME CONTRACT OR SUBCONTRACT WITHIN THE PAST TWELVE MONTHS?	RECORDS IN CONNEC	ESHTO YHA HTIW HOIT
TYES [NO (If yes, identify below.)		
NAME AND ADDRE		PHONE NUMBER/EXTE	NSION
H. WILL YOU REQ	JIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS PROPOSED CONTRACT?		
Yes [NO (If yes, identify on reverse or separate page)		
	RE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? NO (1/ yes, identify.): ADVANCE PAYMENTS PROGRESS PAYMENTS OR GUARANTE	ED LOANS	
	HOLD ANY CONTRACT (Ur. do you have any independently financed (IRGD) projects) FOR THE SA		K CALLED FOR BY THIS
Yes [NO (If yes, identify.):		
V DOES THIS CO	IT SUMMARY CONFORM WITH THE COST PRINCIPLES SET FORTH IN AGENCY REGULATIONS?		ناه الله الله الله الله الله الله الله ا
Yes [NO (If no, explain on reverse or separate page)		

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This proposal is submitted for use in connection with and in response to (Describe RIP, etc.)					
	Moderate-Temperature Geothermal Assessment for Nev	ada: Site Spe	cific		
Studies - OPTION II, Year 1 (Reservoir Confirmation)					
and reflects out	best estimates as of this date, in accordance with the Instructions to Offrors and the Foot	noin which follow.			
TYPED HAME AND	John E. Nellor				
	Late Dean and Research Coordinator	111/Vm1	ľ		
MRIT TO SMAN	University of Nevada System	DATE OF SUBMIS	3		
	University of Nevada, Reno	l	3, 1979		
	EXHIBIT A—SUPPORTING SCHEDULE (Specify. If more space is n	eeded, use reverse)			
COST EL NO.	ITEM DESCRIPTION (See footnote 3)	····	EST COST (S)		
9 Misc	11aneous				
	Map preparation .		500		
	Thin sections 15 @ \$5.00		75		
	Publication costs (journal page costs)		600		
	Communication (postage, telephone, shipping)	•	900		
		TOTAL	2,075		
	•				
	ITIVE AGENCY OF THE UNITED STATES GOVERNMENT PERFORMED. ANY REVIEW OF YOUR ACCOUNTS PRIME CONTRACT OR SURCONTRACT WITHIN THE PAST TWEEVE MONTHS?	OR RECORDS IN CONNEC	SENTO PHA HTIM HOIL		
	NO (If yes, identify below.)				
		TELEPHONE NUMBER/EXTEN			
Dept	. HEW, Wallace Chan	(415) 556-83	343		
H. WILL YOU REOU	IRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS PROPOSED CONTRACT?				
Tres X	NO (If yes, identify on reverse or separate page)				
III DO YOU REQUIE	E GOVERNMENT CONTRACT FINANCING TO PERFORM. THIS PROPOSED CONTRACT?				
	NO (If yes, identify): ADVANCE PAYMENTS PROGRESS PAYMENTS OR GUAR	ANTEED LOANS			
N. DO YOU NOW HOLD ANY CONTRACT (Ur, do you have any independently financed (IRGD) projects) FOR THE SAME OR SIMILAR WORK CALLED FOR BY THIS PROPOSED CONTRACT?					
	NO (If yes, identify.):		Reference		
	SUMMARY CONFORM WITH THE COST PRINCIPLES SET FORTH IN AGENCY REGULATIONS?				
	NO (If so, explain on reserve or separate page)		5		
[] 1.5 [] 1.6 [1, 5.1.17]					

CONTRACT PRICING PROPOSAL Office of Management and Budget Approval No. 29-RO184 (RESEARCH AND DEVELOPMENT) NO. OF PAGES This form is for use when (i) submission of cost or pricing data (see FPR 1-3.807-3) is required and (ii) substitution for the Optional Form 39 is authorized by the contracting officer. SUPPLIES AND/OR SERVICES TO BE PURNISHED HAME OF OFFICE Board of Regents University of Nevada System Low- to Moderate-Temperature Geothermal Assessment for Nevada: University of Nevada, Reno Site Specific Studies OPTION I, Reno, NV 89557 Year 2 DIVISION(S) AND LOCATION(S) WHERE WORK IS TO M PERFORMED TOTAL AMOUNT OF PROPOSAL GOV'T SOLICITATION NO. Nevada Bureau of Mines and Geology 136,469 DETAIL DESCRIPTION OF COST ELEMENTS TOTAL REFER. EST COST (S) 1. DRECT MATERIAL (Itemize on Exhibit A) EST COST ENCE: 10.00 . PURCHASED PARTS A. SUSCONTRACTED ITEMS 200 33700 c. OTHER-(1) RAW MATERIAL (2) YOUR STANDARD COMMERCIAL ITEMS (3) INTERDIVISIONAL TRANSFERS (At order than cost) TOTAL DIRECT MATERIAL MH=) 2. MATERIAL OVERHEAD! (Rate 2.13 ESTIMATED RATE/ EST 3. DIRECT LABOR (Sprift) COST (\$) HOURS HOUR 14,214 (Geologist, P.I.) 1040 13.67 10 mm 1 0 0 Trexler 2080 10.25 21,325 (Geologist) Flynn_ 2080 21,325 10.25 (Geochemist) Koenig 11.00 per 10.00 3.6 52 X 18 77 TOTAL DIRECT LABOR (30.000 M 56,864 O.H. RATE EST COST (\$) 4. LABOR OVERHEAD (Specify Department or Cost Center) X BASE = 1282888 56,864 4,549 8% Retirement (Salah Kara) Nevada Industrial Insur. Health 4% 2,275 56,864 and unemployment TOTAL LABOR OVERHEAD 6,824 3. SPECIAL TESTING (Including field work at Government installations) EST COST (8) 700 Page 1, 1999 698 XXX TOTAL SPECIAL TESTING 6. SPECIAL EQUIPMENT (If direct charge) (Itemize on Exhibit A) EST COST (S) 7. TRAVEL (If direct charge) (Give details on attached Schedule) 7,715 a. TRANSPORTATION 7,97513 M. N. S. PER DIEM OR SUBSISTENCE TOTAL TRAVEL 15,690 Ex. Α EST COST (5) 8. CONSULTANTS (Identify-purpose-rate) all street 13 7 X 7 22.87%XY TOTAL CONSULTANTS Ex. A P. OTHER DIRECT COSTS (Itemite on Exhibit A) 22,237 TOTAL DIRECT COST AND OVERHEAD 101.615 11. GENERAL AND ADMINISTRATIVE EXPENSE (Rate 34.3 % of cost element Nos. 3,4,7,9)" 34,854 12. ROYALTIES " TOTAL ESTIMATED COST 136,469

OPTIONAL FORM 60 October 1971 General Services Administration FPR 1-16,806 3060-101 CONTROL OF THE PROPERTY OF THE

TOTAL ESTIMATED COST AND FEE OR PROFIT

14. PER OR PROPIT

This proposal is submitted for use in connection with and in response to (Describe RFP, etc.)					
and reflects our best estimates as of this date, in accordance with the Instructions to Offerors and the Enotnotes which follow.					
TYPED HAME AND	11126	3107	INIUHE		
HAM OF FIRM				DATE OF SUBMIS	SION
	EXHIBIT A-SUPPORTING	SCHEDULE (Speci	ly. If more space	is needed, use reverse)	
COST EL NO.		ITEM DESCRIPTION (See	footnote 5)		EST COST (\$)
q	Chemical Analyses			·	
	Anal. Type	∦ Samples	\$/Anal.	Lab.	
Whole	Rock Samples				
	Maj-Minor	12	137.50	Teledyne	1,650
	Sulfide Isotopes	5	44.00	Lsochron	220
	Sulfate Isotopes	5	66.00	Isochron	330
				TOTAL	2,200
Geotha	rmal Fluids				
	Maj-Minor	40	137.50	Amtec	5,500
	0 Isotopes	10	82,50	Hebrew Univ.	825
	H Isotopes	10	82.50	Hebrew Univ.	825
	S Isotopes .	10	. 82,50	Isochron	825
				TOTAL	7,975
7a					
Travel	4-WD vehicle (UNR)	12 mos. @ \$80/1	mo.	· · · · · · · · · · · · · · · · · · ·	960
	15,000 miles @ \$.22/	mile			3,300
	Air fares			-	3,455
7b					
Per diem	227 days @ \$35/day			mom + T	7,975 15,690
				TOTAL	15,690
I, HAS ANY EXEC GOVERNMENT	UTIVE AGENCY OF THE UNITED STATES GO- PRIME CONTRACT OR SUBCONTRACT WITH	VERNMENT PERFORMED ANY IN THE PAST TWELVE MONT	REVIEW OF YOUR ACCO HS?	DUNTS OR RECORDS IN CONNEC	TION WITH ANY OTHER
	NO (If yes, identify below.)				
NAME AND ADDRESS OF REVIEWING OFFICE AND INDIVIDUAL TELEPHONE NUMBER/EXTENSION					
H. WILL YOU REQU	JIRE THE USE OF ANY GOVERNMENT PROPER	TY IN THE PERFORMANCE OF	THIS PROPOSED CONTRA	ACT?	
☐ 715	NO III yes, identify on reverse or sep	urute puge)			
HI DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT?					
	NO (If yes, identify): ADVANC			GUARANTED LOANS	
N. DO YOU HOW	HOLD ANT CONTRACT (Or, do you have MIRACE?	uny independently financ	ed (IRGD) projects)	FOR THE SAME OR SIMILAR WOR	K CALLED FOR BY THIS
L.,, L.,	NO (If yes, identify.):				
	I SUMMARY CONFORM WITH THE COST PRIN		Y REGULATIONS?		
L ves [NO (11 == , explain on receive or cep-	irait page)			

This proposal is submitted for use in connection with and in response to (Describe RIP, etc.)				
	•			
	best estimates as of this date, in accordance with the Instructions to Offerors and the Foutnote	n which follow,		
TYPED HAM AND	TITLE			
HAME OF FIRM	•	DATE OF SUBMIS	NON	
	EXHIBIT A—SUPPORTING SCHEDULE (Specify. If more space is need	led, use reverse)		
COST EL NO.	ITEM DESCRIPTION (See foothole 3)	· · · · · · · · · · · · · · · · · · ·	EST COST (5)	
9				
Equip	ment Rental			
	Rock coring equipment 10 days @ \$33/day		330	
	Vehicle mounted drill 2 wks. @ \$330/wk.		660	
		TOTAL	990	
9				
Equip	mant			
Equip	2 thermistor probes @ \$53.00		106	
	PVC pipe 100 ft. @ \$.22/ft.		106	
		TOTAL	128	
		TOTAL	120	
9				
	kpendable equipment			
1011 0	Mylar topo bases		500	
	Existing airphotos 200 photos @ \$4.40 ea.		880	
	Topo, geophysical and geological maps		193	
	Low sun-angle photography: Site 1		3,500	
	Site 2		2,300	
		TOTAL	7,373	
9 Exp	endable supplies			
	Film, flagging, stake, notebooks, batteries, etc.		550	
	Drafting supplies		275	
	Sample bottles, chemicals, glassware		463	
		TOTAL	1,288	
I. HAS ANY EXEC GOVERNMENT	UTIVE AGENCY OF THE UNITED STATES GOVERNMENT PERFORMED ANY REVIEW OF YOUR ACCOUNTS OR PRIME CONTRACT OR SUBCONTRACT WITHIN THE FAST TWELVE MONTHS?	ECORDS IN CONNECT	SHIO YAA HIIW HO!	
YES	NO (If yes, identify below.)			
NAME AND ADDRES	SS OF REVIEWING OFFICE AND INDIVIDUAL TELE	HOTEN STANDER SHORE	SION	
N WILL YOU RECL	HER THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS PROPOSED CONTRACT?			
WEL 100 M.S.	NO (1/ yes, identify on receive or separate page)			
	LE GOVERNMENT CONTRACT FINANCING TO PERFORM. THIS PROPOSED CONTRACT?			
	NO (1/ yes, identify.): ADVANCE PAYMENTS PROGRESS PAYMENTS OR GUARANTE	ED LOANS		
N. DO YOU HOW	IV. DO YOU NOW HOLD ANY CONTRACT (Or, do you have any independently financed (IRGD) projects) FOR THE SAME OR SIMILAR WORK CALLED FOR BY THIS PROPOSED CONTRACT?			
☐ vii] NO (If yes, identify.):			
	SUMMARY CONFORM WITH THE COST PRINCIPLES SET FORTH IN AGENCY REGULATIONS?			
[YES [NO (If to, explain on reverse or reparate page)			

Low- to Moderate-Temperature Geothermal Assessment for Nevada: Site Specific					
I Children OPTION I Voor 7					
	Studies, OPTION I, Year 2				
and reflects our best estimates as of this date, in accordance with the Instructions to Offerers and the Foundates which follow.					
John E. Nellor					
Graduate Dean, Research Coordinator	i				
To a constitution					
University of Nevada System	University of Nevada System				
University of Nevada, Reno March 3, 1979 EXHIBIT A—SUPPORTING SCHEDULE (Specify. If more space is needed, use reverse)					
COST EL NO. STEM DESCRIPTION (See footnote 5) EST COST	(5)				
9 Map preparation 550	-				
Thin sections 15 @ \$5.50 83					
Publication costs (Journal page costs) 660					
Communication (postage, telephone, shipping) 990					
. TOTAL 2,283					
2,205					
1. HAS ANY EXECUTIVE AGENCY OF THE UNITED STATES GOVERNMENT PERFORMED ANY REVIEW OF YOUR ACCOUNTS OR RECORDS IN CONNECTION WITH ANY C GOVERNMENT FRIME CONTRACT OR SUBCONTRACT WITHIN THE FAST TWELVE MONTHS?	THER				
[X] YES NO (If yes, identify below.)	-				
NUME AND ADDRESS OF REVIEWING OFFICE AND INDIVIDUAL TELEPHONE NUMBER/EXTENSION					
Department HEW, Wallace Chan (415) 556-8343					
N. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS PROPOSED CONTRACT?					
TES ANO (If yes, identify on reverse or separate page)					
III DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM. THIS PROPOSED CONTRACT?					
TYES X NO (If yes, identify.): ADVANCE PAYMENTS PROGRESS PAYMENTS OR GUARANTEED LOANS					
IV. DO YOU NOW HOLD ANY CONTRACT (Ur, do you have any independently financed (IR&D) projects) FOR THE SAME OR SIMILAR WORK CALLED FOR BY THIS PROPOSED CONTRACT?					
TYES X NO (If yes, identify.):					

CONTRACT PRICING PROPOSAL

CONTRACT PRICING PROP	Office of	l Managemer	nt and	Budge		
, ' (RESEARCH AND DEVELOPME	NT)		Арр	roval No. 2	9-RO1	84
This form is for use when (i) submission of cost or pricing data (se (ii) substitution for the Optional Form 39 is authorized by	by the contracting	g officer.	Ì	1 . NO.	OF FACE 5	\$
NAME OF CHIEFOR Board of Regents	TOW-	to Moder	u rumishio ate-Temper	rature		
University of Nevada System			sessment :		da.	
Howe office Appealss University of Nevada, Reno	Georgi		Studies (-	
Reno, NV 89557		•	Studies (JELION 1.	L, -	
•	Year					
DIVISION(S) AND LOCATION(S) WHERE WORK IS TO BE PERFORMED	TOTAL AMOUN	IT OF PROPOSAL	GOV'T 1	SOLICITATION NO		
Nevada Bureau of Mines and Geology	208,7	04	<u></u>			
DETAIL DESCRIPTION	ON OF COST	ELEMENTS		·	·	
1. DIRECT MATERIAL (Itemize on Exhibit A)			EST COST (\$	1 531 6031		FER-
a. PURCHASED PARTS						
A. SUBCONTRACTED ITEMS			<u> </u>	7,000	1	
c. OTHER—(1) RAW MATERIAL						
(2) YOUR STANDARD COMMERCIAL ITEMS					1	
(3) INTERDIVISIONAL TRANSFERS (At order thum cost)					4	
	TAL DIRECT .MA	ATERIAL		<u> </u>	ļ	
2. MATERIAL OVERHEAD's (Rate XXS MHZ)			T]	
3. DIRECT LABOR (Sprify)	ESTIMATED HOURS	RATE/ HOUR	cost (s)			
Trexler (Geologist, P.I.)	1040	13.67	14,214	10000 C		
Flynn (Geologist)	2080	10.25	21,325	\$ 10 m	1	
Koenig (Geochemist)	2080	10.25	21,325			
Research Associate (unnamed)	1040	10.51	10,932	11.00 m 10.00 m		
	L			3458155		
		·		712 9 9 1 CH		
TOTAL DIRECT LABOR	100 100 100 100 100 100 100 100 100 100	•		67,796	Ī	
4. LAFOR OVERHEAD (Specify Department or Cost Center)1	O.H. RATE	X BASE =	EST COST (\$)	43444		
Retirement	8%	67,796	5,424	(15) kg/(4) (5).		
Nevada Industrial Commission, Health	<u> </u>			4 0 M F		
Insurance, unemployment	4%	67,796	2,712			
TOTAL LABOR OVERHEAD				8,136	<u> </u>	
S. SPECIAL TESTING (Including field work at Government installations)			est cost (s)	**************************************		
				12 (Sept. 1992)		
				V-0.87.		
	TAL SPECIAL TI	ESTING				
6. SPECIAL EQUIPMENT (If direct charge) (Itemize on Exhibit A)		1		5202000		
7. TRAVEL (If direct charge) (Give details on uttached Schedule)			est cost (s)	Maria Maria		
a. TRANSPORTATION			8,595			
6. PER DIEM OR SUBSISTENCE	70T41 T	P 41'E1	8,850	1- //5		
CONCUERANTS ALL WALLS AND THE	TOTAL T	NA. LL	EST COST (S)	17,445	Ex.	A
1. CONSULTANTS (Identify-phrpose-rale)			231 (031 73)			
				0.87		
		-		1777 - 1 2425 - 1744 - 1		
7	TOTAL CONSULT	TANTS	C 12741	119 Per A. 200 Per B. 1999		
OTHER DIRECT COSTS (liemite on Exhibit A)				62 '024	Ex.	Δ
	TOTAL DIRECT	COST AND OV	ERHEAD	_62,024	<u> </u>	- 27
1. GENERAL AND ADMINISTRATIVE EXPENSE (Rule 34.3 % of coil element N				155,401		
2. ROYALTIES *		,		-53,303		
3.	701	TAL ESTIMATE	D COST	208,704	The decimal of the second	<u> </u>
4. FEE OR PROFIT	***************************************					
S. TOTAL ES	PROFIT					

OPTIONAL FORM 60 October 1971 General Services Administration FPR 1-16.806 3060-101

This proposal is submitted for use in connection with and in tesponse to (Describe RFP, etc.)					
•					
	best estimates as of this date, in accord	lance with the lower	uctions to Offerors and the	Fourtness which fullow.	•
TYPED HAME AND			SIGNATURE	radinotes which tonou.	
HAME OF FIRM		•		DATE OF SUBMI	SSION
	EXHIBIT A-SUPPORTING			is needed, use reverse,	
COST EL NO.		ITEM DESCRIPTION	See sootnote 5)		EST COST (S)
9	Chemical Analyses	# 0 - 1	A / A 1		
Y 77 . 1 .	Anal. Type	# Samples	\$/Ana1.	Lab.	
Whole	Rock Samples	12	137.50	m 1 1	1.650
	Maj-Minor Sulfide Isotopes	5	137.50 44.00	Teledyne	1,650
	Sulfate Isotopes	<u>5</u>	66.00	Isochron	220
	Sullace Isocopes		00.00	Isochron TOTAL	330
				IOIAL	2,200
	7 771 3				
Geothe	rmal Fluids		127 50		
	Maj-Minor	40	137.50	Amtec	5,500
	O Isotopes H Isotopes	10 10	82,50 82,50	Hebrew Univ.	825
	S Isotopes .	10	. 82.50	Hebrew Univ.	825
	b isotopes .	10	. 02.30	Isochron TOTAL	825
				TOTAL	7,975
7a					
Travel	4-WD vehicle (UNR)	12 mos. @ \$8	0/mo.		960
114461	15,000 miles @ \$.22/1		07 1110 :		3,300
	Air fares				3,455
					3,433
7b					
Per diem	227 days @ \$35/day				
rer drem	227 days (- 95)/day			TOTAL	7,975 15.690
I, HAS ANY EXEC	UTIVE AGENCY OF THE UNITED STATES GOV	PERHMENT PERFORMED	ANY REVIEW OF YOUR ACCO	UNIS OR RECORDS IN CONNEC	TION WITH ANY OTHER
COVERHMENT	FRIME CONTRACT OR SUBCONTRACT WITH	IN THE PAST TWELVE M	ONTHS?		
TES [NO (If yes, identify below.)				
NAME AND ADDRES	SS OF REVIEWING OFFICE AND INDIVIDUAL			TELEPHONE NUMBER/EXTE	HSIOH
H. WILL YOU REQU	IRE THE USE OF ANY GOVERNMENT PROPERT	Y IN THE PERFORMANCE	E OF THIS PROPOSED CONTRAC	C17	
Tes [NO (If yes, identify on reverse or sep.	urute puge)			
III DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM. THIS PROPOSED CONTRACT?					
] HO (If yes, identify.): 🔲 ADVANC				
	IV. DO YOU NOW HOLD ANY CONTRACT (Or, do you have any independently financed (IRGD) projects) FOR THE SAME OR SIMILAR WORK CALLED FOR BY THIS PROPOSED CONTRACT?				
	NO (If yes, identify.):				
	I SUMMARY CONFORM WITH THE COST PRINC		SENCY REGULATIONS?		
YES [YES NO (If no, explain on recers or separate page)				

Consider Strong Company of the

This proposal is submitted for use in connection with and in response to (Describe RFP, etc.)						
	best estimates as of this date, in accordance with the Inst		notes which follow.			
TYPED HAME AND	TITLE	SIGNATURE				
				•		
			DATE OF SUBM	VS SLOPA		
MARIT TO EMAN	DATE OF SOL	11337014				
	EXHIBIT A-SUPPORTING SCHEDULE (Shecify If more shace is n	anded we reverse	1		
COST EL NO.		(See footnote 3)	eeded, use reterse	EST COST (S)		
COST EL TO.	nem beseki/110/4	1 (317)00111011))		137 2031 737		
9						
	ment Rental		**************************************			
. Lquip	Rock coring equipment 10 days @	33/day		330		
	Vehicle mounted drill 2 wks.		•	660		
			TOTAL	990		
9						
Equip	ment					
	2 thermistor probes @ \$53.00			106		
	PVC pipe 100 ft. @ \$.22/ft.			22		
			TOTAL	128		
			and the second s			
9						
Non-e	kpendable equipment					
	Mylar topo bases			500		
		otos @ \$4.40 ea.		880		
	Topo, geophysical and geological Low sun-angle photography: Site			193		
	Site			3,500		
	DILC	4	TOTAL	2,300 7,373		
9 Exp	endable supplies		TOTAL	1,373		
<u> </u>	Film, flagging, stake, notebooks	hatteries ota		550		
	Drafting supplies	, bacteries, etc.		550 275		
	Sample bottles, chemicals, glasso	ware		463		
			TOTAL	1,288		
I, HAS ANY EXEC	UTIVE AGENCY OF THE UNITED STATES GOVERNMENT PERFORME	D ANY REVIEW OF YOUR ACCOUNTS				
COVERNMENT	PRIME CONTRACT OR SUBCONTRACT WITHIN THE PAST TWELVE	MONTHS?				
	NO (If yes, identify below.)					
NAME AND ADDRES	S OF REVIEWING OFFICE AND INDIVIDUAL	Ì	TELEPHONE NUMBER/EXT	NSION		
H. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS PROPOSED CONTRACT?						
TES NO (If yes, identify on reverse or separate page)						
III. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM. THIS PROPOSED CONTRACT? YES NO (If yes, identify.): ADVANCE PAYMENTS PROGRESS PAYMENTS OR GUARANTEED LOANS						
TYES NO (If yes, identify.): ADVANCE PAYMENTS OF FROGRESS PAYMENTS OR GUARANTEED LOANS IV. DO YOU HOW HOLD ANY CONTRACT (Or, do you have any independently financed (IRGD) projects) FOR THE SAME OR SIMILAR WORK CALLED FOR BY THIS PROPOSED CONTRACT?						
TYES NO (If yes, identify.):						
V DOES THIS COST SUMMARY CONFORM WITH THE COST PRINCIPLES SET FORTH IN AGENCY REGULATIONS?						
YES NO (If no. explain on recerse or separate page)						

This proposal is submitted for use in connection with and in response to (Describe RFP, etc.)							
		•					
and reflects our best estimates as of this date, in accordance with the Instructions to Offerors and the Footnotes which follow.							
TYPED HAME AHD	TITLE	SIGNATURE .					
HAME OF FIRM			DATE OF SUB-	MISSION			
	·						
	EXHIBIT A-SUPPORTING SCHEDULE (S	pecify. If more space is i	reeded, use reverse	')			
COST EL NO.	ITEM DESCRIPTION	(See footnote 5)		EST COST (S)			
9	Map preparation			550			
	Thin sections 15 @ \$5.50			83			
	Publication costs (journal page			660			
	Communication (postage, telephon	e, shipping)		990			
			· TOTAL	2,283			
				_			
	-						
	•						
				 			
				 			
1. HAS ANY EXECUTIVE AGENCY OF THE UNITED STATES GOVERNMENT PERFORMED ANY REVIEW OF YOUR ACCOUNTS OR RECORDS IN CONNECTION WITH ANY OTHER GOVERNMENT PRIME CONTRACT OR SUBCONTRACT WITHIN THE PAST TWELVE MONTHS?							
YES [NO (If yes, identify below.)			į.			
HAME AND ADDRE	ENSION						
H. WILL YOU REQU	JIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANC	CE OF THIS PROPOSED CONTRACT?					
YES NO (If yes, identify on reverse or separate page)							
III DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM. THIS PROPOSED CONTRACT?							
YES NO (1/ yes, identify.): ADVANCE PAYMENTS PROGRESS PAYMENTS OR GUARANTEED LOANS							
IV. DO YOU NOW HOLD ANY CONTRACT (Ur. do you have any independently financed (IRGD) projects) FOR THE SAME OR SIMILAR WORK CALLED FOR BY THIS PROPOSED CONTRACT?							
TES NO (If yes, identify.):							
V DOES THIS COST SUMMARY CONFORM WITH THE COST PRINCIPLES SET FORTH IN AGENCY REGULATIONS?							
YES NO (If no. expluin on receive or separate page)							

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This proposal is submitted for use in connection with and in response to (Describe RIP, etc.) Low- to Moderate Temperature Geothermal Assessment for Nevada: Site Specific							
Studies - OPTION II (Reservoir Confirmation)							
and reflects our best estimates as of this date, in accordance with the Instructions to Offeron and the Footgoger which follow.							
TYPED HAME AND		1/1 // 1/1					
John E	. Nellor	1111111m/					
Gradua	te Dean and Research Coordinator	VICTO					
HAME OF FIRM	SSION 2 1070						
	L	3, 1979					
EXHIBIT A—SUPPORTING SCHEDULE (Specify. I) more space is needed, use reverse)							
COST EL NO.	ITEM DESCRIPTION (See Soothole 3)		EST COST (S)				
	OPTION II						
9	Drilling costs						
	2 holes total footage 1300 ft. @ \$29/ft.	mom a r	37,700				
		. TOTAL	37,700				
9	Chemical analyses		1 200				
	Major-Minor 10 @ \$137.50		1,380				
	O Isotope 2 @ \$82.50 H Isotope 2 @ \$82.50		165				
	S Isotope 2 @ \$66.00		165 132				
	3 Isotope 2 @ 900.00	TOTAL	1,842				
		TOTAL	1,042				
	Mina-11 manus						
9	Miscellaneous Sample bags 500 @ \$16/100		0.0				
	Thin sections 30 @ \$5.50		80				
	Thin sections 30 G 93.30	TOTAL	165 245				
		TOTAL	243				
	Travel						
7a	Mileage: 4000 mi @ \$0.22/mi.		880 .				
7 <u>b</u>	Per Diem 25 days @ \$35/day		875				
,,,		TOTAL	· 1,755				
I, HAS ANY EXECT	UTIVE AGENCY OF THE UNITED STATES GOVERNMENT PERFORMED ANY REVIEW OF YOUR ACCOUNTS FRIME CONTRACT OR SUBCONTRACT WITHIN THE PAST TWELVE MONTHS?	S OR RECORDS IN CONNEC	R3HTO YHA HTIW HOIT				
X 723 [NO (If yes, identify below.)						
NAME AND ADDRES	S OF REVIEWING OFFICE AND INDIVIDUAL	TELEPHONE NUMBER/EXTE	4210H				
Depart	ment HEW Wallace Chan	(415) 556-8	3343				
H. WILL YOU REQU	IRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS PROPOSED CONTRACT?						
L	NO (If yes, identify on reverse or separate page)						
III DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM. THIS PROPOSED CONTRACT?							
YES X NO (15 yes, identify.): ADVANCE PAYMENTS PROGRESS PAYMENTS OR GUARANTEED LOANS							
IV. DO YOU NOW HOLD ANY CONTRACT (Ur. do you have any independently financed (IRGD) projects) FOR THE SAME OR SIMILAR WORK CALLED FOR BY THIS PROPOSED CONTRACT?							
YES X NO (If yes, identify.):							
V DOES THIS COST SUMMARY CONFORM WITH THE COST PRINCIPLES SET FORTH IN AGENCY REGULATIONS?							
X YES [YES NO (If no. expluin on recerse or separate page)						

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