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AK-61

Nov 6, 1985

Voucher	1 Amt	2 Σ	3 $ Avail	4 $ left	5	6 billed thru	7 comments	8	9	
1	612.77		117,000							
2	29,334.53									
3										
4	12,532.16									
5	4078.30									
6	4055.13									
7	97.94									
8	1,484.76									
9	1,219.96									
10	628.57									
11	46.54									
12	925.07									
13	7,024.46	62,040.19	+120,000= 237,000	54,959.81 / 174,959.81			mod 2			
14	48,572.47									
15	85,222.15									
16	5,538.04	201,372.85	237,000	35,627.15		10-15-85				
17	4,015.15			31,612.00			@ DOE 12-3-85			
18	178.97	205,566.97		31,433.03			@ DOE 1-3-86 ESL got			
19	204.09	205,771.06		31,228.94			DOE 1-23-86 ESL Feb. 7'86			
20	1,079.79	206,850.85		30,149.15			@ DOE - 2-26-86 10% would be ~213K			
21	912.89	207,763.74		29,236.26						
22	1149.44	208,913.18		28,086.82						
23	6436.61	215,349.79		21,650.21			@ ID 5-22-86 NCTE thl 12-8-86			
24	1357.97	216,707.76		20,292.24			@ ESL 7-10-86			
25	3118.61	219,826.37		17,173.63			@ ESL 8-12-86			
26	53.62	219,879.99		17,120.01			@ ESL 9-8-86	Paid by Reggy 9/4/86		
27	788.47	220,668.46		16,331.54			@ ESL 10-8-86	Paid by Reggy 10/6/86		
28	1,041.88	221,710.34		15,289.66			Called by Reggy 11-20-86 OK.	@ ESL 11/24/86		
29	7,320.31	229,030.65		7,969.35			Called By Reggy 12-19-86 OK.			
30	7,969.35	237,000.-		$0.-			Called by Reggy 1-27-87 OK -	@ ESL 1/30/87		
31				Final Payment Approved			1-27-87			

AMPAD EFFICIENCY LINE® 22-206

CONTRACT DELIVERABLES

ORGANIZATION Geophysical Institute, Univ. Alaska

PRINCIPAL CONTACTS Dr. Donald Turner PHONE 907-474-7198
Dr. Gene Wescott 907-474-7576

CONTRACT NO. DE-FG07-84ID12471 COMPLETION DATE 5-31-86

ORIG. $	OBLIGATED	PAID	RETAINED	REMAINING	NOTES
DOE	$117,000	53,513		63,681	inv. 1-4
STATE	0			0	

vouchers 8, 9 outstanding $2,705 3-29-85
voucher 10 outstanding $629 4-1-85
$ DATA UPDATED 4-29-85

CONTRACT START
ORIGINAL 5-31-84

TASKS
All work is to be done in the Copper River Basin area
1. define He and Hg anomalies, to site geophysical studies
2. SP, gravity, and ground magnetic studies
3. further He and Hg sampling
4. SP of 2 He anomalies at Klawasi mud volcanos
5. He and Hg in area of Task 4
6. gravity in area of Task 4
7. deep EM in all anomalous areas
8. final report
9. management

COMMENTS 4-29-85
Field work and most data analysis are completed. Text writing is in progress.

DF/ESL/4-29-85

TASK	DELIVERABLES	DATE DUE	REC'D
1-7	see #8		
8	final report, to include: maps and data on geochemical and geophysical anomalies, with a geothermal interpretation, in detail sufficient to allow readers to interpret results	5-31-86	
	draft final report	4-16-86	
9	quarterly reports	10-15-84	11-16-84
		1-15-85	1-16-85
		4-15-85	4-15-85
		7-15-85	
		10-15-85	
		1-15-86	
		4-15-86	

4-15-85 (?)

April 12, 1985

Mr. Duncan Foley
University of Utah Research Institute
Earth Science Laboratory
391 Chipeta Way, Suite C
Salt Lake City, UT 84108

Dear Mr. Foley:

Enclosed please find 1 copy of the Quarterly Report on Grant DE-FG07-841D12471, covering the period 1 Janaury-31 March, 1985. The final report on the Copper River work is progressing and will be completed during the next quarter.

Sincerely yours,

E M Wescott

Eugene M. Wescott
Professor of Geophysics

Donald L. Turner
Professor of Geology

EMW/DLT:ceh

Distribution w/encl.:
R. Eldon Bray
Elizabeth M. Hyster
Ron Toms
Duncan Foley

Geophysical Institute, University of Alaska, C.T. Elvey Building,
Fairbanks, Alaska 99701

PHONE: 907-474-7282 TELEX: 35414 GEOPH INST FBK

File 4.M.2.31

U.S. DEPARTMENT OF ENERGY

NOTICE OF FINANCIAL ASSISTANCE AWARD

(See Instructions on Reverse)

Under the authority of Public Law 93-410 and subject to legislation, regulations and policies applicable to *(cite legislative program title)*:

Geothermal Research, Development and Demonstration Act of 1977

1. PROJECT TITLE
Geothermal Resource Assesment Research

2. INSTRUMENT TYPE
☒ GRANT ☐ COOPERATIVE AGREEMENT

4. INSTRUMENT NO.
DE-FG07-84ID12471

5. AMENDMENT NO.

3. RECIPIENT *(Name, address, zip code, area code and telephone no.)*
University of Alaska
Geophysical Institute, C.T. Elvey Building
Fairbanks, AK 99701

6. BUDGET PERIOD
FROM: 5/31/84 THRU: 5/31/86

7. PROJECT PERIOD
FROM: 5/31/84 THRU: 5/31/86

8. RECIPIENT PROJECT DIRECTOR *(Name and telephone No.)*
Gene Wescott (907)474-7576
Donald Turner (907)474-7198

10. TYPE OF AWARD
☒ NEW ☐ CONTINUATION ☐ RENEWAL
☐ REVISION ☐ SUPPLEMENT

9. RECIPIENT BUSINESS OFFICER *(Name and telephone No.)*
Neta Stilkey (907)474-7644

12. ADMINISTERED FOR DOE BY *(Name, address, zip code, telephone No.)*
Elizabeth M. Hyster (208)526-1229
U. S. Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, ID 83401

11. DOE PROJECT OFFICER *(Name, address, zip code, telephone No.)*
R. Eldon Bray (208)526-0086
U.S.DOE, Idaho Operations Office
550 Second Street, Idaho Falls, Idaho 83401

13. RECIPIENT TYPE
☐ STATE GOV'T ☐ INDIAN TRIBAL GOV'T ☐ HOSPITAL ☐ FOR PROFIT ORGANIZATION ☐ INDIVIDUAL
☐ LOCAL GOV'T ☒ INSTITUTION OF HIGHER EDUCATION ☐ OTHER NONPROFIT ORGANIZATION ☐ C ☐ P ☐ SP ☐ OTHER *(Specify)*

14. ACCOUNTING AND APPROPRIATIONS DATA

a. Appropriation Symbol	b. B & R Number	c. FT/AFP/OC	d. CFA Number
89X0224.91	AM1510000	ID-44-91/250	

15. EMPLOYER I.D. NUMBER/SSN

16. BUDGET AND FUNDING INFORMATION

a. CURRENT BUDGET PERIOD INFORMATION		b. CUMULATIVE DOE OBLIGATIONS	
(1) DOE Funds Obligated This Action	$ 117,000	(1) This Budget Period *[Total of lines a.(1) and a.(3)]*	$ 117,000
(2) DOE Funds Authorized for Carry Over	$ -0-	(2) Prior Budget Periods	$ -0-
(3) DOE Funds Previously Obligated in this Budget Period	$ -0-		
(4) DOE Share of Total Approved Budget	$ 117,000		
(5) Recipient Share of Total Approved Budget	$ -0-	(3) Project Period to Date *[Total of lines b. (1) and b. (2)]*	$ 117,000
(6) Total Approved Budget	$ 117,000		

17. TOTAL ESTIMATED COST OF PROJECT $ _____

(This is the current estimated cost of the project. It is not a promise to award nor an authorization to expend funds in this amount.)

18. AWARD/AGREEMENT TERMS AND CONDITIONS

This award/agreement consists of this form plus the following:

a. Special terms and conditions (if grant) or schedule, general provisions, special provisions (if cooperative agreement)

b. Applicable program regulations *(specify)* N/A *(Date)* _____

c. DOE Assistance Regulations, 10 CFR Part 600, as amended, Subparts A and ☒ B (Grants) or ☐ C (Cooperative Agreements).

d. Application/proposal dated 11/83. ☐ as submitted ☒ with changes as negotiated

19. REMARKS

This Grant consists of this NFAA, Part I - Budget Plan, Part II - Conditions, and Part III - Statement of Work. The DOE Financial Assistance Rules (10CFR Part 600), OMB Circular A-110, and OMB Circular A-21 are incorporated by reference and attached hereto.

20. EVIDENCE OF RECIPIENT ACCEPTANCE

(Signature of Authorized Recipient Official) *(Date)*

Jerome L. Trojan
(Name)

Vice Chancellor for Administration
(Title)

21. AWARDED BY

William C. Drake 5/31/84
(Signature) *(Date)*

William C. Drake
(Name)

Contracting Officer
(Title)

Grantee: University of Alaska, Geophysical Institute

BUDGET PLAN

1. Salaries (Incl. Benefits)	$ 49,583
2. Travel - Field Travel	9,030
Helicopter Charter	10,544
Other Domestic	4,835
3. Supplies	3,000
4. He Analyses	3,500
5. Other Services (computer, secretarial, electronic drafting, photographic, etc.) Communications and Shipping	7,478
SUBTOTAL DIRECT	$ 87,970
6. Indirect Costs	29,030
TOTAL	$117,000

PART II - CONDITIONS

This grant is subject to the following provisions:

1. General

The grantee is obligated to conduct such project oversight as may be appropriate, to manage the funds with prudence, and to comply with the provisions outlined herein.

2. Reporting Program Technical Performance

a. Copies. Copies of reports and all other related data and information generated under this grant shall be submitted in accordance with the attached Federal Assistance Reporting Checklist (DOE Form EIA-459A).

b. Publication of results. The Grantee may publish the results of its work. However, publications and reports prepared under this grant shall contain the following acknowledgment statement, "This (material) was prepared with the support of the U.S. Department of Energy (DOE) Grant No. DE-FG07-83ID12471. However, any opinions, findings, conclusions, or recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of DOE."

c. The Federal assistance recipient shall prepare and submit (postage prepaid) the plans and reports indicated on the Federal Assistance Reporting Distribution List. Preparation of the specified plans and reports shall be in accordance with the DOE Uniform Reporting System for Federal Assistance Guidelines. The level of detail the recipient provides in the plans and reports shall be commensurate with the scope and complexity of the task and shall be as delineated in Block 4 - Reporting Requirements - and Block 5 - Special Instructions. The prime recipient shall be responsible for acquiring data from any subcontractors, or subrecipients to ensure that data submitted are compatible with the data elements which prime recipients submit to DOE. Plans and reports submitted in compliance with this provision are in addition to any other reporting requirements of the Federal assistance instrument.

d. All reports delivered to DOE shall be the sole property of the DOE. The Grantee shall not claim that any report contains any trade secrets or commercial or financial information deemed by the Grantee to be privileged or confidential, or that the Grantee has any proprietary interest in any report.

3. Travel

Domestic travel is an appropriate charge to this grant, and prior authorization for specific trips is not required. Foreign travel must be clearly essential to the grant effort and must, to be charged against this grant, have prior explicit approval of the Grants Officer regardless of its inclusion in the approved grant budget. The Grantee agrees to use U.S. Flag air carriers to the maximum extent practicable when international air transportation becomes necessary under this grant. The difference in cost between first-class air accommodations and economy class accommodations is unallowable.

4. Allowable Costs

Allowability of costs shall be determined in accordance with OMB Circular A-21 which is attached and hereby incorporated by reference.

5. Payments

a. The Grantee may request advance payment of cost to be incurred. Such requests should not exceed the expected outlays by the Grantee in the succeeding 30-day period.

b. Payments to the Grantee shall equal the Federal share of actual allowable costs of performance of this grant, provided however, and notwithstanding any other provision of this grant, that the Government's monetary liability under this grant shall not exceed the Government share of the total approved budget or an amount equal to the Federal share of actual allowable costs, whichever is less. The Grantee shall be obligated to perform under this grant throughout the agreed-upon period of performance, and to bear all costs which DOE has not agreed to pay. However, the Grantee shall have the right to cease to perform when or after the Federal share of actual allowable costs equals or exceeds the Government share of the total approved budget and if prior written notice to that has been provided to DOE.

c. The Government obligations may be increased unilaterally by DOE by written notice to the Grantee and may be increased or decreased by written agreement of the parties.

d. Upon termination or expiration of the total period of performance, the Grantee shall promptly refund to DOE (or make such disposition as DOE may in writing direct) any sums paid by DOE to the Grantee under this grant in excess of the cumulative Government allowable cost incurred in performance under the grant.

5. Payments (Cont'd)

e. Applicable Credits. The Grantee agrees that any refunds, rebates, credits, or other amounts (including any interest thereon) accruing to or received by the Grantee or any assignee under this grant shall be paid by the Grantee to the Government, to the extent that they are properly allocable to costs for which the Grantee has been reimbursed by the Government under this grant. Reasonable expenses incurred by the Grantee for the purpose of securing such refunds, rebates, credits, or other amounts shall be allowable costs hereunder when approved by the Grant Officer.

f. Audit Adjustments. The Grant Officer may have invoices or vouchers and statements of cost submitted under this grant audited at any time prior to the end of the required retention period for the grant records. Each payment made shall be subject to reduction for amounts included in the related invoice or voucher which are found by the Grant Officer, on the basis of audit, not to constitute allowable cost. If a final audit of costs has not been performed prior to closeout of the grant, DOE or its successor agency, shall have the right to recover an appropriate amount after fully considering the recommendations on disallowed costs resulting from the final audit when conducted.

6. Financial Reporting Requirements

Three copies of the Grantee's Financial Status Report (prepared on an accrual basis) shall be submitted to the Grant Officer at the end of the project period. (The project period of this grant is inclusive of the 90 days stated in OMB Circular A-110, Attachment G.)

7. Retention and Custodial Requirements for Records

Grantees shall retain and permit examination of records as required by OMB Circular A-110, Attachment C.

7. Retention and Custodial Requirements for Records

Grantees shall retain and permit examination of records as required by OMB Circular A-110, Attachment C.

8. Patent Rights - (Small Business Firms and Nonprofit Organizations) (March 1982)

a. Definitions

(1) "Invention" means any invention or discovery which is or may be patentable or otherwise protectable under Title 35 of the United States Code (USC).

8. Patent Rights - (Small Business Firms and Nonprofit Organizations) (March 1982) (Cont'd)

(2) "Subject Invention" means any invention of the grantee conceived or first actually reduced to practice in the performance of work under this agreement.

(3) "Practical Application" means to manufacture in the case of a composition or product, to practice in the case of a process or method, or to operate in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is utilized and that its benefits are, to the extent permitted by law or Government regulations, available to the public on reasonable terms.

(4) "Made" when used in relation to any invention means the conception or first actual reduction to practice of such invention.

(5) "Small Business Firm" means a small business concern as defined at Section 2 of Public Law 85-536 (15 USC 632) and implementing regulations of the Administrator of the Small Business Administration. For the purpose of this clause, the size standard for small business concerns involved in Government procurement, contained in 13 CFR 121.3-8, and in subcontracting, contained in 13 CFR 121.3-12, will be used.

(6) "Nonprofit Organization" means universities and other institutions of higher education or an organization of the type described in section 501(c)(3) of the Internal Revenue Code of 1954 (26 USC 501a) and exempt from taxation under section 501(a) of the Internal Revenue Code (26 U.S.C. 501(a)) or any nonprofit scientific or educational organization qualified under a state nonprofit organization statute.

(7) "Patent Counsel" means the Department of Energy (DOE) patent counsel assisting the DOE contracting activity.

b. Allocation of Principal Rights

The Grantee may retain the entire right, title, and interest throughout the world to each subject invention subject to the provisions of this clause and 35 U.S.C. 203. With respect to any subject invention in which the Grantee retains title, the Federal Government shall have a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States any subject invention throughout the world.

8. Patent Rights - (Small Business Firms and Nonprofit Organizations) (March 1982) (Cont'd)

c. Invention Disclosure, Election of Title and Filing of Patent Applications by the Grantee

(1) The Grantee will disclose each subject invention to the Patent Counsel (with notification by the Patent Counsel to the Contracting Officer) within two months after the inventor discloses it in writing to Grantee personnel responsible for the administration of patent matters. The disclosure to the Patent Counsel shall be in the form of a written report and shall identify the agreement under which the invention was made and the inventor(s). It shall be sufficiently complete in technical detail to convey a clear understanding, to the extent known at the time of the disclosure, of the nature, purpose, operation, and the physical, chemical, biological or electrical characteristics of the invention. The disclosure shall also identify any publication, on sale or public use of the invention and whether a manuscript describing the invention has been submitted for publication and, if so, whether it has been accepted for publication at the time of disclosure. In addition, after disclosure to Patent Counsel, the Grantee will promptly notify Patent Counsel of the acceptance of any manuscript describing the invention for publication or of any on sale or public use planned by the Grantee.

(2) The Grantee will elect in writing whether or not to retain title to any such invention by notifying Patent Counsel within twelve months of disclosure to the Grantee: provided that in any case where publication, on sale or public use has initiated the one year statutory period wherein valid patent protection can still be obtained in the United States, the period for election of title terminates sixty days prior to the end of the statutory period.

(3) The Grantee will file its initial patent application on an elected invention within two years after election or, if earlier, prior to the end of any statutory period wherein valid patent protection can be obtained in the United States after a publication, on sale, or public use. The Grantee will file patent applications in additional countries within either ten months of the corresponding initial patent application or six months from the date permission is granted by the Commissioner of Patents and Trademarks to file foreign patent applications where such filing has been prohibited by a Secrecy Order.

8. Patent Rights - (Small Business Firms and Nonprofit Organizations) (March 1982) (Cont'd)

(4) Requests for extension of the time for disclosure to Patent Counsel, election, and filing may, at the discretion of the Patent Counsel, be granted.

d. Conditions When the Government May Obtain Title

(1) The Grantee will convey to DOE, upon written request, title to any subject invention:

(i) If the Grantee fails to disclose or elect the subject invention within the times specified in c. above, or elects not to retain title.

(ii) In those countries in which the Grantee fails to file patent application within the times specified in c. above: provided, however, that if the Grantee has filed a patent application in a country after the times specified in c. above, but prior to its receipt of the written request of Patent Counsel, the Grantee shall continue to retain title in that country; or

(iii) In any country in which the Grantee decides not to continue the prosecution of any application for, to pay the maintenance fees on, or defend in a reexamination or opposition proceeding on, a patent on a subject invention.

e. Minimum Rights to Grantee

(1) The Grantee will retain a nonexeclusive, royalty-free license throughout the world in each subject invention to which the Government obtains title except if the Grantee fails to disclose the subject invention within the times specified in c. above. The Grantee's license extends to its domestic subsidiaries and affiliates, if any, within the corporate structure of which the Grantee is a part and includes the right to grant sublicenses of the same scope to the extent the Grantee was legally obligated to do so at the time the agreement was awarded. The license is transferable only with the approval of DOE except when transferred to the successor of that part of the Grantee's business to which the invention pertains.

8. Patent Rights - (Small Business Firms and Nonprofit Organizations) (March 1982) (Cont'd)

(2) The Grantee's domestic license may be revoked or modified by DOE to the extent necessary to achieve expeditious practical application of the subject invention pursuant to an application for an exclusive license submitted in accordance with 10 CFR 781. This license will not be revoked in that field of use or the geographical areas in which the Grantee has achieved practical application and continues to make the benefits of the invention reasonably accessible to the public. The license in any foreign country may be revoked or modified at the discretion of DOE to the extent the Grantee, its licensees, or its domestic subsidiaries or affiliates have failed to achieve practical application in that foreign country.

(3) Before revocation or modification of the license, DOE will furnish the Grantee a written notice of its intention to revoke or modify the license, and the Grantee will be allowed thirty days (or such other time as may be authorized by DOE for good cause shown by the Grantee) after the notice to show cause why the license should not be revoked or modified. The Grantee has the right to appeal, in accordance with 10 CFR 781, any decision concerning the revocation or modification of its license.

f. Grantee Action to Protect Government's Interest

(1) The Grantee agrees to execute or to have executed and promptly deliver to Patent Counsel all instruments necessary to:

(i) Establish or confirm the rights the Government has throughout the world in those subject inventions for which the Grantee elects to retain title, and

(ii) Convey title to DOE when requested under d. above, and to enable the Government to obtain patent protection throughout the world in that subject invention.

(2) The Grantee agrees to require, by written agreement, its employees, other than clerical and nontechnical employees, to disclose promptly in writing to personnel identified as responsible for the administration of patent matters and in a format suggested by the Grantee each subject invention made under this agreement in order that the Grantee can comply with the disclosure provisions of c. above, and to

8. Patent Rights - (Small Business Firms and Nonprofit Organizations) (March 1982) (Cont'd)

execute all papers necessary to file patent applications on subject inventions. The disclosure format should require, as a minimum, the information requested by subparagraph c.(1) above. The Grantee shall instruct such employees through the employee agreements or other suitable educational programs on the importance of reporting inventions in sufficient time to permit the filing of patent applications prior to United States or foreign statutory bars.

(3) The Grantee will notify Patent Counsel of any decision not to continue prosecution of a patent application, pay maintenance fees, or defend in a reexamination or opposition proceeding on a patent, in any country, not less than thirty days before the expiration of the response period required by the relevant patent office.

(4) The Grantee agrees to include, within the specification of any United States patent application and any patent issuing thereon covering a subject invention, the following statement, "This invention was made with Government support under (identify the agreement) awarded by the Department of Energy. The Government has certain rights in this invention."

(5) The Grantee agrees to:

(i) Provide a report prior to the close-out of the agreement listing all subject inventions;

(ii) Provide notification of all subcontracts for experimental, developmental, demonstration, or research work, the identity of the patent rights clause therein, and copy of each subcontract upon request;

(iii) Provide promptly a copy of the patent application, filing date, serial number, patent number and issue date for any subject invention in any country in which the Grantee has applied for patents.

g. Subcontracts

(1) The Grantee will include this clause, suitably modified to identify the parties, in all subcontracts, regardless of tier, for experimental, developmental or research work to be performed in the United States by a small business firm or domestic nonprofit organization. The subcontractor will

8. Patent Rights - (Small Business Firms and Nonprofit Organizations) (March 1982) (Cont'd)

retain all rights provided for the Grantee in this clause, and the Grantee will not, as part of the consideration for awarding the subcontract, obtain rights in the subcontractor's subject inventions.

(2) The Grantee will include in all other subcontracts, regardless of tier, for experimental, developmental, demonstration, or research work the patent rights clause required by 41 CFR 9-9.107-5(a) or 41 CFR 9-9.107-6 as appropriate, modified to identify the parties.

(3) In the case of a subcontract, at any tier DOE, the subcontractor, and the Grantee agree that the mutual obligations of the parties created by this clause constitute a contract between the subcontractor and DOE with respect to those matters covered by this clause.

h. Reporting on Utilization of Subject Inventions

The Grantee agrees to submit on request periodic reports no more frequently than annually on the utilization of a subject invention or on efforts at obtaining such utilization that are being made by the Grantee or its licensees or assignees. Such reports shall include information regarding the status of development, date of first commercial sale or use, gross royalties received by the Grantee, and such other data and information as DOE may reasonably specify. The Grantee also agrees to provide additional reports as may be requested by DOE in connection with any march-in proceeding undertaken by DOE in accordance with paragraph j. of this clause. To the extent data or information supplied under this section is considered by the Grantee, its licensee or assignee to be privileged and confidential and is so marked, DOE agrees that, to the extent permitted by 35 USC 202(c)(5), it will not disclose such information to persons outside the Government.

i. *Preference for United States Industry*

Notwithstanding any other provision of this clause, the Grantee agrees that neither it nor any assignee will grant to any person the exclusive right to use or sell any subject invention in the United States unless such person agrees that any products embodying the subject invention or produced through the use of the subject invention will be manufactured substantially in the United States. However, in individual cases, the requirement

8. Patent Rights - (Small Business Firms and Nonprofit Organizations) (March 1982) (Cont'd)

for such an agreement may be waived by DOE upon a showing by the Grantee or its assignee that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible.

j. March-in Rights

The Grantee agrees that with respect to any subject invention in which it has acquired title, DOE has the right in accordance with the procedures in OMB Circular A-124 to require the Grantee, an assignee or exclusive licensee of a subject invention to grant a nonexclusive, partially exclusive, or exclusive license in any field of use to a responsible applicant or applicants, upon terms that are reasonable under the circumstances, and if the Grantee, assignee, or exclusive licensee refuses such a request, DOE has the right to grant such a license itself if DOE determines that:

(1) Such action is necessary because the Grantee or assignee has not taken, or is not expected to take within a reasonable time, effective steps to achieve practical application of the subject invention in such field of use;

(2) Such action is necessary to alleviate health or safety needs which are not reasonably satisfied by the Grantee, assignee, or their licensees;

(3) Such action is necessary to meet requirements for public use specified by federal regulations and such requirements are not reasonably satisfied by the Grantee, assignee, or licensees; or

(4) Such action is necessary because the agreement required by paragraph i. of this clause has not been obtained or waived or because a licensee of the exclusive right to use or sell any subject invention in the United States is in breach of such agreement.

k. Special Provisions for Agreements with Nonprofit Organizations

If the Grantee is a nonprofit organization, it agrees that:

8. Patent Rights - (Small Business Firms and Nonprofit Organizations) (March 1982) (Cont'd)

(1) Rights to a subject invention in the United States may not be assigned without the approval of DOE, except where such assignment is made to an organization which has as one of its primary functions the management of inventions and which is not, itself, engaged in or does not hold a substantial interest in other organizations engaged in the manufacture or sale of products or the use of processes that might utilize the invention or be in competition with embodiments of the invention (provided that such assignee will be subject to the same provisions as the Grantee);

(2) The Grantee may not grant exclusive licenses under United States patents or patent applications in subject inventions to persons other than small business firms for a period in excess of the earlier of:

(i) Five years from first commercial sale or use of the invention; or

(ii) Eight years from the date of the exclusive license excepting that time before regulatory agencies necessary to obtain premarket clearance, unless on a case-by-case basis, DOE approves a longer exclusive license. If exclusive field of use licenses are granted, commercial sale or use in one field of use will not be deemed commercial sale or use as to other fields of use, and a first commercial sale or use with respect to a product of the invention will not be deemed to end the exclusive period to different subsequent products covered by the invention.

(3) The Grantee will share any royalties collected on a subject invention with the inventor; and

(4) The balance of any royalties or income earned by the Grantee with respect to subject inventions, after payment of expenses (including payments to inventors) incidental to the administration subject inventions, will be utilized for the support of scientific research or education.

1. Communications

The DOE central point of contact for communications or matters relating to this clause is the Patent Counsel.

9. Rights in Technical Data - Short Form

a. Definitions. The definitions of terms set forth in 41 CFR 9-9.201 apply to the extent these terms are used herein.

b. Allocation of Rights.

(1) The Government shall have:

(i) Unlimited rights in technical data first produced or specifically used in the performance of this grant;

(ii) The right of the Grant Officer or his representatives to inspect at all reasonable times up to three (3) years after final payment under this grant all technical data first produced or specifically used in the grant (for which inspection the Grantee or its subcontractor shall afford proper facilities to DOE);

(iii) The right to have any technical data first produced or specifically used in the performance of this grant delivered to the Government as the Grant Officer may from time to time direct during the progress of the work or in any event as the Grant Officer shall direct upon completion or termination of this Grant.

(2) The Grantee shall have: The right to use for its private purposes, subject to patent, security or other provisions of this grant, technical data it first produces in the performance of this grant provided the data requirements of this grant have been met as of the date of the private use of such data. The Grantee agrees that to the extent it receives or is given access to proprietary data or other technical, business or financial data in the form of recorded information from DOE or a DOE contractor or subcontractor, the Grantee shall treat such data in accordance with any restrictive legend contained thereon, unless use is specifically authorized by prior written approval of the Grant Officer.

c. Copyrighted Material.

(1) The Grantee agrees to, and does hereby grant to the Government, and to its officers, agents, servants and employees acting within the scope of their duties:

9. Rights in Technical Data - Short Form (Cont'd)

(i) A royalty-free, nonexclusive, irrevocable license to reproduce, translate, publish, use, and dispose of and to authorize others so to do, all copyrightable material first produced or composed in the performance of this grant by the Grantee, its employees or any individual or concern specifically employed or assigned to originate and prepare such material; and

(ii) A license as aforesaid under any and all copyrighted or copyrightable works not first produced or composed by the Grantee in the performance of this grant but which are incorporated in the material furnished under the grant, provided that such license shall be only to the extent the Grantee now has, or prior to completion or final settlement of the grant may acquire, the right to grant such license without becoming liable to pay compensation to others solely because of such grant.

(2) The Grantee agrees that it will not knowingly include any material copyrighted by others in any written or copyrightable material furnished or delivered under this grant without a license as provided for in subparagraph c.(1)(ii) hereof, or without the consent of the copyright owner, unless it obtains specific written approval of the Grant Officer for the inclusion of such copyrighted material.

10. Authorization and Consent

The Government hereby gives its authorization and consent for all use and manufacture of any invention described in and covered by a patent of the United States in the performance of this grant or any part hereof or any amendment hereto or any grant hereunder (including any lower-tier subcontract).

11. Notice and Assistance Regarding Patent and Copyright Infringement

a. The Grantee shall report to the Grant Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this grant of which the Grantee has knowledge.

b. In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this grant or out of the use of any supplies furnished or work or services performed hereunder, the Grantee shall furnish to the Government when requested by the Grant Officer, all evidence and information in possession of the Grantee pertaining to

11. Notice and Assistance Regarding Patent and Copyright Infringement (Cont'd)

such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Grantee has agreed to indemnify the Government.

c. This clause shall be included in all lower-tier agreements and subcontracts.

12. Reporting of Royalties

If any royalty payments are directly involved in the grant or are reflected in the grant price to the Government, the Grantee agrees to report in writing to the Grant Officer or Patent Counsel during the performance of this grant and prior to its completion or final settlement the amount of any royalties or other payments paid by it directly to others in connection with the performance of this grant together with the names and addresses of licensors to whom such payments are made and either the patent numbers involved or such other information as will permit the identification of the patents or other basis on which the royalties are to be paid. The approval of DOE of any individual payments or royalties shall not stop the Government at any time from contesting the enforceability, validity or scope of, or title to, any patent under which a royalty or payments are made.

13. Procurement Standards

Grantee procurements are subject to the requirements of OMB Circular A-110, Attachment O. DOE prior approval is required for all sole source contracts or where only one bid or proposal is received and the aggregate expenditure is expected to exceed $5,000.

14. Revision of Financial Plans

Any revision to financial plans under this grant are subject to the requirements of OMB Circular A-110, Attachment J and paragraph 600.114 of the DOE Financial Assistance Rules (10 CFR Part 600). DOE approval is required for transfers of amounts budgeted between direct and indirect costs. Among direct cost catagories, DOE approval is required when the cumulative amounts of such transfers exceeds or is expected to exceed 5% of the total budget as last approved by DOE. The Grantee shall promptly notify DOE whenever the amount of Federal authorized funds is expected to exceed the needs of the recipient by more than $5,000 or five percent of the Federal award, whichever is greater. None of the substantive programmatic work may be subcontracted or transferred without the prior approval of DOE.

15. Program Income

Program income is subject to the policy prescribed by OMB Circular A-110, Attachment D and paragraph 600.113 of the DOE Financial Assistance Rules (10 CFR Part 600). Program income other than interest, proceeds from the sale of real and personal property, and royalties shall be treated as specified in 600.113(e)(2)(i). That is they shall be deducted from the total approved budget to determine the net costs on which the DOE costs shall be calculated.

16. Liabilities and Losses

DOE assumes no liability with respect to any damages or loss arising out of any activities undertaken with the financial support of this grant.

17. Property

Property is subject to the requirements of OMB Circular A-110, Attachment N and paragraph 600.117 of the DOE Financial Assistance Rules (10 CFR Part 600). At the end of the project period or at the termination of DOE support for the project, the Grantee shall certify as to any property acquired under this grant.

18. Suspension and Termination

a. DOE reserves the right to suspend this grant in accordance with the provisions of OMB Circular A-110, Attachment L, paragraph 3 and paragraph 600.122 of the DOE Financial Assistance Rules (10 CFR Part 600).

b. DOE reserves the right to terminate for cause, in addition to the right to terminate for convenience as provided in OMB Circular A-110, Attachment L, paragraph 4 and paragraph 600.122 of the DOE Financial Assistance Rules (10 CFR Part 600).

STATEMENT OF WORK

The Grantee will accomplish the purpose of these Geothermal Energy Investigations by performing the following tasks:

TASK 1 - Collect additional soil samples in the vicinity of the two helium anomaly areas accessible from the road and analyze these samples for helium and mercury. Interpret and then utilize this additional data to better define the anomalous areas and to determine the most useful areas for geophysical surveys.

TASK 2 - Explore the two areas (in Task 1 above) with a closed self-potential survey for analyses of geothermal type anomalies, interpret the results, and then conduct a detailed gravity and ground magnetometer survey.

TASK 3 - Again collect additional soil samples in the vicinity of the two areas (in Task 1 above) as suggested by interpretation of the available data from Tasks 1 and 2.

TASK 4 - Complete the self-potential survey of the two helium anomalies in the vicinity of the Klawasi mud volcanoes and interpret the results.

TASK 5 - Collect additional soil samples in these areas and analyze them for helium and mercury values for the purpose of better defining the extent of the anomalous zones.

TASK 6 - Conduct supplementary gravity survey work in the anomalous areas of Tasks 4 and 5.

TASK 7 - Conduct deep electrical method soundings in the anomalous areas defined by the above tasks.

TASK 8 - Analyze and interpret all the available data for the study areas and prepare and publish a final report regarding the geochemical and geopysical signatures of the anomalous areas and their relationship to geothermal resources. The final report will include maps and data regarding all methods of investigation in sufficient detail that readers can also evaluate the results and interpretations of the work performed.

TASK 9 - Provide overall project management and complete and report on tasks in a timely manner. Management reports shall be provided as defined by the attached DOE Form CR-537 Reporting Requirements Checklist. The required reports are also summarized as follows:

	DUE
1. Form DOE 538 Notice of Enery RD&D	30 days after award of grant
2. Quarterly Management Summary Report	15 days after calendar quarter end
3. Project Status Report	15 days after calendar quarter end
4. Final Report (Draft)	Due 45 days prior to completion date
5. Final Report	Due on completion date
6. Financial Status Report, OMB Form 269	Due annually

U.S. DEPARTMENT OF ENERGY

FEDERAL ASSISTANCE REPORTING CHECKLIST

FORM EIA-459A
(10-89)

FORM APPROVED
OMB NO. 1900-0127

1. Identification Number: DE-FG07--84ID12471	2. Program/Project Title: Geothermal
3. Recipient: University of Alaska	

4. Reporting Requirements:	Frequency	No. of Copies	Addressees
PROGRAM/PROJECT MANAGEMENT REPORTING			
☐ Federal Assistance Milestone Plan			
☐ Federal Assistance Budget Information Form			
☒ Federal Assistance Management Summary Report	Q		
☒ Federal Assistance Program/Project Status Report	Q		
☒ Financial Status Report, OMB Form 269	Y		
TECHNICAL INFORMATION REPORTING			
☒ Notice of Energy RD&D	O		
☐ Technical Progress Report			
☐ Topical Report			
☒ Final Technical Report	F		

FREQUENCY CODES AND DUE DATES:

A - As Necessary; within 5 calendar days after events.
F - Final; upon completion date
Q - Quarterly; within 15 days after end of calendar quarter or portion thereof.
O - One time after project starts; within 30 days after award.
X - Required with proposals or with the application or with significant planning changes.
Y - Yearly; at the end of program year. (Financial Status Reports 90 days).
S - Semiannually; within 30 days after end of program fiscal half year.

5. Special Instructions:

6. Prepared by: (Signature and Date)	7. Reviewed by: (Signature and Date)

U.S. DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE

REPORT DISTRIBUTION LIST

DE-FG07-84ID12471

Addressees	Federal Assistance Milestone Plan	Federal Assistance Budget Information Form	Federal Assistance Management Summary Report	Federal Assistance Program/Project Status Report	Financial Status Report, OMB Form 269	Notice of Energy RD&D Technical Progress Report	Topical Report	Final Technical Report	Number of Report Copies
U. S. Department of Energy Idaho Operations Office 550 Second Street Idaho Falls, ID 83401									
Attn: R. Eldon Bray, Program Mgr. Energy & Technology Division				2	2			8	
Attn: Elizabeth M. Hyster Contracts Management Div.				1	1	1	1	1	
Attn: E. G. Jones, Director Financial Management Div.				1					
U. S. Department of Energy Forrestal Bldg., CE-324 1000 Independence Ave, S.W. Washington, DC 20585 Attn: Ron Toms				1	1			6	
University of Utah Research Institute Earth Science Laboratory 391 Chipeta Way, Suite C Salt Lake City, UT 84108 Attn: Duncan Foley				1	1			1	
U. S. Department of Energy Technical Information Center P. O. Box 62 Oak Ridge, TN 37830						1			

Special Instructions

TECHNICAL EVALUATION

OF GRANT PROPOSAL

TITLE: Continuation of Geothermal Energy Investigations in Alaska

SUBMITTED TO: Department of Energy
Headquarters, Washington, DC

SUBMITTED BY: Geophysical Institute, University of Alaska
C. T. Elvey Building
Fairbanks, Alaska 99701

AMOUNT REQUESTED: $117,000

PROPOSED DURATION: 24 Months - to April 15, 1986

PROPOSED DESCRIPTION: The proposer offers to conduct research regarding the geophysical and geochemical signatures of four areas in which soil samples contain abnormal helium and mercury values, and in which limited geophysical work has produced positive results.

GENERAL REMARKS:

1. Work Statement: The grantee's proposed work statement and schedule are compatible with DOE technical requirements.

2. Task Changes: The research efforts of the proposed work tasks should be stressed with proven geophysical and geochemical work conducted primarily for the purpose of evaluating the results of the research efforts.

3. The cost information which is provided is adequate for evaluation.

SPECIFIC REMARKS:

1. Manhours: The proposed quantity of manhours and the mix of personnel utilized are reasonable and appropriate for the proposed activities.

2. Materials: The $3,000 cost for miscellaneous field supplies is very reasonable.

3. Subcontracts: The proposed activities do not include any subcontracting activities.

4. Travel and Per Diem: The proposed number of trips and destinations are appropriate and necessary to task fulfillment. Per diem and total travel costs are appropriate for the area.

5. Other Direct Costs: These costs, which include several diverse items such as helicopter charter, room and board for a field crew, leasing of field equipment, laboratory work, drafting, etc. are all appropriate and reasonable.

6. Proposer's Capability to Meet the Objectives: The proposer possesses unique personnel expertise developed through previous DOE contracts and other agency involvements. The proposer is fully capable of meeting the objectives of the proposal.

7. Key Personnel Qualifications: The key personnel who will assume responsibility for this activity have extensive experience and training in the required disciplines and are fully qualified for this work. Eugene M. Wescott, the Principal Investigator, is a Professor of Geophysics at the Geophysical Institute, has experience in Geophysics dating back to 1954, and has previously conducted work of exactly this type. Donald L. Turner, the Co-Principal Investigator, is a Professor of Geology at the Geophysical Institute, has experience in Geology dating back to 1963 and has also previously been involved in work of this exact nature. Special Research Contract DE-AS07-78ID01720 and Cooperative Agreement DE-FC07-79ET27034 were conducted very satisfactorily with these same two Principal Investigators, and they are capable of conducting all the necessary tasks for this proposal in a fully satisfactory fashion.

8. Anticipated Objectives and Probability of Success: The anticipated objectives of this activity are to investigate and conduct field research utilizing a variety of geophysical and geochemical technologies, to interpret the results of the field investigations, and to report on these activities. The proposer has the capability to perform the work and should succeed in properly fulfilling these objectives.

March 26, 1984
Date

R Eldon Bray

R. Eldon Bray
General Engineer
Advanced Technology Division
U. S. Department of Energy
Idaho Operations Office

JUSTIFICATION FOR NON-COMPETITIVE AWARDS

I recommend that negotiations be conducted only with those organizations listed below for the services described herein in accordance with DOE-PR 9-3.805-501.

Organization

State of Washington, Department of Natural Resources
State of Washington, Energy Office
State of Oregon, Dept. of Geology & Mineral Industries
State of Oregon, Department of Energy
State of Alaska, Department of Commerce & Economic Development, Office of Energy
University of Alaska, Geophysical Institute
State of Alaska, Department of Natural Resources
New Mexico State University, Energy Institute
State of New Mexico Energy & Minerals Department
Idaho Department of Water Resources
State of Utah, Utah Geological & Mineral Survey
State of Utah, Division of Water Rights
State of Montana, Dept. of Natural Resources & Conservation
State of Montana, College of Mineral Science & Technology

Department of Energy
P.O. Box 2567
Grand Junction, CO 81502

November 29, 1983

TO: Susan M. Prestwich, E&T, HQ J25, Idaho Operations Office

FROM: Clayton R. Nichols, Manager, Grand Junction Area Office

SUBJECT: REVIEW OF "CONTINUATION OF GEOTHERMAL ENERGY INVESTIGATIONS IN ALASKA"

I have reviewed the proposal from the Geophysical Institute, University of Alaska, for continuation of Alaska geothermal work and would recommend its funding as proposed.

The researchers are competent and productive. The State and the Federal programs would receive a significant benefit from their efforts. The field costs proposed are very reasonable for the areas. The use of the helicopter time is absolutely essential.

I personally am not very optimistic about the prospects in the Copper River and Mt. Spurr areas. In the Copper River region the most obvious targets are on National Park land, and at Mr. Spurr the physical location (its topography and volcanic hazards) would make the development of any potential resource very difficult. In spite of these inherent drawbacks, I support the need for the work. The proposers do tend to be overly optimistic about geophysical anomalies which they find, and an attempt should be made to coordinate their work with the DGGS crew which is more experienced in the areas of geologic and geochemical interpretation.

These concerns notwithstanding, I fully support this work.

Department of Energy
Washington, D.C. 20585

NOV 18 1983

Dr. Donald L. Turner
Professor of Geology

Dr. Eugene M. Wescott
Professor of Geophysics

Geophysical Institute
University of Alaska
C.T. Elvey Building
Fairbanks, Alaska 99701

Gentlemen:

We have received your proposal for continuation of your Alaska geothermal resource assessment work. We have sent a copy to DOE-Idaho Operations Office with a favorable endorsement. Ms. Susan Prestwich of that office will be responsible for finalizing the scope of work and funding amount. You may contact her at 208/526-1147.

I enjoyed the opportunity to discuss the Alaska situation with you at Portland and look forward to continued cooperation.

Sincerely,

Ronald S.H. Toms, Chief
Technology Development Branch
Geothermal and Hydropower
Technologies Division
Conservation and Renewable Energy

cc: Susan Prestwich

November 2, 1983

RECEIVED
RONALD S. H. TOMS
NOV 07 1983

FILE

Mr. Ronald S. H. Toms
Code CE-324
U.S. Dept. of Energy
1000 Independence Avenue S.W.
Washington, D.C. 20585

Dear Ron:

It was good to see you again last week at the Portland GRC meeting. Following our discussion, we had a very productive meeting with Ray Wallace and Marshall Reed to discuss our current project results and possible funding options for the continuation of our work in Alaska.

As you know, we have been working in Alaska for the past several years as part of the D.O.E. state-coupled geothermal program. This work began with the compilation of a geothermal energy resources map for Alaska, followed by a number of site-specific reports and publications. A list of these reports and publications is enclosed.

When federal funding for the D.O.E. program was terminated, we were successful in obtaining State of Alaska funding for work in the Copper River Basin (80 K contract from the Alaska Division of Geological and Geophysical Surveys) and for a continuation of our earlier D.O.E.-sponsored work in the lower Susitna Basin (150 K grant from the Alaska Council for Science and Technology). In addition, our work at Pilgrim Springs stimulated a state sponsored exploratory drilling program. This drilling encountered an extensive hot water reservoir at the exact depths predicted by our electrical resistivity surveys.

The Pilgrim Springs work helped to generate widespread in-state interest in Alaska's geothermal resources. This favorable political climate helped the efforts of the Alaska Power Authority to obtain state funding of $5,000,000 for the successful geothermal exploration and drilling on the flank of Makushin Volcano on Unalaska Island.

We believe that these developments amply demonstrate that D.O.E.'s initial investment in Alaskan geothermal work has had the desired result of stimulating substantial state-funded exploration; in fact, considerably more than might have been originally expected, given Alaska's small population and abundant petroleum resources.

Geophysical Institute, University of Alaska, C.T. Elvey Building,
Fairbanks, Alaska 99701

PHONE: 907-474-7282 TELEX: 35414 GEOPH INST FBK

Unfortunately, the recent state decision to abolish the Alaska Council for Science and Technology (A.C.S.T.) as a funding agency will mean that our geothermal program here at the Geophysical Institute will be terminated on January 31, 1984, unless new federal funding can be found to keep the program alive. State funding for the D.G.G.S. geothermal program is also highly uncertain, but we would hope to be able to continue our fruitful cooperative work with this agency. One unfortunate consequence of no geothermal funding would be the probable loss of major geophysical equipment (e.g. complete electrical resistivity surveying system, cost: 60 K) to other funded projects at the University. Another aspect is the land status of two geothermal prospects discussed in our proposed 1984 work plan. They lie near the unresolved boundary of the Wrangell National Park on land claimed but not patented by the State or Ahtna Native Corporation. If we cannot finish the exploration and define the geothermal areas, they may be incorporated into the National Park and lost to development forever.

Following our initial discussion of these problems with you last week, we are submitting the enclosed tentative 3-year work plan, together with a specific proposal for geothermal work in Alaska next year. We realize that there can be no assurance of funding beyond the first year of the proposed plan, but we are including our tentative work plans for subsequent years for the purpose of continuity of planning. Lack of funding continuity in the past has proved particularly frustrating from the point of view of funding graduate students. We have had continued student interest in doing geothermal graduate theses, but have been unable to accept these promising students due to funding uncertainties.

We would be pleased to have your comments regarding the enclosed plan.

Yours sincerely,

Donald L. Turner /cet

Donald L. Turner
Professor of Geology

Eugene M. Wescott
Professor of Geophysics

DLT:ceh

Encls. (3):
1. Geophysical Institute reports and publications on Alaskan geothermal energy resources
2. Tentative 3-year work plan
3. Detailed proposal for first year of work plan

cc w/encls:
Raymond H. Wallace, Jr.
Marshall Reed

Original

November 2, 1983

Mr. Ronald S. H. Toms
Code CE-324
U.S. Dept. of Energy
1000 Independence Avenue S.W.
Washington, D.C. 20585

Dear Ron:

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As you know, we have been working in Alaska for the past several years as part of the D.O.E. state-coupled geothermal program. This work began with the compilation of a geothermal energy resources map for Alaska, followed by a number of site-specific reports and publications. A list of these reports and publications is enclosed.

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Geophysical Institute, University of Alaska, C.T. Elvey Building,
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PHONE: 907-474-7282 TELEX: 35414 GEOPH INST FBK

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We would be pleased to have your comments regarding the enclosed plan.

Yours sincerely,

Donald L. Turner

Donald L. Turner
Professor of Geology

Eugene M. Wescott
Professor of Geophysics

DLT:ceh

Encls. (3):
1. Geophysical Institute reports and publications on Alaskan geothermal energy resources
2. Tentative 3-year work plan
3. Detailed proposal for first year of work plan

cc w/encls:
Raymond H. Wallace, Jr.
Marshall Reed

UNIVERSITY OF UTAH RESEARCH INSTITUTE

UURI

EARTH SCIENCE LABORATORY
391 CHIPETA WAY, SUITE C
SALT LAKE CITY, UTAH 84108—1295
TELEPHONE 801-524-3422

January 5, 1987

Ms. Peggy Brookshier
U. S. DOE, Idaho Operations Office
785 DOE Place
Idaho Falls, ID 83402

Dear Peggy:

Enclosed is a memo to you which is a critical review of the University of Alaska - Geophysical Institute (U AK-GI) final report. If the report had been submitted as a draft final report as specified in Task 8 I would have strongly recommended changes which addressed these comments, or at least required some satisfactory response from the U AK-GI team.

When I talked with Gene Wescott in December he indicated that the report was in final form and that no money was available for report revisions. I assume that a request for revisions and a new final report would not be received with much enthusiasm. I am most concerned about work items in the statement of work that have not been addressed, and about the somewhat incomplete presentation of data. Please review the enclosed memo and then call me to discuss the possibility of requesting changes in the U AK-GI final report.

Sincerely,

Howard P. Ross
Section Head/Geophysics

encl.
/ HR

UNIVERSITY OF UTAH RESEARCH INSTITUTE

UURI

EARTH SCIENCE LABORATORY
391 CHIPETA WAY, SUITE C
SALT LAKE CITY, UTAH 84108—1295
TELEPHONE 801-524-3422

M E M O R A N D U M

TO: Peggy Brookshier

FROM: Howard Ross

SUBJECT: Review of Final Report "Geothermal Energy Resource Investigations at Mt. Spurr, Alaska"

DATE: December 29, 1986

The subject report has been submitted as a final report by the Geophysical Institute, University of Alaska in fulfillment of U. S. Department of Energy Grant No. DE-FG07-84ID2471. The report has been submitted in final form, more than one month early, rather than as a draft final report 45 days prior to termination date of the grant, as specified for deliverables in the grant.

I have reviewed the subject report and noted several items which should have been corrected or responded to prior to submitting the report in final form. If the report is to be reproduced for widespread distribution (by N. T. I. S.) some of these items should still be changed or addressed in appendices. My comments follow.

Specific Comments Sequential to Text Order

Pg. vii. There is only one Plate 6-1.

Pg. 3-3. The radar soundings on the Mt. Spurr ice field represent significant new data obtained at substantial cost to D O E and effort by the Geophysical Institute. The data should be identified by station and tabulated to record station elevation, reflection time, calculated depth, calculated elevation of the reflection, and quality of the data or precision of the determination. The presentation in map and section form only is not adequate.

Pg. 3-3. After study of Fig. 3-2, 3-3, and 3-4, it appears that several radar reflections occur at depths of 100 to more than 200 m. It is concluded that these reflections arise from a major ash layer deposited in 1953. Is this depth to a 30 year old ash layer consistent

ions arise from a major ash layer deposited in 1953. Is this depth to a 30 year old ash layer consistent with the glacial geology? The layer is approximately midway to the interpreted base of the glacier. Discussion or support from glacial geology seems appropriate.

Pg. 3-6. The "few Schlumberger array resistivity measurements" may represent the most meaningful data for the interpretation of ice resistivity, and subsequently the interpretation of ice thickness from the VLF data. The data should be tabulated showing resistivity for each station and each AB/2 distance.

Pg. 3-7. The EM-16-R data were obtained after considerable effort and cost, and should be presented in more detail than shown in Fig. 3-2, 3-3, 3-4, and 3-5. The data should be tabulated for each station, listing apparent resistivity, phase angle, precision, interpreted ice thickness, and probable error.

Pg. 3-7. The presence and depth of the narrow north-south trending ridge (at less than 60 m) is important to contouring of Fig. 3-2 and the section Fig. 3-3. It is supported only by the one sentence statement about structural mechanics and a personal communication reference. The discussion should be expanded and/or a pertinent reference provided.

Pg. 3-8. Figure 3-2 shows many solid contours and relatively little data. Contours should be broken and/or questioned in uncontrolled areas.

Pg. 3-11. No location is provided for the U S G S radar measurement.

Pg. 4-3. Last paragraph. A reference could be provided to Sill's cross-coupling studies published in GEOPHYSICS in addition to the personal communication.

Pg. 4-4. The S P survey is not fully described. What were the station spacings or dipole lengths? Where was the reference base station?

Pg. 4-4. It seems unlikely that the topographic effect was 3700 mV/100 m for the 150-250 ft. hills, and only -151 mV /100 m for the large slopes. Is it -3700 (i.e. the same sign as for the -151 mV/100 m) or is the sign reversed? Is there any other logical explanation for this very large effect on the small hills? There is too little discussion of these major survey features.

Pg. 4-4. S P traverse misties of the order of 100 mV would normally be considered very large. To what are the large

misties attributed?

Pg. 4-6. Figure 4-1. This figure presents all of the S P data. It is difficult to read contour values, both elevation and S P. S P contours should be broken in areas of large gaps between stations or traverses. The main base station should be indicated. The stippled pattern is not identified- is it glacial ice? The S P data should be tabulated in an appendix.

Pg. 4-7. Last paragraph. A third important reason for lower resistivity is wall rock alteration to clay and zeolite minerals.

Pg. 4-9. Skin depths of at least 40,000 ft. are possible with natural magnetotelluric soundings (frequencies less than 1 Hz are considered subaudio).

Pg. 4-9,4-10. It should probably be stated that the CSAMT as completed and described here is scalar CSAMT rather than vector or tensor.

Pg. 4-13,4-14. The presentation of CSAMT data is incomplete. A tabulation of the data, identifying each receiver (Rc) and transmitter (Tx) site, the Tx-Rc distance, usable frequencies recorded, Ex, Hy, and pa, phi for each frequency, and some indication of noise or reliability should be recorded in an appendix. Were any receiver stations occupied for both transmitter sites to evaluate transmitter overprint? If so, what were the results?

Pg. 4-15. Third line from bottom. Significant figures- the interpreted resistivity should be stated as 2 ohm-m, not 2.48 ohm-m.

Pg. 4-16. No data are shown for CSAMT sta. 18. Logarithmic or variable contour intervals are often used for resistivity or CSAMT data to improve psuedosection contour presentations.

Pg. 4-17 to 4-19. Figures 4-4, 4-5, 4-6. Some contour values are hard to read; contouring could have been improved with a variable contour interval.

Pg. 4-20. Fig. 4-7. The format for this figure differs from Figs. 4-4, 4-5, 4-6; no vertical bar is shown on the elevation scale. CSAMT (ohm-m) is missing from the illustration. The elevation scale is not labeled.

Pg. 4-21. Last paragraph. The meaning is not clear in "the shallowest data ..... but very deep...?? Should be reworded.

Pg. 4-22. Paragraph 4. English- sentence begins with a conjunction.

Pg. 4-23. Figure 4-8. The intent of the fence diagram is good, but the contouring is too dense and many values are hard to read.

Pg. 4-24, 4-25. Errors in REFERENCES. see attached pages.

Pg. 5-2. Line 3. Coso Hot Springs.

Pg. 5-6. Paragraphs 1,2. The significance of the mercury data and its relationship to geothermal activity could be further tested by making a cumulative distribution plot to identify the number of different distributions present. Hg in glass may not all have been volatilized and lost during the eruptive stage. Any references to support conclusions?

Pg. 6-4. Last paragraph. The reference to Figure 4-7 should be to stations 19 and 20, not sections 9 and 10.

Plate 5-2. Shouldn't the solid symbols indicate < 1st std. dev. rather than > 1st. std. dev.?

Correspondence with Statement of Work

The final report has been compared to the Statement of Work Modification No. A002, Contract No. DE-AC07-85ID12471 to determine if all intended work was completed or has been satisfactorily described. My evaluation follows.

Task 1. Completed.

Task 2.-Compile all existing data: the location of the USGS radar measurement is not indicated.
-Develop a model for the geothermal system: This subtask is an important part of the study. The data are integrated but the model itself is presented only as three sentences on page 6-3. A more complete discussion, under a separate heading, and supported by a cross-section illustration would be more appropriate.

Task 3.-Conduct He, Hg, S P, resistivity and CSAMT studies. No resistivity data are presented for the south and southeast flanks of the volcano, and there is no discussion of a resistivity survey in this area. All other surveys were completed.

Task 4.-Conduct gravity and radar studies on the central ice field. Radar studies and EM-16-R VLF were completed. There are no gravity data, and there is no explanation for why gravity data were not obtained.

Task 5.-Conduct K-Ar and 14 C dating. The K-Ar dating was completed but there are no 14C data and no discussion why this subtask was not completed.

Task 6.-Integrate data from Tasks 2,3,4, and 5 with DGGS studies to interpret and develop a comprehensive model of geothermal resource. See comments for Task 2.

Task 7.-Prepare a final report which will present all the data from Tasks 2-6 above, including a model of geothermal resources, . .: The data are presented only in a limited fashion, generally as a final form interpretation. No raw data, i.e. S P readings, Ex(f), Hy(f), radar times, etc. are presented. Some data appear to be missing (CSAMT sta. 18). The model is incompletely developed (see comments for Task 2).

Task 8. Provide project management and complete reports on time. Task completed with the exception that this final report was submitted without a draft final report submitted for comment 45 days prior to contract termination date (item 6 of task 8).

Summary

Personnel of the Geophysical Institute, University of Alaska have completed a broad range of studies in the Mt. Spurr volcano area. Data from these studies were instrumental in defining an area of significant geothermal potential and some of these lands have been leased by the state to a private developer.

The field studies were completed in a remote area of difficult terrain, access, and weather conditions. Because of this much of the data have a high unit cost and some data (i.e. radar and VLF soundings over the ice) are fairly unique. The total D O E funding for this work, $237,000 is not insignificant. Thus the basic data should be presented in some detail, perhaps in appendices. The comprehensive model identified in Tasks 2,6, and 7 should be described in more detail, illustrated, and rates a distinct heading in the final report.

Any task items identified in the Grant - Statement of Work which were not completed and discussed must be identified and a satisfactory explanation presented for omitting these work items. It would be in the best interest of both the Geophysical Institute and the Department of Energy that any obvious reporting errors and shortcomings be corrected prior to distribution by N T I S.

Howard Ross

REFERENCES

Anderson, Walter L., 1977, Electromagnetic fields about a finite electric wire source, Computer Program, National Technical Information Service Report PB-238-199, 205 pp.

Anderson, Walter L., 1979, Inversion of MT/AMT plane wave frequency soundings, Computer Program, USGS Open-File Report 79-586, 37 pp.

Bostick, F. X., 1977, A simple almost exact method of MT analysis, in Ward, S. H., ed., Workshop on Electrical Methods in Geothermal Exploration: Univ. of Utah, Salt Lake City, UT, 84112, p. 175-183.

Caigniard, L., 1953, Basic theory of the magneto-telluric method of geophysical prospecting, Geophysics 18(3), p. 605-635.

Caigniard, L., 1956, Electricité tellurique, in Encyclopedia of physics XLVII, Geophysics I: Springer.

Campbell, D. L., 1981, MT inversion (Bostick's Algorithm) calculator program EM-8. In: Manual of Geophysical Hand-Calculator Programs, Society of Exploration Geophysicists, HP Volume, p. 1-8.

Corwin, R. F. and D. B. Hoover, 1979, The self-potential method in geothermal exploration, Geophysics, 44, 226-245.

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Goldstein, M. A. and D. W. Strangway, 1975, Audio-frequency magnetotellurics with a grounded electric dipole source, Geophysics Vol. 40 (4), p. 669-683.

Jones, A. G. and J. H. Foster, 1983, An objective real-time data adaptive technique for efficient in-field model resolution improvement in magneto-telluric studies; extended abstract of paper presented at 1983 Society of Exploration Geophysics meeting, Las Vegas.

Morrison, H. F., R. F. Corwin, G. de Moully and D. Durand, 1978, Semi-annual technical progress report, contract 14-08-0001-16546, Univ. of California, Berkeley.

Republic Geothermal, 1983, Unalaska Geothermal Project, Phase 1B Final Report for the Alaska Power Authority, 1:67-70.

Telford, W. M., L. P. Geldart, R. E. Sheriff and D. A. Keys, 1976, Applied Geophysics, Cambridge University Press, New York, 458-466.

Zabloski, C. J., 1976, Mapping thermal anomalies on an active volcano by the self-potential method, Kilauea, Hawaii, Proc. 2nd U.N. Symposium on Development and Use of Geothermal Resources, San Francisco, CA, U.S. Government Printing Office, Washington DC 2:1299-1309.

December 5, 1986

Dr. Howard Ross
University of Utah Research Institute
Earth Sciences Laboratory
391 Chipeta Way, Suite C
Salt Lake City, UT 84108

Dear Howard:

Enclosed please find one (1) copy of our Final Technical Report on DE-FG07-84ID12471, "Geothermal Energy Resource Investigations at Mt. Spurr, Alaska." The results we obtained are quite positive for an energy resource in this area. We hope to be able to continue work on evaluation of Alaska's geothermal resources in the future.

Sincerely yours,

Eugene Wescott
Professor of Geophysics

EMW:cs

Enclosure: as stated

Geophysical Institute, University of Alaska
Fairbanks, Alaska 99775-0800

PHONE. 907-474-7282 TELEX: 35414 GEOPH INST FBK

1:2 10/14/86

October 10, 1986

Dr. Howard Ross
University of Utah Research Institute
Earth Science Laboratory
391 Chipeta Way, Suite C
Salt Lake City, UT 84108

Dear Mr. Ross:

We are enclosing 1 copy of the Quarterly Report on Grant DE-FG07-84ID12471, Geothermal Reconnaissance of Mt. Spurr, Alaska.

Sincerely,

Vicki L. Wester for

Donald L. Turner
Professor of Geology

Vicki Wester for

Eugene M. Wescott
Professor of Geophysics

vli
Enclosure

Geophysical Institute, University of Alaska
Fairbanks, Alaska 99775-0800

PHONE. 907-474-7282 TELEX: 35414 GEOPH INST FBK

October 10, 1986

Dr. Marshall Reed
U.S. Department of Energy
Forrestal Building, CE-324
1000 Independence Avenue, SW
Washington, DC 20585

Dear Marshall:

We are enclosing 1 copy of the Quarterly Report on Grant DE-FG07-84ID12471, Geothermal Reconnaissance of Mt. Spurr, Alaska.

Best regards,

Donald L. Turner
Professor of Geology

Eugene M. Wescott
Professor of Geophysics

vli
Enclosure

Distribution w/encl.:
Elizabeth M. Hyster
Howard Ross
Peggy Brookshire
Neta Stilkey
David Stone

Geophysical Institute, University of Alaska
Fairbanks, Alaska 99775-0800

PHONE. 907-474-7282 TELEX: 35414 GEOPH INST FBK

Quarterly Progress Report to U.S. Department of Energy

July 1 through September 30, 1986

for Grant DE-FG07-84ID12471

Geothermal Reconnaissance of Mt. Spurr, Alaska

by

Donald L. Turner and Eugene M. Wescott

Geophysical Institute

University of Alaska-Fairbanks

Fairbanks, AK 99775-0800

Geophysical Data Analysis

During the past quarter, six additional models of resistivity structure versus depth have been calculated from our controlled-source audiomagneto-telluric data set for the Mt. Spurr area. This work was completed by our graduate student, Patricia Moore, in consultation with Wescott.

Geological and Geochemical Studies

A paper on the geology and geochemistry of the Mt. Spurr volcanic system has been prepared for presentation at the annual meeting of the American Geophysical Union in San Francisco this December. The abstract for this paper by Nye and Turner is enclosed.

Transfer of Dr. Christopher Nye to the Geophysical Institute

Recent severe budget cuts at the Alaska Division of Geological and Geophysical Surveys (now called the Division of Mining and Geology) have resulted in several geologist positions being terminated. Dr. Christopher Nye, principal investigator for the ADGGS part of the Mt. Spurr DOE project, was among those terminated. In recognition of Dr. Nye's scientific research expertise and accomplishments, and in the interest of providing scientific continuity of cooperative effort in our state-coupled geothermal program, the Geophysical Institute has offered Dr. Nye a research associate position. Dr. Nye has accepted the position and will be moving to an office at the Geophysical Institute in mid-October. He will complete his part of the Mt. Spurr project at the Geophysical Institute.

Enclosure: AGU Abstract

Geology and Geochemistry of the Spurr Volcanic System, South-central Alaska

C.J. Nye (Alaska Division of Geological and Geophysical Surveys, 794 University Avenue, BSMT, Fairbanks, Alaska, 99709)
D.L. Turner (Geophysical Institute, University of Alaska, Fairbanks, Alaska, 99775)

The Spurr volcanic system (SVS) is the easternmost active volcanic center in the Aleutian Arc. It sits on continental crust about 40 km thick, and is about 375 km southwest of the edge of the subducted Pacific plate and 400 km from the trench. The oldest petrologic and stratigraphic unit at the SVS is an eroded volcanic center composed of andesite, basaltic-andesite and rare basalt whose composition changes irregularly throughout individual stratigraphic sections. The base of the pile is somewhat older than 0.24 Ma and the uppermost part of the pile is somewhat younger than 0.05 Ma. This center underwent sector collapse, probably during the early Holocene, to produce a debris flow and overlying ashflows. The debris flow travelled a minimum of 27 km SE from the center of the old volcano. Immediately after sector collapse a large dome (the present Mt. Spurr) formed in the center of the caldera and a large cinder cone (the presently active vent, Crater Peak), with an extensive pyroclastic apron, formed in the caldera breach. The cinder cone was formed in two stages separated by a period of glacial erosion. Each stage had only a few intervals of magma resupply. Mt. Spurr and Crater Peak are both Holocene, and may have been in part coeruptive, in spite of the fact that Spurr (and the associated ashflows which overlie the debris flow) are the most silicic whole rock samples from the SVS (61-63% SiO2) and Crater Peak samples are 54-57% SiO2, among the most mafic. The eruption of such diverse lavas so close in time implies complex Holocene plumbing geometry.

SVS lavas are pl + cpx + opx ± mt andesites. At SiO2 contents less than about 57% olivine is also common. Hornblende xenocrysts are present but uncommon, and hb phenocrysts are extremely rare. Empirical bulk partition coefficients for K, Zr, Y, and Nb (compared to an arbitrary bulk D=0.05 for Rb) are about 0.5, 0.7, 0.75, and 0.85, respectively. Such high values are inconsistent with fractionation of the observed phenocryst assemblage, and require substantial amounts of either cryptic hornblende fractionation or crustal assimilation in the production of SVS lavas.

1. 1986 Fall Meeting
2. 001592749 (Nye)
3. (a) corresponding address
   Christopher Nye
   Alaska Geological Survey
   794 Univ. Ave. BSMT
   Fairbanks Alaska 99709

   (b) telephone
   (907) 474-7147
4. V
5. 8499 general volcanology
6. S (prefer oral)
7. 0%
8. send bill to corresponding author
9. C

(See Instructions on Reverse)

Under the authority of Public Law 93-410 and subject to legislation, regulations and policies applicable to *(cite legislative program title)*:

OJECT TITLE
Geothermal Resource Assessment Research

2. INSTRUMENT TYPE
☒ GRANT ☐ COOPERATIVE AGREEMENT

4. INSTRUMENT NO.
DE-FG07-84ID12471

5. AMENDMENT NO.
A002

3. RECIPIENT *(Name, address, zip code, area code and telephone no.)*
University of Alaska
Geophysical Institute, C.T.Elvey Building
Fairbanks, AK 99701

6. BUDGET PERIOD
FROM: 7/8/85 THRU: 7/8/86

7. PROJECT PERIOD
FROM: 5/31/84 THRU: 7/8 86

8. RECIPIENT PROJECT DIRECTOR *(Name and telephone No.)*
Gene Wescott (907)474-7576
Donald Turner (907)474-7198

10. TYPE OF AWARD
☐ NEW ☐ CONTINUATION ☐ RENEWAL
☒ REVISION ☐ SUPPLEMENT

9. RECIPIENT BUSINESS OFFICER *(Name and telephone No.)*
Neta Stilkey (907)474-7644

12. ADMINISTERED FOR DOE BY *(Name, address, zip code, telephone No.)*
Elizabeth M. Hyster (208)526-1223
U. S. Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, ID 83401

11. DOE PROJECT OFFICER *(Name, address, zip code, telephone No.)*
Peggy A. Brookshier (208)526-1403
U.S.DOE, Idaho Operations Office
550 Second Street, Idaho Falls, ID 83401

13. RECIPIENT TYPE
☐ STATE GOV'T ☐ INDIAN TRIBAL GOV'T ☐ HOSPITAL ☐ FOR PROFIT ORGANIZATION ☐ INDIVIDUAL
☐ LOCAL GOV'T ☒ INSTITUTION OF HIGHER EDUCATION ☐ OTHER NONPROFIT ORGANIZATION ☐ C ☐ P ☐ SP ☐ OTHER *(Specify)*

14. ACCOUNTING AND APPROPRIATIONS DATA

a. Appropriation Symbol	b. B & R Number	c. FT/AFP/OC	d. CFA Number
89X0224.91	AM1510000	ID-54-91/410	

15. EMPLOYER I.D. NUMBER/SSN

16. BUDGET AND FUNDING INFORMATION

CURRENT BUDGET PERIOD INFORMATION		b. CUMULATIVE DOE OBLIGATIONS	
(1) DOE Funds Obligated This Action	$ 120,000	(1) This Budget Period [Total of lines a.(1) and a.(3)]	$ 120,000
(2) DOE Funds Authorized for Carry Over	$ 34,296	(2) Prior Budget Periods	$ 117,000
(3) DOE Funds Previously Obligated in this Budget Period	$ -0-		
(4) DOE Share of Total Approved Budget	$ 154,296	(3) Project Period to Date [Total of lines b. (1) and b. (2)]	$ 237,000
(5) Recipient Share of Total Approved Budget	$ -0-		
(6) Total Approved Budget	$ 154,296		

17. TOTAL ESTIMATED COST OF PROJECT $ _____

(This is the current estimated cost of the project. It is not a promise to award nor an authorization to expend funds in this amount.)

18. AWARD/AGREEMENT TERMS AND CONDITIONS

This award/agreement consists of this form plus the following:

a. Special terms and conditions (if grant) or schedule, general provisions, special provisions (if cooperative agreement)

b. Applicable program regulations *(specify)* N/A *(Date)* _____

c. DOE Assistance Regulations, 10 CFR Part 600, as amended, Subparts A and ☒ B (Grants) or ☐ C (Cooperative Agreements).

d. Application/proposal dated September, 1984, ☐ as submitted ☒ with changes as negotiated

19. REMARKS
This modification increases the scope by adding additional work as described in the Statement of Work (Part II), and increases the funding as provided in the revised Budget Plan (Part I).

20. EVIDENCE OF RECIPIENT ACCEPTANCE
(Signature of Authorized Recipient Official) 7/23/85 *(Date)*
Jerome L. Trojan
(Name)
Vice Chancellor for Administration, UAF
(Title)

21. AWARDED BY
William C. Drake 7/15/85
(Signature) *(Date)*
William C. Drake
(Name)
Contracting Officer
(Title)

DE-FG07-84ID12471
Modification No. A002

Part I - Budget Plan is hereby revised to read as follows:

BUDGET PLAN

		5/1/84 to 5/31/86	7/8/85 to 7/8/86
1.	Salaries (Incl. Benefits)	$ 24,371	$ 56,276
2.	Travel - Field Travel	9,030	9,575
	Helicopter Charter	10,554	28,770
	Other Domestic	2,225	2,830
3.	Supplies	3,991	2,820
4.	Equipment - Generator & Coil	8,950	-0-
5.	He Analyses		2,700
6.	Other Services (computer, secretarial, electronic drafting, photographic, etc.) Communications and Shipping	5,299	7,400
	SUBTOTAL DIRECT	$ 64,420	$110,371
7.	Indirect Costs	18,284	43,925
	TOTAL	$ 82,704	$154,296
	Carryover	34,296	<34,296>
	TOTAL	$117,000	$120,000

Contract No. DE-AC07-85ID12471
Modification. No. A002

STATEMENT OF WORK

SCOPE OF WORK

The Grantee will perform Geothermal Energy Investigations in the Mt. Spurr area to identify any high temperature geothermal prospects. To accomplish this work, the Grantee will perform the following tasks:

Task 1. Coordinate closely with and provide field work logistical support for DOE-funded researchers from the Alaska Division of Geological and Geophysical Surveys (DGGS).

Task 2. Compile all exsiting geological, geochemical, geophysical, and hydrologic data in the study area. Integrate and interpret these data and appropriate data from other Alaska volcanos to develop a model for the nature and occurrence of a high-temperature geothermal resource on Mt. Spurr.

Task 3. On the south and southeast flanks of the volcano, conduct helium and mercury geochemical surveys. Also, conduct self-potential, resistivity, and controlled-source audio magnetotelluric studies in this area. Conduct appropriate analytic and modeling techniques to transform field data to a useful format.

Task 4. On the central ice field, conduct appropriate gravity and radar studies to identify the sub-ice topography and other appropriate geological characteristics of a caldera. Conduct appropriate analytic and modeling techniques to transform field data to a useful format.

Task 5. Conduct, k-Ar and 14C dating of young pyroclastics deposits, if suitable dating samples can be found. Coordinate collection of these samples with petrologic studies being conducted by Alaska DGGS.

Task 6. Integrate the data from Tasks 2, 3, 4, and 5 above with results of Alaska DGGS studies, in order to interpret these and develop a comphrehensive model of the nature and occurrence of high-temperature geothermal resources on the volcano.

Task 7. Prepare a final report which will present all the data from Tasks 2-6 above, including a model of geothermal resources and suggestions for further studies, based on techniques that are found to be successful or unsucessful.

Task 8. Provide overall project management and complete and report on tasks in a timely manner. Management reports shall be provided as defined by the attached DOE Form EIA 459A - Reporting Requirements Checklist. The required reports are summarized as follows:

	REPORT	DUE
(1)	Form DOE 538 Notice of Energy RD&D grant	30 days after award of
(2)	Quarterly Management Summary Report	15 days after calendar quarter end
(3)	Project Status Report	15 days after calendar quarter end
(4)	Phase I Final Report (Draft)	Due 45 days prior to original completion date
(5)	Phase I Final Report	Due on original completion date
(6)	Final Report (Draft)	Due 45 days prior to updated completion date
(7)	Final Report	Due on updated completion date
(8)	Finanical Status Report OMB Form 269	Due annually and upon completion

The deliverables resulting from the tasks outlined above which will be delivered to DOE are summarized as follows:

1. The original Final Report (herein referred to as Phase I Final Report) and the Final Report for this addition to the grant--one camera-ready copy plus sixteen additional copies--will be distributed as specified in the attached DOE Form EIA 459A.

2. Reports previously described under Task 8 above will be prepared and issued in the amounts and at the frequency shown.

U.S DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE

REPORT DISTRIBUTION LIST

Addressees	Number of Report Copies																													
	Federal Assistance Monitoring Plan	Federal Assistance Budget Information Form	Federal Assistance Management Summary Report	Federal Assistance Property/Project Status Report	Technical Progress Report, DOE Form 2599	Technical Progress Report	Final Technical Report	2																						
U. S. Department of Energy Idaho Operations Office 550 Second Street Idaho Falls, ID 83401																														
Attn: Peggy Brookshier, Prog. Mgr. Energy & Technology Division			2	2				8																						
Attn: Elizabeth M. Hyster Contracts Management Div.			1	1	1	1		1																						
Attn: E. G. Jones, Director Financial Management Div.			1																											
U. S. Department of Energy Forrestal Bldg., CE-324 1000 Independence Ave, S.W. Washington, DC 20585 Attn: Marshall Reed			1	1				2																						
University of Utah Research Institute Earth Science Laboratory 391 Chipeta Way, Suite A Salt Lake City, UT 84108 Attn: Duncan Foley			1	1				1																						
U. S. Department of Energy Technical Information Center P. O. Box 62 Oak Ridge, TN 37830					1																									

Special Instructions

U.S. DEPARTMENT OF ENERGY

FEDERAL ASSISTANCE REPORTING CHECKLIST

FORM EIA-459A
(10/80)

FORM APPROVED
OMB NO. 1900-0127

1. Identification Number: DE-FG07-84ID12471	2. Program/Project Title:
3. Recipient: University of Alaska, Geophysical Institute	

4. Reporting Requirements:	Frequency	No. of Copies	Addressees
PROGRAM/PROJECT MANAGEMENT REPORTING			
[ ] Federal Assistance Milestone Plan			
[ ] Federal Assistance Budget Information Form			
[X] Federal Assistance Management Summary Report	Q		
[X] Federal Assistance Program/Project Status Report	Q		
[X] Financial Status Report, OMB Form 269	Y,F		
TECHNICAL INFORMATION REPORTING			
[X] Notice of Energy RD&D	Y		
[ ] Technical Progress Report			
[ ] Topical Report			
[X] Final Technical Report (2)	F		

FREQUENCY CODES AND DUE DATES:

A - As Necessary; within 5 calendar days after events.
F - Final; Upon completion date
Q - Quarterly; within 15 days after end of calendar quarter or portion thereof.
O - One time after project starts; within 30 days after award.
X - Required with proposals or with the application or with significant planning changes.
Y - Yearly; 30 days after the end of program year. (Financial Status Reports 90 days).
S - Semiannually; within 30 days after end of program fiscal half year.

5. Special Instructions:

The budget period includes the 90 days for report preparation in accordance with OMB Circular A-110.

6. Prepared by: (Signature and Date)	7. Reviewed by: (Signature and Date)

DOE F 4600.1 (1-81)

U.S. DEPARTMENT OF ENERGY

NOTICE OF FINANCIAL ASSISTANCE AWARD

(See Instructions on Reverse)

Under the authority of Public Law 93-410 and subject to legislation, regulations and policies applicable to *(cite legislative program title)*:
Geothermal Research, Development and Demonstration Act of 1977

PROJECT TITLE
Geothermal Resource Assessment Research

2. INSTRUMENT TYPE
☒ GRANT ☐ COOPERATIVE AGREEMENT

4. INSTRUMENT NO. DE-FG07-84ID12471

5. AMENDMENT NO. M001

3. RECIPIENT *(Name, address, zip code, area code and telephone no.)*
University of Alaska
Geophysical Institute, C.T. Elvey Building
Fairbanks, AK 99701

6. BUDGET PERIOD FROM: 5/31/84 THRU: 5/31/86

7. PROJECT PERIOD FROM: 5/31/84 THRU: 5/31/86

10. TYPE OF AWARD
☐ NEW ☐ CONTINUATION ☐ RENEWAL
☒ REVISION ☐ SUPPLEMENT

8. RECIPIENT PROJECT DIRECTOR *(Name and telephone No.)*
Gene Wescott (907)474-7576
Donald Turner (907)474-7198

9. RECIPIENT BUSINESS OFFICER *(Name and telephone No.)*
Neta Stilkey (907)474-7644

12. ADMINISTERED FOR DOE BY *(Name, address, zip code, telephone No.)*
Elizabeth M. Hyster (208)526-1229
U. S. Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, ID 83401

11. DOE PROJECT OFFICER *(Name, address, zip code, telephone No.)*
P. A. Brookshier (208)526-1403
U.S.DOE, Idaho Operations Office
550 Second Street, Idaho Falls, ID 83401

13. RECIPIENT TYPE
☐ STATE GOV'T ☐ INDIAN TRIBAL GOV'T ☐ HOSPITAL ☐ FOR PROFIT ORGANIZATION ☐ INDIVIDUAL
☐ LOCAL GOV'T ☒ INSTITUTION OF HIGHER EDUCATION ☐ OTHER NONPROFIT ORGANIZATION ☐ C ☐ P ☐ SP ☐ OTHER *(Specify)*

14. ACCOUNTING AND APPROPRIATIONS DATA

a. Appropriation Symbol	b. B & R Number	c. FT/AFP/OC	d. CFA Number
89X0224.91	AM1510000	ID-44-91/250	

15. EMPLOYER I.D. NUMBER/SSN

16. BUDGET AND FUNDING INFORMATION

a. CURRENT BUDGET PERIOD INFORMATION

(1) DOE Funds Obligated This Action	$ -0-
(2) DOE Funds Authorized for Carry Over	$ -0-
(3) DOE Funds Previously Obligated in this Budget Period	$ 117,000
(4) DOE Share of Total Approved Budget	$ 117,000
(5) Recipient Share of Total Approved Budget	$ -0-
(6) Total Approved Budget	$ 117,000

b. CUMULATIVE DOE OBLIGATIONS

(1) This Budget Period *[Total of lines a.(1) and a.(3)]*	$ 117,000
(2) Prior Budget Periods	$ -0-
(3) Project Period to Date *[Total of lines b. (1) and b. (2)]*	$ 117,000

17. TOTAL ESTIMATED COST OF PROJECT $ _____

(This is the current estimated cost of the project. It is not a promise to award nor an authorization to expend funds in this amount.)

18. AWARD/AGREEMENT TERMS AND CONDITIONS

This award/agreement consists of this form plus the following:

a. Special terms and conditions (if grant) or schedule, general provisions, special provisions (if cooperative agreement)

b. Applicable program regulations *(specify)* N/A *(Date)* _____

c. DOE Assistance Regulations, 10 CFR Part 600, as amended, Subparts A and ☒ B (Grants) or ☐ C (Cooperative Agreements).

d. Application/proposal dated 4/25/85, ☐ as submitted ☒ with changes as negotiated

19. REMARKS
This Modification revises the DOE Project Officer and the Budget Plan.

20. EVIDENCE OF RECIPIENT ACCEPTANCE

6-6-85
(Signature of Authorized Recipient Official) *(Date)*

Gary M. Lu
(Name)

Grant & Contract Services
(Title)

21. AWARDED BY

Elizabeth M. Hyster 5/30/85
(Signature) *(Date)*

Elizabeth M. Hyster
(Name)

Contracting Officer
(Title)

Part I - Budget Plan is hereby revised to read as follows:

BUDGET PLAN

1. Salaries (Incl. Benefits)	$ 42,891
2. Travel - Field Travel	9,030
Helicopter Charter	10,544
Other Domestic	4,835
3. Supplies	3,000
4. Equipment - Generator & Coil	8,900
5. He Analyses	3,500
6. Other Services (computer, secretarial, electronic drafting, photographic, etc.) Communications and Shipping	7,478
SUBTOTAL DIRECT	$ 90,178
7. Indirect Costs	26,822
TOTAL	$117,000

U. AK - GI

Contract No. DE-AC07-85ID12471
Modification. No. A002

REVISED
STATEMENT OF WORK

SCOPE OF WORK

The Grantee will perform Geothermal Energy Investigations in the Mt. Spurr area to identify any high temperature geothermal prospects. To accomplish this work, the Grantee will perform the following tasks:

Task 1. Coordinate closely with and provide field work logistical support for DOE-funded researchers from the Alaska Division of Geological and Geophysical Surveys (DGGS).

Task 2. Compile all exsiting geological, geochemical, geophysical, and hydrologic data in the study area. Integrate and interpret these data and appropriate data from other Alaska volcanos to develop a/model for the nature and occurrence of a high-temperature geothermal resource on Mt. Spurr.

Task 3. On the south and southeast flanks of the volcano, conduct helium and mercury geochemical surveys. Also, conduct self-potential, resistivity, and controlled-source audio magnetotelluric studies in this area. Conduct appropriate analytic and modeling techniques to transform field data to a useful format.

Task 4. On the central ice field, conduct appropriate gravity and radar studies to identify the sub-ice topography and other appropriate geological characteristics of a caldera. Conduct appropriate analytic and modeling techniques to transform field data to a useful format.

Task 5. Conduct, k-Ar and 14C dating of young pyroclastics deposits, if suitable dating samples can be found. Coordinate collection of these samples with petrologic studies being conducted by Alaska DGGS.

Task 6. Integrate the data from Tasks 2, 3, 4, and 5 above with results of Alaska DGGS studies, in order to interpret these and develop a comphrehensive model of the nature and occurrence of high-temperature geothermal resources on the volcano.

Task 7. Prepare a final report which will present all the data from Tasks 2-6 above, including a model of geothermal resources and suggestions for further studies, based on techniques that are found to be successful or unsucessful.

Task 8. Provide overall project management and complete and report on tasks in a timely manner. Management reports shall be provided as defined by the attached DOE Form EIA 459A - Reporting Requirements Checklist. The required reports are summarized as follows:

use helium, mercury, self-potential and electrical (resistivity and controlled-source audio magnetotelluric) surveying methods. Our second goal is to verify or disprove the large caldera hypothesis by means of gravity and radar surveys of ice depth across the central ice field. In addition, we will do K-Ar and ^{14}C dating of the pyroclastic deposits which are likely products of a caldera-forming eruption, in order to establish age constraints for the suspected high-level magma chamber. K-Ar dating costs will be funded by our ongoing GI-DGGS cooperative geochronology program at no cost to this proposal budget.

Our field work will be conducted jointly with the geologic mapping, petrologic and geochemical studies by DGGS geologist Chris Nye. The results of these joint studies will be presented in coordinated, final G.I. and D.G.G.S. reports assessing the geothermal energy potential of the area. This proposal budget covers logistic support for the combined interagency (GI-DGGS) field party. Funds for DGGS salaries, analytical support and travel are being requested in a separate, coordinated DGGS proposal.

EQUIPMENT

Funds are requested to replace two components of our controlled-source audio magnetotelluric system. This system has proved to be extremely effective for detecting deep zones of low resisitivity during our 1984 field work in the Copper River basin, and has excellent potential for the proposed Mt. Spurr study.

This year our military surplus 30KVA 400 cycle generator failed just prior to the field season, requiring the very costly ($4000) leasing of a replacment unit from Geotronics Corp. in Texas. The damage to our old military surplus unit is presently being evaluated by our electronics shop personnel. It is likely that the unit may be beyond cost-effective repair.

date valley bottom pyroclastics possibly associated with a caldera forming eruption have yielded "zero" K-Ar ages (J. Riehle, personal comm.), suggesting that the suspected caldera magma chamber is likely to be young enough to have retained significant amounts of heat up to the present time.

In 1983 the state of Alaska held a geothermal lease sale on the south flank of Mt. Spurr. Although industry expressed some interest in the area, no competent bids were made, due primarily to the lack of any geophysical or geochemical exploration work in the area. This lease offering was unfortunate for geothermal energy development in Alaska, as it gave "proof" to detractors of geothermal energy that there was no interest in geothermal development and that all state exploration and development activities should cease. Nevertheless, the state has funded exploratory drilling programs on Unalaska Island and at Pilgrim Springs, as well as our recent exploration work in the Copper River basin, due in large part to the very encouraging results of the DOE state-coupled programs in these areas.

We believe that an exploration program in the Mt. Spurr area is important for the future of geothermal energy in Alaska. Because of the geological setting discussed above we believe there is an excellent chance of a high temperature resource at Mt. Spurr. The consumers of Mt. Spurr power would be the Chugiak Electric Association to feed into the Anchorage-Fairbanks grid through the new intertie which will soon connect these cities. The western side of Cook Inlet is also being developed, and the future power needs of this area will also increase significantly.

PROPOSED WORK

The research effort on Mt. Spurr will encompass two goals. The first will be to explore the south and southeast flanks geophysically and geochemically for evidence of high temperature geothermal reservoirs. We will

Department of Energy

Idaho Operations Office
785 DOE Place
Idaho Falls, Idaho 83402

January 27, 1987

Dr. Donald L. Turner
University of Alaska
Geophysical Institute
Fairbanks, AK 99775-0800

SUBJECT: Final Report Grant No. DE-FG07-84ID12471

Dear Dr. Turner:

I have received your letter of January 21, 1987. Since you will not be able to revise the final report, please be sure to maintain the raw data and details not reported so that if anyone desired to see them they could contact you.

Also, please note our address change.

Very truly yours,

Peggy

Peggy A.M. Brookshier
Project Manager
Advanced Technology Division

cc: Ron King, DOE-ID
Marshall Reed, DOE-HQ
Howard Ross, UURI

Rec 1/28 NPR

Department of Energy

Idaho Operations Office
785 DOE Place
Idaho Falls, Idaho 83402

January 23, 1987

Dr. Gene Wescott
University of Alaska
Geophysical Institute
C.T. Elvey Building
Fairbanks, AK 99701

SUBJECT: Final Report - Grant No. DE-FG07-84ID12471

Dear Dr. Wescott:

We have reviewed your final report. The memo with the comments by Howard Ross is attached. We would like you to address the comments and resubmit the final report. In order to help keep your costs down, please send me one copy plus the camera ready copy of the revised final report.

If you have any questions, please call either myself or Howard Ross.

Very truly yours,

Peggy A.M. Brookshier
Project Manager
Advanced Technology Division

Enclosures

cc: R. King, DOE-ID, w/enc.
H. Ross, UURI, wo/enc.

Rec 1/26/87 WPR

January 21, 1987

Ms. Peggy Brookshire
Energy Technology Division
U.S. Department of Energy
Idaho Operations Office
550 2nd Street
Idaho Falls, ID 83401

Dear Ms. Brookshire:

We would like to apologize for our oversight in submitting the Mt. Spurr project report in final form rather than in the draft form stipulated in our contract. We unintentionally overlooked the requirement that a preliminary draft was required 45 days in advance. We regret that our oversight may have caused administrative problems for you and Dr. Ross.

In a recent phone conversation, Dr. Ross expressed some concern regarding our performance of two contract work statement tasks -- ^{14}C dating and the gravity survey of the Mt. Spurr summit icefield. We wish to point out that ^{14}C dating was, in fact, done at no cost to DOE on the only datable sample relevant to our project. This work is discussed in Chapter 1, page 8 of our report. An extensive search by Dr. Jim Beget, our Quaternary geologist on the project, produced no other suitable samples for radiocarbon work. The extensive K-Ar dating in our report was almost entirely paid for by the Geophysical Institute.

With regard to the gravity survey, we did begin this work by establishing a gravity base station at our field airstrip and tying it to the standard gravity station at Palmer, Alaska. However, two logistical problems prevented the gravity work from being continued: 1) The ceiling was almost always below the 10,000-ft level of the icefield where the work was to be done. 2) Our pilot decided that the helicopter engine could not be shut down at the 10,000-ft elevation because it might not restart, causing the party to be stranded on the mountain. Alternatively, operating with the engine running continuously would have seriously depleted our fuel supply. Given these considerations, we made the decision in the field to cancel the gravity survey. Gravity work at lower elevations was never planned, as it would have produced little useful information for this project. You will note from our report (Chapter 3) that the objective of the summit gravity survey (defining the configuration of the ice-filled summit depression as a means of testing the caldera hypothesis) has been fulfilled by our VLF resistivity and radar survey of the area. This latter work was much less time-intensive than the planned gravity survey, so we were able to get it done during times when the summit was clear, using only about 3 days of helicopter time.

Overall, we believe that the final report we have submitted represents a significant advance in our knowledge of the geothermal energy resource potential of the Mt. Spurr area. We operated under difficult logistic conditions in a remote area of Alaska and were able to collect, analyze and interpret a very large amount of new data. Marshall Reed told us, after reviewing one of our earlier quarterly reports, that he was very pleased with the amount of work we were able to accomplish, given the limited field time available and the difficult field conditions. At this point we have each put in over 1 1/2 months on this project over and above the time budgeted in our contract. We are both very satisfied with the report. We hope that you will find it to be satisfactory. We are now heavily committed to other projects and would find it very difficult to undertake revisions. Once again, our apologies for any problems that our oversight may have caused.

Sincerely,

Donald L. Turner
Professor of Geology

Eugene M. Wescott
Professor of Geophysics

vli
cc: Marshall Reed
Howard Ross
Neta Stilkey

rec'd@ESL
13 Nov '84
DF

GI 85-27

RESEARCH PROPOSAL

TO

U.S. DEPARTMENT OF ENERGY

GEOTHERMAL ENERGY RESOURCE INVESTIGATION OF MT. SPURR, ALASKA

Geophysical Institute
University of Alaska
Fairbanks, Alaska, 99701

A Cooperative Study with the State of Alaska Division of Geological and Geophysical Surveys

September 1984

Donald L. Turner
Principal Investigator
Geophysical Institute
Tel. (907) 474-7198

Neta J. Stilkey
Business Manager
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Tel. (907) 474-7644

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Vice Chancellor for Research
and Advanced Study
University of Alaska
Tel. (907) 474-7314

Juan G. Roederer
Director
Geophysical Institute
Tel. (907) 474-7282

RESEARCH PROPOSAL TO.	U.S. Department of Energy
TITLE:	Geothermal Energy Assessment of Mt. Spurr, Alaska
INSTITUTION.	Geophysical Institute University of Alaska Fairbanks, Alaska 99701
PRINCIPAL INVESTIGATOR.	Donald L. Turner Professor of Geology S.S. #569-46-1429
CO-PRINCIPAL INVESTIGATOR:	Eugene M. Wescott Professor of Geophysics S.S. #563-40-7834
DURATION OF PROJECT.	1 year
STARTING DATE:	March 1, 1985
AMOUNT REQUESTED FROM DOE:	$130,526

ABSTRACT

In 1983 the State of Alaska held a geothermal lease sale on the south flank of Mt. Spurr, an active volcano on the west side of Cook Inlet, approximately 80 miles west of Anchorage. Although industry expressed some interest, they pointed out that practically no geological or geophysical work had been done to provide the necessary data for a leasing decision on their part. Recent work by the USGS suggests that Mt. Spurr may indeed be a high temperature geothermal resource. There are pyroclastics in nearby valley bottoms, and a radar sounding in the central ice field of 380 m suggests the presence of a large caldera, which is also suggested by recent U-2 vertical stereo photo pairs.

We propose to carry out helium and mercury soil surveys, and electrical geophysical surveys to look for high temperature geothermal prospects. We also propose to carry out detailed gravity and radar sounding surveys to measure ice depth in the central ice field in order to be able to confirm or reject the caldera hypothesis. We will also do K-Ar and ^{14}C dating of pyroclastics in order to place age constraints on the suspected caldera-forming eruption and on the possible cooling history of the suspected high level silicic magma chamber. Our proposed work will be done in collaboration with Alaska DGGS geologic mapping, volcanic petrology, and preexisting gas and water chemistry, in order to most effectively characterize the geothermal potential of the Mt. Spurr area. DGGS is requesting funds for this work in a separate, coordinated proposal. This proposal budget includes all logistical support for the combined GI-DGGS field party.

GEOTHERMAL ENERGY ASSESSMENT OF MT. SPURR, ALASKA

INTRODUCTION

Mt. Spurr is a large andesitic strato volcano located about 80 miles west of Anchorage and about 40 miles from the Beluga electrical transmission line on the west side of Cook Inlet. Its high flanks are covered with ice and snow fields. The volcano is composed of andesitic flows and pyroclastic breccias which overlie a basement of granite and quartz diorite.

On July 9, 1953, a parasitic crater on the south flank erupted a large cloud of ash and steam to a height of 60-70,000 ft. Anchorage was covered with about 1/4 inch of ash, and ash fell as far away as Valdez.

Capps (1935) suggested that Mt. Spurr might be a central cone built inside an older very large caldera, breached in places by glaciated valleys. However, Juhle and Coulter (1955) disagreed, pointing out that the dips of flows and pyroclastics on the flanks of individual peaks of the eastern "crater rim" are quaquaversal, and that the peaks of the "western rim" are entirely granitic rocks.

Recent work by the USGS tends to support the caldera hypothesis. A radar echo sounding in the central ice field yielded an ice depth of 380 meters (R. March, personal comm.). Our examination of recent U-2 vertical stereo photography also supports the caldera hypothesis.

It is critical to the geothermal energy assessment of this area that the caldera question be resolved. The presence of a caldera would prove that the volcano has evolved a high level magma storage chamber. It is likely that large amounts of viscous and partially crystallized magma would be left in the magma chamber following a caldera-forming eruption, resulting in a high-level heat source that could produce one or more high temperature geothermal steam systems suitable for electrical power generation. Initial USGS attempts to

date valley bottom pyroclastics possibly associated with a caldera forming eruption have yielded "zero" K-Ar ages (J. Riehle, personal comm.), suggesting that the suspected caldera magma chamber is likely to be young enough to have retained significant amounts of heat up to the present time.

In 1983 the state of Alaska held a geothermal lease sale on the south flank of Mt. Spurr. Although industry expressed some interest in the area, no competent bids were made, due primarily to the lack of any geophysical or geochemical exploration work in the area. This lease offering was unfortunate for geothermal energy development in Alaska, as it gave "proof" to detractors of geothermal energy that there was no interest in geothermal development and that all state exploration and development activities should cease. Nevertheless, the state has funded exploratory drilling programs on Unalaska Island and at Pilgrim Springs, as well as our recent exploration work in the Copper River basin, due in large part to the very encouraging results of the DOE state-coupled programs in these areas.

We believe that an exploration program in the Mt. Spurr area is important for the future of geothermal energy in Alaska. Because of the geological setting discussed above we believe there is an excellent chance of a high temperature resource at Mt. Spurr. The consumers of Mt. Spurr power would be the Chugiak Electric Association to feed into the Anchorage-Fairbanks grid through the new intertie which will soon connect these cities. The western side of Cook Inlet is also being developed, and the future power needs of this area will also increase significantly.

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The research effort on Mt. Spurr will encompass two goals. The first will be to explore the south and southeast flanks geophysically and geochemically for evidence of high temperature geothermal reservoirs. We will

use helium, mercury, self-potential and electrical (resistivity and controlled-source audio magnetotelluric) surveying methods. Our second goal is to verify or disprove the large caldera hypothesis by means of gravity and radar surveys of ice depth across the central ice field. In addition, we will do K-Ar and ^{14}C dating of the pyroclastic deposits which are likely products of a caldera-forming eruption, in order to establish age constraints for the suspected high-level magma chamber. K-Ar dating costs will be funded by our ongoing GI-DGGS cooperative geochronology program at no cost to this proposal budget.

Our field work will be conducted jointly with the geologic mapping, petrologic and geochemical studies by DGGS geologist Chris Nye. The results of these joint studies will be presented in coordinated, final G.I. and D.G.G.S. reports assessing the geothermal energy potential of the area. This proposal budget covers logistic support for the combined interagency (GI-DGGS) field party. Funds for DGGS salaries, analytical support and travel are being requested in a separate, coordinated DGGS proposal.

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This year our military surplus 30KVA 400 cycle generator failed just prior to the field season, requiring the very costly ($4000) leasing of a replacment unit from Geotronics Corp. in Texas. The damage to our old military surplus unit is presently being evaluated by our electronics shop personnel. It is likely that the unit may be beyond cost-effective repair.

We are therefore requesting funds to purchase a modern 30KVA unit from Geotronics Corp. Should the unit prove to be econmocially repairable, we may be able to reduce this budget item to the cost of repairs. A unit of this size is required to provide sufficient power for our Zonge Engineering 20 ampere AMT transmitter.

We are also requesting funds to replace our present AMT magnetometer coil, which has been found to have insufficient gain to allow acquisition of data with good signal-to-noise characteristics over the wide frequency range required for our operation. Our present coil is another surplus unit which was donated to us from an inactive G.I. project.

Funds have also been requested to purchase a Data Precision digital voltmeter, which is required for self-potential and resistivity surveying.

REFERENCES

Capps, S.R., 1935, The southern Alaska Range, U.S. Geological Survey Bull. 862, 101 p., 8 plates.

Juhle, R.W. and N.W. Coulter, 1955, Mt. Spurr (Alaska) eruption, July 9, 1953, Am. Geophys. Union Trans., 36(2):199-202

Budget

Salaries		
Principal Investigator, D. Turner Prof. of Geology, 2½ mo. @$6155	15,388	
Co-Principal Investigator, E. Wescott, Prof. of Geophysics, 2½ mo. @$6928	17,320	
3 Graduate Students, 2 mo. each @$1676 70% of $10,056*	7,039	
Camp Cook, 1 mo. @$2500	2,500	
Subtotal	42,247	
5% salary increment FY85	2,112	
Subtotal	44,359	
5% salary increment FY86	2,218	
Subtotal	46,577	
Reserve for annual leave 11%**	3,967	
Holiday and sick leave 9.5%**	3,426	
Total Salaries		53,970
Staff Benefits** Hospitalization, Social Security, Retirement, 19% of $43,454		8,256
Travel		
2 round trips Fairbanks-Kona for annual Geothermal Resources Council Meeting, including 10 days subsistence @$80/day	2,430	
Registration for Kona meeting	400	
		2,830
Materials and Supplies Miscellaneous field supplies		3,000
Equipment		
30 KVA, 400 cycle generator for controlled-source audiometatelluric surveys	12,000	
AMT magnetometer coil	5,500	
Paulin surveying altimeter	1,065	
		18,565
Other Direct Costs		
Helicopter charter, 21 days @ 3 hr./day minimum, @$440/hr. with fuel included (Hughes 500C)	27,720	
Fixed wing aircraft charter for transporting personnel & equipment to & from field site, 6 round trips Palmer, Alaska to base of Mt. Spurr @$700	4,200	$1,545/day
21 days food, propane, heating fuel and miscellaneous camp supplies for 9-person field crew (includes helicopter pilot & 3 A.D.D.G.S. geologists) @$25/day/person	4,725	
Use of G.I. vehicles, 1300 miles @$.50/mi.	650	
Communications & shipping	2,000	
Subcontract: U.S. Geological Survey, helium soil gas analyses; 100 samples @$15	1,500	
Subcontract: Chemical Projects, Ltd., helium & organic soil gas analyses, 50 samples @$45***	2,250	

Budget

Other Direct Costs (continued)		
Computer time	500	
Electronic shop service center, 20 hr. @$40	800	
Machine shop service center, 8 hr. @$44	352	
Programming service center, 8 hr. @$31.75	254	
Secretarial service center, 40 hr. @$28	1,120	
Photo/Graphics service center, 50 hr. @$34.50	1,725	
		47,796
Total Direct Costs		134,417
Indirect Costs		
39.8% of total modified direct costs ($115,852)		46,109
Total Budget		180,526
Less funds to be carried over from ongoing DOE contract DE-FG07-84ID12471		(50,000)
Total Amount Requested		130,526

* The Geophysical Institute will cost share an additional 30% of the Graduate Students' salaries, i.e. $4650.

** Not computed on Graduate Student or Camp Cook salaries.

*** Note: Part of these funds will be used for ^{14}C dating if appropriate organic layers can be found associated with the pyroclastic units to be dated.

Additional Note: The Geophysical Institute will provide K-Ar dating at no cost to this budget. This should amount to approximately $3,000 (6 dates @$500).

PERSONAL DATA

NAME: Donald L. Turner

DATE OF BIRTH: December 21, 1937

PLACE OF BIRTH: Richmond, California

EDUCATION:

A.B. University of California, Berkeley, 1960, Geology
Ph.D. University of California, Berkeley, 1968, Geology

POSITIONS HELD AND EXPERIENCE:

Research Assistant, K-Ar Laboratory, University of California, Berkeley, 1963-1965.
Teaching Assistant, University of California, Berkeley, 1965-1966.
Research Assistant, K-Ar Laboratory, University of California, Berkeley, 1966-1967; President of Earth Sciences Club.
Post-doctoral Research Associate, Isotope Geology Branch, U.S. Geological Survey, Denver, Colorado, 1967-1968.
Post-doctoral Research Associate, Isotope Geology Branch, U.S. Geological Survey, Menlo Park, California, 1968-1970.
Associate Professor of Geology, Geophysical Institute and Geology/Geophysics program, University of Alaska, Fairbanks, Alaska, 1970-1979.
In charge of development and operation of Geochronology Laboratory, 1970-present.
Geologist (W.A.E.) with U.S. Geological Survey, 1970-present.
Professor of Geology, Geophysical Institute and Geology/Geophysics program, 1980-present.
Visiting Research Geologist at U.S. Geological Survey, Denver and Australian National University, Canberra, 1980-1981 academic year.

PROFESSIONAL ORGANIZATIONS:

American Geophysical Union
ΣXi

HONORS AND AWARDS:

National Research Council Post-doctoral Research Associateship in Isotope Geology
Geological Society of America Penrose Research Grant
Honorary Membership in Society of Economic Paleontologists and Mineralogists
Graduate Thesis Research Grants from Standard Oil Company of California, Union Oil Company and Atlantic Richfield Company.
1974 Penrose Conference on Linear Volcanic Chains and Plate Motions-invited paper.
1975 Penrose Conference on Plio-Pleistocene Geochronology-invited paper.
1976 Penrose Conference on Geology of Metamorphic Systems-invited paper.

HONORS AND AWARDS (Cont'd)

1982 Alaska Geological Society Annual Meeting-luncheon speaker.
1983 Geological Society of America Symposium on Pacific Margin Tectonostratigraphic Terranes-invited paper.
1984 Geological Society of America Symposium on the Yukon-Koyukuk Basin-2 invited papers.

PRESENT RESEARCH INTERESTS:

Geochronology, regional tectonics, radiometric calibration of time scales based on fossils, radiometric studies of geothermal gradients, Alaskan geothermal energy resource assessment, dating of ash partings in coals, origin and tectonic significance of Pacific island and seamount chains.

Published Articles

Hall, C. A., D. L. Turner, R. C. Surdham, Potassium-argon age of the Obispo Formation with Pecten lompocensis Arnold, southern Coast Ranges, California, Geol. Soc. Amer. Bull., V. 77, 443-446, 1966.

Turner, D. L., Potassium argon dating of Pacific Coast Miocene foraminiferal stages, in Geol. Soc. Amer. Spec. Paper 124, Paleontologic Zonation and Radiometric Dating, 91-129, 1970.

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Smith, T. E. and D. L. Turner, Geochronology of the Maclaren metamorphic belt, south-central Alaska: a progress report, Isochron West, No. 7, 21-25, 1973.

Huffman, O. F., D. L. Turner and R. N. Jack, Offset of late Oligocene-early Miocene volcanic rocks along the San Andreas fault in central California, Proc. Conf. on Tectonic Problems of the San Andreas Fault System, Stanford Univ. Publication in Geol. Sci., 13, 368-373, 1973.

Forbes, R. B., D. L. Turner, J. Stout, T. E. Smith and F. Weber, The Denali Fault Offset problem, in, United States Geological Survey Alaska Program, 1973: U.S. Geol. Survey Circular 683, p. 46, 1973.

Forbes, R. B., D. L. Turner and J. R. Carden, $^{40}K/^{40}Ar$ age of trachyte from Observation Hill, Hut Point Peninsula, Ross Island, Antarctica, Geology, V. 2, No. 6, 297-298, 1974.

Hoare, J. M., R. B. Forbes and D. L. Turner, Precambrian rocks in Southwest Alaska, in, U.S. Geological Survey Alaska Program, 1974: U.S. Geol. Survey Circular 700, p. 46, 1974.

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Wahrhaftig, C., D. L. Turner, F. R. Weber and T. E. Smith, Nature and timing of movement on the Hines Creek strand of the Denali fault system, Alaska, Geology, 3, No. 8, 463-466, 1975.

Turner, D. L., D. Grybeck and F. H. Wilson, Radiometric dates from Alaska: a 1975 Compilation, State of Alaska Department of Natural Resources, Div. of Geol. and Geophys. Surveys, Special Report 10, 64 p., 1975.

Kienle, J. and D. L. Turner, The Shumagin-Kodiak Batholith-a Paleocene magnetic arc? in Short Notes on Alaska Geology, Alaska Div. Geol. and Geophys. Surveys, Geologic Report 51, 9-11, 1976.

Gilbert, W. G., V. Ferrell and D. L. Turner, The Teklanika Volcanic formation in the central Alaska Range, Alaska, Alaska Div. of Geol. and Geophys. Surveys, Geologic Report 47, 16 p., 1976.

Carden, J. R., W. Connelly, R. B. Forbes and D. L. Turner, Blueschists of the Kodiak Islands, Alaska: an extension of the Seldovia schist terrane, Geology, V. 5, 529-533, 1977.

Triplehorn, D. M., D. L. Turner and C. W. Naeser, K-Ar and fission-track dating of ash partings in coal beds from the Kenai Peninsula, Alaska: a revised age for the Homerian Stage-Clamgulchian Stage boundary, Geol. Soc. Amer. Bull., V. 88, p. 1156-1160, 1977.

Hudson, T., G. Plafker and D. L. Turner, Metamorphic rocks of the Yakutat-St. Elias area, south-central Alaska, Jour. Research U.S. Geol. Survey, Vol. 5, No. 2, p. 173-184, 1977.

Weber, F. R., and D. L. Turner, a late Tertiary thrust fault in the central Alaska Range, in U.S. Geol. Survey in Alaska during 1976 accomplishments, U.S. Geol. Survey Circular, 751B, p. 1367-1377, 1977.

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Forbes, R. B., J. R. Carden, D. L. Turner and Wm. Connelly, Regional tectonic implications of Alaskan Blueschist terranes, in The Relationship of Plate Tectonics to Alaskan Geology and Resources Alaska Geol. Soc. 1977 Symposium Vo., p. L1-L28, 1979.

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PUBLICATIONS:

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September 1984

UNIVERSITY OF UTAH RESEARCH INSTITUTE

UURI

EARTH SCIENCE LABORATORY
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TELEPHONE 801-524-3422

March 4, 1985

MEMORANDUM

TO: Gene Wescott

FROM: Duncan Foley

SUBJECT: Review of gravity program

Attached please find a memorandum from Howard Ross to me, evaluating the GM3D model. If you have any questions, please call Howard or me. I hope this helps.

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MEMORANDUM

February 25, 1985

TO: Duncan Foley

FROM: Howard Ross

SUBJECT: Evaluation of GM3D gravity model output for Alaska State Team

I have completed a brief review of four gravity model input/output sets submitted by Gene Wescott, Geophysical Institute, University of Alaska on behalf of a student presently working with program GM3D. A first inspection of the output did indeed suggest there may be problems with program GM3D, or in its conversion to the University of Alaska VAX computer system.

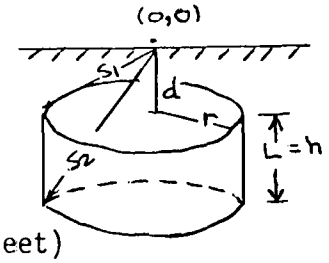
Plotting the source bodies roughly to the scale of the grid interval shows that the prisms are extremely small when compared to the grid interval and for the four computed models only one point (the -207 mg value) was totally over the anomalous prism, and only one point (-108 mg) was over an edge. All other computed data values were at least 0.50 grid intervals from a corner, or farther from an edge of the body. Besides being of small horizontal extent (as compared to the grid interval), the prisms are shallow (0.025 g.i.) and thin (0.05 g.i.). As a result the gravity anomaly attenuates very rapidly as one moves away from the center of the prism.

I made an independent calculation of the maximum anomaly amplitude, by computing the anomaly above a buried vertical cylinder, on its axis. A cylinder of equivalent volume is given by

$$V_c = V_p \ , \ \pi r^2 h = x^2 h,$$

so

$$r = \sqrt{\frac{x^2}{\pi}} = 74{,}044.24 \text{ ft.}$$



Using a simple formula from Dobrin (1960),

$$g_z = 2\pi\gamma\sigma\,(L - S_1 + S_2) \qquad (L,\ S_1,\ S_2 \text{ in kilofeet})$$

$$g_z = -207.67 \text{ mg}$$

which compares to the $g_p = -207.09$ mg from GM3D. Thus the data point in question has not been "blown up" but has a correct amplitude of -207.09 mg.

Unfortunately, I was unable to duplicate the model results by using our archive copy of GM3D. We have been awaiting parts to repair our tape drive and GM3D is not routinely available without respooling. Instead I have computed several models using our improved program, GM3, which was accessible. GM3 uses the same numerical algorithms as GM3D, but has some new tests for divide by zero, some output changes, and the +Y1 axis is geographic north. Nonetheless, I have duplicated most of the results of the models submitted and I can see no problem with their version of GM3D.

Copies of several models are included to indicate the importance of a proper grid size, to compare anomaly magnitudes at various places, etc. It is important to note the maximum values, contour intervals and matrix (scaling) factors for our line printer contour maps. Our GM3 version plots out 3 or 4 significant figures and requires annotation of the decimal point. A brief description of the output follows:

Model A-1 single prism, g.i. = 65620 ft.

This grid interval is 0.25 the size of the University of Alaska grid interval, and permits computation points over the center, over an edge, and over a corner with resulting values of -207, -108.1, and -57.2 mg respectively. These agree with data values for equivalent positions on the various University of Alaska plots.

Model A-2 single prism, g.i. = 32810 ft.

Similar to A-1 but with a smaller grid which better illustrates the rapid attenuation of anomaly amplitude near the edge and corners of this shallow, thin prism.

Model A-3

Same prism, large grid interval, offset from center to the southeast quadrant (different from GM3D). Nearest data points (-1.76 mg) are about 0.5 g.i. from corners. Agrees with University of Alaska models.

Model A-4

Five prisms, large grid interval. Duplicates results of University of Alaska output. Note virtues of drawing bodies to scale.

Gene Wescott also mentioned that he may have had a problem with a magnetic model. I recall some discussion of an error in an early version of GM3D when the observation point was located directly over an edge (or corner?) of a prism. If there was such an error we had it corrected in later versions of GM3D and GM3. I have used the same single prism model for calculating a magnetic model at the north magnetic pole (D = 0°, I = 90°), model M-1, and for Arizona field parameters (D = 15°, I = 60°), model M-2.

Although the anomaly contours are a little irregular, I believe this is

because the observation points are so close to the prism. I see no indication of erratic values over corners or edges on this output from our new version, GM3. I suggest that Gene try to duplicate these model results using his program. Have him call me if there is a problem.

Dan (Gene's student?) noted the need for a larger grid, such as 30 x 30. We also had the need and have a larger, variable grid option in our proprietary version, GM3. I suggest he can use a smaller grid interval over individual bodies to get a better result, then piece the results together. Note that GM3D has the capability for offsetting the desired computational grid of (15, 15) from the geographic center of the model.

Howard

Howard P. Ross
Section Head, Geophysics

HPR/jp

CONTRACT DELIVERABLES

ORGANIZATION Geophysical Institute, Univ. Alaska

PRINCIPAL CONTACTS Dr. Donald Turner PHONE 907-474-7198
Dr. Gene Wescott 907-474-7576

CONTRACT NO. DE-FG07-84ID12471 COMPLETION DATE 5-31-86

ORIG. $	OBLIGATED	PAID	RETAINED	REMAINING	NOTES
DOE	$117,000	54,044		62,956	inv. 1-10
STATE	0			0	

MOD.1 $	OBLIGATED	PAID	RETAINED	REMAINING	NOTES
DOE	$117,000			117,000	
STATE	0			0	

vouchers 11, 12 ($971) outstanding (as of 6-24-85)
voucher 13 (?) for $7024 received in ID (8-13-85)
$ DATA UPDATED 8-14-85

:

CONTRACT	START	TASKS
ORIGINAL	5-31-84	All work is to be done in the Copper River Basin area 1. define He and Hg anomalies, to site geophysical studies 2. SP, gravity, and ground magnetic studies 3. further He and Hg sampling 4. SP of 2 He anomalies at Klawasi mud volcanos 5. He and Hg in area of Task 4 6. gravity in area of Task 4 7. deep EM in all anomalous areas 8. final report 9. management
MOD. 1	5-30-85	All work on this mod is to be done in the Mt. Spurr area 1. coordinate closely with and provide field support for AK DGGS researcher 2. compile existing data. develop resource model 3. Hg, He, SP, resistivity, CSAMT, of south and southeast flanks 4. radar and gravity of central ice field 5. dating, without cost to project 6. develop model of resource 7. final report 8. continue management

DF/ESL/8-14-85

COMMENTS 4-29-85
Field work and most data analysis are completed. Text writing is in progress. (Copper River Basin)
COMMENTS 8-14-85
Field work at Mt. Spurr has been completed, and data reduction has begun.

TASK	DELIVERABLES	DATE DUE	REC'D
1-7	see #8		
8	final report, to include: maps and data on geochemical and geophysical anomalies, with a geothermal interpretation, in detail sufficient to allow readers to interpret results	5-31-86	
	draft final report	4-16-86	
9	quarterly reports	10-15-84	11-16-84
		1-15-85	1-16-85
		4-15-85	4-15-85
		7-15-85	missing
		10-15-85	
		1-15-86	
		4-15-86	

NOTE: ESL does not have the final edition of the Mod. 1 Statement of Work. The outline included here is from an early draft. Conversation with Don Turner on Aug. 13, 1985, indicated that rather than sending a quarterly progress report for 7-15-85, they plan to send the final report for the Copper River Basin study by the end of August.

AK-DGGS

10-06-86

Voucher	1 Amt	2 Σ #	# Avail	Left	5	Billed thru	Comments	8	9	
1			27,875			Orig Cont.	Copper River Basin.			
2			39,891	67,766		Mod. 2 Added	11-27-85	Mt. Spurr		
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ADDENDUM AND CORRECTIONS

UAG R-311

Stratigraphy, Petrology, and Geochemistry of the Spurr Volcanic Complex, Eastern Aleutian Arc, Alaska

Christopher J. Nye
Geophysical Institute
University of Alaska Fairbanks

(with an appendix describing geothermal fluid chemistry by Roman J. Motyka and Christopher J. Nye)

The following disclaimer applies:

P. 3, para. 1. "U.S. Department of Energy Grant DE-FG07-84-ID2471" should read "U.S. Department of Energy Grant DE-FG07-84-ID12524"

P. 60, para. 2. "U.S. Department of Energy Grant DE-FG07-84-ID12471" should read "U.S. Department of Energy Grant DE-FG07-84-ID12524"

Some copies of the report were distributed as UAG R-310. The correct Geophysical Institute report number is UAG R-311.

Rec 1/04/88

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

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December 28, 1987

Dr. Howard Ross
University of Utah Research Institute
Earth Science Laboratory
391 Chipeta Way, Suite A
Salt Lake City, Utah 84108

Dear Dr. Ross:

Enclosed is a copy of the final version of the report entitled "Stratigraphy, Petrology, and Geochemistry of the Spurr Volcanic Complex, Eastern Aleutian Arc, Alaska" by Christopher Nye with an appendix describing fluid chemistry by myself and Dr. Nye. Five copies of this report have been submitted to the U.S. Department of Energy in fulfillment of our contractual obligations under Grant DE-FG07-84ID12524, Geothermal Studies in Alaska, Task I.

Thank you for your critical review of the draft manuscript. Most of your suggested changes were incorporated into the final version.

Sincerely,

Dr. Roman J. Motyka
Geologist

Enclosure

RJM:als

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December 7, 1987

Dr. Roman J. Motyka
Alaska-Dept of Natural Resources
Division of Geological and Geophysical Surveys
400 Willoughby Ave., Third Floor
Juneau, AK 99801

Dear Roman:

Thank you for the opportunity to review the draft of the report "Stratigraphy, Petrology and Geochemistry of the Spurr Volcanic Complex" by Dr. Christopher Nye. Your own editorial comments throughout the text and the letter of general comments were most helpful, and after your careful review I have relatively little to add.

The report is generally well written and draws upon numerous detailed analyses to support the interpretation. Perhaps the main missing element is the need to tie this detailed volcanic stratigraphy study to geothermal resource evaluation earlier in the study (Introduction - your comment no. 4) and perhaps include a short generalized conclusion in the abstract. Could the conclusions also be extended to address the possibility of volcanic hazards as they relate to geothermal resource development as well?

A few additional comments and copies of pages with suggestions for rewording are attached. When your comments and the enclosed comments are addressed the report should be ready for final form.

Thank you again for the opportunity to review this report in draft form.

Sincerely,

Howard Ross

Howard P. Ross
Project Manager

cc: S. M. Prestwich

encl.

Review Comments for
"Stratigraphy, Petrology, and Geochemistry of the Spurr Volcanic Complex" by Dr. Christopher Nye

1. There should be an acknowledgement of DOE funding under Grant DE-FG07-84ID12524.

2. DOE or DGGS Disclaimer statement should be included.

3. **Abstract.** Include a brief summary of the conclusions relative to geothermal resource potential.

4. **Writing style.** Consider replacing the **"We ..."** statements with third person form **"It has been determined"** etc.

5. Earlier and more frequent reference to figures 1 and 2, when appropriate, would help to orient the reader. Some locations named in the text do not appear on these figures,i.e., Mt. Douglas, Hayes Volcano.

6. leMaitre (1982), and Helz (1976) are not included in the references.

7. **Pg. 20, para. 2** Where is section 5.1?

8. **Pg. 40, line 2.** Which data support the minimum 50,000 year resupply conclusion?

9. **p. 41, para. 2.** Clarify the statement of depth from which Holocene magmas rise.

10. From the conclusion of p. 43, 44, can anything be said about the potential volcanic hazard to any geothermal development,or just about the possibility of any near term (0-50 year) eruption? (See Turner & Wescott, 1986, p. iii).

11. **Pg. 44** ".. Turner and Wescott (1986) have described a subsurface discontinuous zone of low resistivity and related surface soil mercury and helium anomalies".

12. **References:** The format for references is not generally accepted and should be modified to the Alaska DGGS bibliography format (Note especially authors initials, and punctuation).

13. **Appendix cover pages:** Perhaps the cover page format could be improved by centering the Appendix number and title. Could any additional explanation of the data tabulations be included on the cover page or immediately following, or is the format familiar to most readers?

14. **Figure 1:** Needs a distance scale, north arrow, explanation of dashed line for 1000 m., identification of locations mentioned in the text, identification of numbered magnetic anomalies, etc.

15. **Figure 2.** Identify areas referred to in the text, use larger lettering, north arrow, reference source.

16. **Figure 3.** Indicate units for SiO_2(%), K_2O, MgO, abbreviations.

17. **Figure 7.** Identify units (ppm?) and abbreviations.

18. **Figure 4-18.** Are all units and abbreviations identified?

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

STEVE COWPER, GOVERNOR

☐ P.O. BOX 7028
ANCHORAGE, ALASKA 99510
PHONE: (907) 561-2020

☑ 794 UNIVERSITY AVENUE, BASEMENT
FAIRBANKS, ALASKA 99709
PHONE: (907) 474-7147

September 14, 1987

Jeff Hoyles
Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls, Idaho 83402

Dear Mr. Hoyles:

I would like to request a four-month no-cost extension to my current contract with DOE. The new contract expiration date would be December 31, 1987.

Dr. Nye has informed me that he has become aware of an error in the published algorithm which he has used to reduce much of his mineral chemistry. This will require that he redo many of the calculations necessary to produce his report on the geochemistry and geology of Mt. Spurr. The corrected data will alter his conclusions substantially.

We are, in one sense, lucky that this error came to light before the report was submitted; he was at the stage of writing down his conclusions.

Sincerely,

Roman J. Motyka / RJM

Roman J. Motyka

RJM/pv

cc: Peggy Brookshier
Howard Ross
Christopher Nye

UNIVERSITY OF UTAH RESEARCH INSTITUTE

UURI

EARTH SCIENCE LABORATORY
391 CHIPETA WAY, SUITE C
SALT LAKE CITY, UTAH 84108—1295
TELEPHONE 801-524-3422

March 27, 1987

Dr. Roman Motyka
Head, Geothermal Studies
Department of Natural Resources- DGGS
400 Wiloughty Bldg., 3rd Floor
Juneau, AK 99801

Dear Dr. Motyka:

Thank you for the opportunity to review the report "Alaska Geothermal Bibliography". It certainly is a comprehensive bibliography which will offer the researcher several options for finding the information available about a given topic. This should be a very useful volume for future workers.

The report is already in very good form, but I have a few recommendations regarding a few formalities (Acknowledgement of DOE funding and Disclaimer statement) and other comments which are attached. We appreciate the DGGS financial situation and hope that the suggested changes will not incur significant additional costs. Please feel free to call me at (801) 524-3444 to discuss any of the comments.

The bibliography is well done and should be a very useful item. Perhaps this report, and the final technical report, should be announced in the GRC Bulletin when completed.

Sincerely,

Howard Ross

Howard F. Ross
Section Head/Appl. Geophysics

encl
HR

RECOMMENDATIONS AND COMMENTS - ALASKA GEOTHERMAL BIBLIOGRAPHY

1. A one page Table of Contents which identifies new sections, tables, and figures by page would be most useful. A suggested page is enclosed.

2. An acknowledgement of DOE funding under Grant DE-FG07-84ID12524 is appropriate and should appear on the report cover or title page.

3. A Disclaimer statement or notice should also be included. When NTIS was reproducing and distributing DOE funded reports the standard Disclaimer appeared on the inside front cover. The statement could also include DGGS, in the event there is some sensitivity about ommited reports, company names, etc. A copy of the NTIS statement and a UURI disclaimer notice is enclosed for your consideration.

4. The initial description of the Bibliography could be titled Introduction, and be identified as such in the Contents.

5. The Introduction (description) should indicate that references include reports and published work through the year 1986 (?).

6. The start of each new section of the bibliography would be more clearly indicated if the cover page occurred on the right hand side (odd page number). It might also be helpful to refer to relevant tables or figures (maps) by page number on this cover page, i.e. for Section II,

   (see Table I -Abbreviations Used in Short Reference-Pg.223)
   (see Table II-Codes Used in Short References-Pg.227)

7. Adak - I was under the impression that the U S Navy (China Lake) had an ongoing program for Adak, and had at least completed a microearthquake survey, about 1981 (?) Is any of this information available in reports?

8. Mt. Spurr - Is it too late to include the final report to DOE by Turner and Wescott- Geothermal Energy Resource Investigations at Mt. Spurr, Alaska -December 1986?

Typos, Grammar, Spellings, Inconsistancies Noted in Reading

Pg.2, l.6 - etc.; l.11- appears

Pg.7, Beget, J.E.- Mt. ~~St.~~ St.? Augustine (?)

Pg.16, Davies, J.N. - volcanic

Pg.38, Lockhart, A.B., and Kienle, J., 1980 - seismic

Pg.51, Osterkamp et al, 1979 - Shallow thermal and electrical (?)

Pg.57, Robinson, M.S., et al, 1986 - selected

Pg.63, Stith, J.L., et al, 1977 - nuée ardente

Pg.64, Turner, D.L. and Forbes, R.B., eds,1980 - prepared for

Pg.223, 227 - Inconsistant capitalization in title

Pg.245 Adak - There may be some more recent work, even though not yet published

Pg.248, 1.12, para. 1 - like

Pg.251, Mt. Spurr, 1.23 - fired

Pg.253, Umnak, 1.13 - areas have

Pg.254, Willow-Lower Susitna Basin, 1.5 - data....have

Pg.255, U.S.G.S. - 345 Middlefield Rd, ...

Pg.258, Misc - UURI - ~~420~~ 391 Chipeta Way, Suite C, Salt Lake City, UT 84108 (address changed)

CONTENTS

NTIS Disclaimer (inside cover)

DISCLAIMER

UURI Disclaimer (before title page)

rec 2/23/87

United States Government **Department of Energy**

Idaho Operations Office

memorandum

DATE: February 19,1987

SUBJECT: State of Alaska Grant No. DE-FG07-84ID12524

TO: Ron King
R&D Contracts Branch

Attached is a copy of the letter Roman Motyka sent to me. I agree with his proposal of not printing the bibliography, but make it available at cost. Please send him a letter agreeing with his proposal.

Peggy

Peggy A.M. Brookshier
Project Manager
Advanced Technology Division

Attachment

cc: Marshall Reed, DOE-HQ, w/att.
Howard Ross, UURI, w/att.

STATE OF ALASKA
STEVE COWPER, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

400 Willoughby Bldg., 3rd Floor
Juneau, Alaska 99801
(907) 465-2520

February 9, 1987

Ms. Peggy Brooksheir, Program Manager
Energy & Technology Division
U. S. Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls, Idaho 83402

Dear Ms. Brooksheir:

I wish to appraise you of our need to revise our contract Grant DE-FG07-84ID12524, Geothermal Studies in Alaska, Task II, regarding publication of the "Alaska Geothermal Bibliography".

When we first submitted our proposal we had anticipated that sufficient in-house funding would be available to publish the bibliography as a ADGGS Special Report. Such is no longer the case.

We originally estimated the bibliography would be 25 double-spaced pages in length. In actuality, the final version is likely to exceed 200 pages. Cheri Daniels, our publications chief, estimates that offset printing of 1,000 to 1,500 copies of this document would cost $3,000 to $4,000. Severe budget cuts during the past two years have financially devastated our division and this level of funding cannot be made available without severely impacting other programs.

As a cost-saving way of placing the geothermal bibliography into the public domain, we propose the following alternative. The special report that would be published and distributed would consist only of a cover sheet and short information narrative. This document will briefly describe the contents and format of the actual full-length bibliography including the number and types of entries. This document will then state that the biblography has been compiled on a IBM-PC compatible personal computer using Data Base III and that a soft-copy of all or any part of the bibliography is available for a nominal fee if the interested party would supply a suitable tape or diskette (for an additional fee, ADGGS could also supply the tape or

diskette). Hard-copy print-outs would also be made available upon request using our laser printer at a cost of 10 cents per page.

One significant advantage of this sort of computer-based document is that in addition to the savings, the bibliography could also be continually updated so that subscribers could be assured of always having the most up-to-date version.

Six hard-copies of the bibliography would be sent to your office for your review in compliance with the contract. Additional hard-copies would be made available as requested. We anticipate that several hard-copies would also be distributed to our principal state-wide offices, the USGS in Anchorage and Fairbanks, and to the principal university libraries in the state.

Please let me know if this method of publication meets with your approval.

Sincerely,

Roman J. Motyka
Geologist

(7-81)

NOTICE OF FINANCIAL ASSISTANCE AWARD

(See Instructions on Reverse)

rec. 12/3/86

der the authority of Public Law 93-410 and
ject to legislation, regulations and policies applicable to (cite legislative program title): Geothermal Research, Development and Demonstration Act of 1977

PROJECT TITLE
Geothermal Study of Copper River Basin Area, Alaska

2. INSTRUMENT TYPE
☒ GRANT ☐ COOPERATIVE AGREEMENT

4. INSTRUMENT NO.
DE-FG07-84ID12524

5. AMENDMENT NO.
M004

RECIPIENT *(Name, address, zip code, area code and telephone no.)*
State of Alaska, Department of Natural Resources, 230 South Franklin Street
Juneau, AK 99801

6. BUDGET PERIOD
FROM: 11/15/86 THRU: 5/15/87

7. PROJECT PERIOD
FROM: 8/13/84 THRU: 5/15/87

10. TYPE OF AWARD
☐ NEW ☐ CONTINUATION ☐ RENEWAL
☒ REVISION ☐ SUPPLEMENT

RECIPIENT PROJECT DIRECTOR *(Name and telephone No.)*
Roman J. Motyka (907) 465-2520

RECIPIENT BUSINESS OFFICER *(Name and telephone No.)*

12. ADMINISTERED FOR DOE BY *(Name, address, zip code, telephone No.)*
Ronald A. King (208) 526-0790
U.S. Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls, ID 83402

DOE PROJECT OFFICER *(Name, address, zip code, telephone No.)*
Peggy A. Brookshier (208) 526-1403
U.S. DOE, Idaho Operations Office
785 DOE Place, Idaho Falls, ID 83402

RECIPIENT TYPE
☒ STATE GOV'T ☐ INDIAN TRIBAL GOV'T ☐ HOSPITAL ☐ FOR PROFIT ORGANIZATION ☐ INDIVIDUAL
☐ LOCAL GOV'T ☐ INSTITUTION OF HIGHER EDUCATION ☐ OTHER NONPROFIT ORGANIZATION ☐ C ☐ P ☐ SP ☐ OTHER *(Specify)*

ACCOUNTING AND APPROPRIATIONS DATA

a. Appropriation Symbol	b. B & R Number	c. FT/AFP/OC	d. CFA Number
N/A			

15. EMPLOYER I.D. NUMBER/SSN

BUDGET AND FUNDING INFORMATION

a. CURRENT BUDGET PERIOD INFORMATION		b. CUMULATIVE DOE OBLIGATIONS	
DOE Funds Obligated This Action	$ -0-	(1) This Budget Period [Total of lines a. (1) and a. (3)]	$ -0-
DOE Funds Authorized for Carry Over	$ 30,703		
DOE Funds Previously Obligated in this Budget Period	$ -0-	(2) Prior Budget Periods	$ 67,766
DOE Share of Total Approved Budget	$ 30,703		
Recipient Share of Total Approved Budget	$ -0-	(3) Project Period to Date [Total of lines b. (1) and b. (2)]	$ 67,766
Total Approved Budget	$ 30,703		

TOTAL ESTIMATED COST OF PROJECT $ _____

(This is the current estimated cost of the project. It is not a promise to award nor an authorization to expend funds in this amount.)

AWARD/AGREEMENT TERMS AND CONDITIONS

This award/agreement consists of this form plus the following:

a. Special terms and conditions (if grant) or schedule, general provisions, special provisions (if cooperative agreement)

b. Applicable program regulations *(specify)* N/A *(Date)* _____

c. DOE Assistance Regulations, 10 CFR Part 600, as amended, Subparts A and ☒ B (Grants) or ☐ C (Cooperative Agreements).

d. Application/proposal dated 10/13/86. ☐ as submitted ☐ with changes as negotiated

REMARKS

This modification revises the budget categories with no increase in obligated funds. Revision as attached. Project manager is changed to Roman Motyka.

EVIDENCE OF RECIPIENT ACCEPTANCE

(Signature of Authorized Recipient Official) *(Date)*

(Name)

(Title)

21. AWARDED BY

William C. Drake 11/24/86
(Signature) *(Date)*

William C. Drake
(Name)

Contracting Officer
(Title)

FEDERAL ASSISTANCE BUDGET INFORMATION FORM

FORM EIA-459C
(10/80)

FORM APPROVED
OMB No. 1900-0127

1. Program/Project Identification No.	2. Program/Project Title
DE-FG07-84ID12524	Geothermal Study of Copper River Basin Area, Alaska

3. Name and Address	4. Program/Project Start Date	5. Completion Date
State of Alaska, Department of Natural Resources 230 South Franklin Street Juneau, Alaska 99801	8/13/84	5/15/87

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No. (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. 12524		$ 0	$ 0	$ 30,703	$ 0	$ 30,703
2						
3						
4						
5 TOTALS		$	$	$	$	$

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity				Total (5)
	(1) 12524	(2)	(3)	(4)	
a. Personnel	$ 4,978	$	$	$	$ 4,978
b. Fringe Benefits	2,288				2,288
c. Travel	1,200				1,200
d. Equipment	-0-				-0-
e. Supplies	1,000				1,000
f. Contractual	21,237				21,237
g. Construction	-0-				-0-
h. Other	-0-				-0-
i. Total Direct Charges	30,703				30,703
j. Indirect Charges	-0-				-0-
k. TOTALS	$ 30,703	$	$	$	$ 30,703
7. Program Income	$	$	$	$	$

DOE F 4600.1
(7-81)

rec 10/10/86

U.S. DEPARTMENT OF ENERGY
NOTICE OF FINANCIAL ASSISTANCE AWARD
(See Instructions on Reverse)

Under the authority of Public Law 93-410 and subject to legislation, regulations and policies applicable to *(cite legislative program title):*
Geothermal Research, Development and Demonstration Act of 1977

1. PROJECT TITLE
Geothermal Study of Copper River Basin Area, Alaska

2. INSTRUMENT TYPE
☒ GRANT ☐ COOPERATIVE AGREEMENT

3. RECIPIENT *(Name, address, zip code, area code and telephone no.)*
State of Alaska, Department of Natural Resources, 230 South Franklin Street
Juneau, AK 99801

4. INSTRUMENT NO.
DE-FG07-84ID12524

5. AMENDMENT NO.
M003

6. BUDGET PERIOD
FROM: 11/15/85 THRU: 5/15/87

7. PROJECT PERIOD
FROM: 8/13/84 THRU: 5/15/87

8. RECIPIENT PROJECT DIRECTOR *(Name and telephone No.)*
Roman J. Motyka (907) 465-2520

10. TYPE OF AWARD
☐ NEW ☐ CONTINUATION ☐ RENEWAL
☒ REVISION ☐ SUPPLEMENT

9. RECIPIENT BUSINESS OFFICER *(Name and telephone No.)*

12. ADMINISTERED FOR DOE BY *(Name, address, zip code, telephone No.)*
Ronald A. King (208) 526-0790
U.S. Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls, ID 83402

11. DOE PROJECT OFFICER *(Name, address, zip code, telephone No.)*
Peggy Brookshier (208) 526-1403
U.S. DOE, Idaho Operations Office
785 DOE Place, Idaho Falls, ID 83402

13. RECIPIENT TYPE
☒ STATE GOV'T ☐ INDIAN TRIBAL GOV'T ☐ HOSPITAL ☐ FOR PROFIT ORGANIZATION ☐ INDIVIDUAL
☐ LOCAL GOV'T ☐ INSTITUTION OF HIGHER EDUCATION ☐ OTHER NONPROFIT ORGANIZATION ☐ C ☐ P ☐ SP ☐ OTHER *(Specify)*

14. ACCOUNTING AND APPROPRIATIONS DATA

a. Appropriation Symbol	b. B & R Number	c. FT/AFP/OC	d. CFA Number
N/A			

15. EMPLOYER I.D. NUMBER/SSN

16. BUDGET AND FUNDING INFORMATION

a. CURRENT BUDGET PERIOD INFORMATION

(1) DOE Funds Obligated This Action	$ -0-
(2) DOE Funds Authorized for Carry Over	$ 39,891
(3) DOE Funds Previously Obligated in this Budget Period	$ 39,891
(4) DOE Share of Total Approved Budget	$ 39,891
(5) Recipient Share of Total Approved Budget	$ -0-
(6) Total Approved Budget	$ 39,891

b. CUMULATIVE DOE OBLIGATIONS

(1) This Budget Period *[Total of lines a.(1) and a.(3)]*	$ 39,891
(2) Prior Budget Periods	$ 27,875
(3) Project Period to Date *[Total of lines b. (1) and b. (2)]*	$ 67,766

17. TOTAL ESTIMATED COST OF PROJECT $ _____
(This is the current estimated cost of the project. It is not a promise to award nor an authorization to expend funds in this amount.)

18. AWARD/AGREEMENT TERMS AND CONDITIONS

This award/agreement consists of this form plus the following:

a. Special terms and conditions (if grant) or schedule, general provisions, special provisions (if cooperative agreement)

b. Applicable program regulations *(specify)* N/A *(Date)* _____

c. DOE Assistance Regulations, 10 CFR Part 600, as amended, Subparts A and ☒ B (Grants) or ☐ C (Cooperative Agreements).

d. Application/proposal dated 9/11/86, ☐ as submitted ☒ with changes as negotiated

19. REMARKS

This document is a no cost time extension to allow participant time to complete research. Budget categories remain intact.

20. EVIDENCE OF RECIPIENT ACCEPTANCE

_____
(Signature of Authorized Recipient Official) *(Date)*

_____
(Name)

_____
(Title)

21. AWARDED BY

William C. Drake 9/30/86
(Signature) *(Date)*

William C. Drake
(Name)

Contracting Officer
(Title)

...ASSISTANCE AWARD

(See Instructions on Reverse)

2 Jan '86

Under the authority of Public Law 93-410 and subject to legislation, regulations and policies applicable to *(cite legislative program title)*:

Geothermal RD&D Act of 1977

1. PROJECT TITLE
Geothermal Studies in Alaska

2. INSTRUMENT TYPE
☒ GRANT ☐ COOPERATIVE AGREEMENT

3. RECIPIENT *(Name, address, zip code, area code and telephone no.)*
State of Alaska
Division of Geological & Geophysical Survey
Pouch M, Juneau, AK 99811

4. INSTRUMENT NO.
DE-FG07-84ID12524

5. AMENDMENT NO.
A002

6. BUDGET PERIOD
FROM: 11/15/85 THRU: 11/15/86

7. PROJECT PERIOD
FROM: 11/15/85 THRU: 11/15/86

8. RECIPIENT PROJECT DIRECTOR *(Name and telephone No.)*
Christopher J. Nye (907) 474-7147

10. TYPE OF AWARD
☐ NEW ☐ CONTINUATION ☐ RENEWAL
☒ REVISION ☐ SUPPLEMENT

9. RECIPIENT BUSINESS OFFICER *(Name and telephone No.)*

12. ADMINISTERED FOR DOE BY *(Name, address, zip code, telephone No.)*
Ronald A. King
Department of Energy (208) 526-0790
785 DOE Place
Idaho Falls, ID 83402

11. DOE PROJECT OFFICER *(Name, address, zip code, telephone No.)*
Peggy A. M. Brookshier, DOE
785 DOE Place
Idaho Falls, ID 83402 (208) 526-1403

13. RECIPIENT TYPE
☒ STATE GOV'T ☐ INDIAN TRIBAL GOV'T ☐ HOSPITAL ☐ FOR PROFIT ORGANIZATION ☐ INDIVIDUAL
☐ LOCAL GOV'T ☐ INSTITUTION OF HIGHER EDUCATION ☐ OTHER NONPROFIT ORGANIZATION ☐ C ☐ P ☐ SP ☐ OTHER *(Specify)*

14. ACCOUNTING AND APPROPRIATIONS DATA

a. Appropriation Symbol	b. B & R Number	c. FT/AFP/OC	d. CFA Number
89X0224.91	AM1810/ 101510	ID-64-91/250	

15. EMPLOYER I.D. NUMBER/SSN

16. BUDGET AND FUNDING INFORMATION

a. CURRENT BUDGET PERIOD INFORMATION

(1) DOE Funds Obligated This Action	$ 39,891
(2) DOE Funds Authorized for Carry Over	$ 0
(3) DOE Funds Previously Obligated in this Budget Period	$ 0
(4) DOE Share of Total Approved Budget	$ 39,891
(5) Recipient Share of Total Approved Budget	$ -
(6) Total Approved Budget	$ 39,891

b. CUMULATIVE DOE OBLIGATIONS

(1) This Budget Period *[Total of lines a.(1) and a.(3)]*	$ 39,891
(2) Prior Budget Periods	$ 27,875
(3) Project Period to Date *[Total of lines b. (1) and b. (2)]*	$ 67,766

17. TOTAL ESTIMATED COST OF PROJECT $ _____
(This is the current estimated cost of the project. It is not a promise to award nor an authorization to expend funds in this amount.)

18. AWARD/AGREEMENT TERMS AND CONDITIONS

This award/agreement consists of this form plus the following:

a. Special terms and conditions (if grant) or schedule, general provisions, special provisions (if cooperative agreement)

b. Applicable program regulations *(specify)* N/A *(Date)* _____

c. DOE Assistance Regulations, 10 CFR Part 600, as amended, Subparts A and ☒ B (Grants) or ☐ C (Cooperative Agreements).

d. Application/proposal dated 9/26/84. ☒ as submitted ☐ with changes as negotiated

19. REMARKS This modification revises Part I - Budget Plan and Part II - Statement of Work. This modification adds additional tasks within Scopes to the existing Statement of Work. Additional funds increase total Project Costs to $67,766. Recipient address is also changed. The Budget Period and Project Periods have also been extended to 11/15/86.

20. EVIDENCE OF RECIPIENT ACCEPTANCE

Ross G. Schaff 11/9/85
(Signature of Authorized Recipient Official) *(Date)*

Ross G. SCHAFF
(Name)

STATE GEOLOGIST
(Title)

21. AWARDED BY

William C. Drake 11/27/85
(Signature) *(Date)*

WILLIAM C. DRAKE
CONTRACTING OFFICER *(Name)*

(Title)

STATEMENT OF WORK

ALASKA DIVISION OF GEOLOGICAL AND GEOPHYSICAL SURVEYS

The purpose of these Geothermal Energy Investigations will be accomplished by performing in the area of Mt. Spurr Volcano, in conjunction with personnel from the University of Alaska-Fairbanks Geophysical Institute, the following tasks:

Task 1. Collect a complete suite of Holocene lavas.

Task 2. Collect a representative suite of other late-Tertiary lavas.

Task 3. Conduct petrographic and microprobe studies of these lavas to detect and document magma mixing and/or crystal fractionation at a range of depths, if appropriate, and if possible, infer magma temperatures.

Task 4. Analyze whole rock samples for appropriate major and trace elements.

Task 5. Prepare a final report, which will include tables of all data, interpretations of the range of chemistry in terms of magmatic processes, a discussion of the derived history of the volcano, and interpret all data (including results of cooperative efforts with the UAF Geophysical Institute and preexisting fumarole gas geochemistry data from the DGGS) in terms of the shallow magmatic system and present magmatic geometry.

Task 6. Prepare and publish a document which will include:

(a) An annotated bibliography of available literature pertaining to geothermal resources in Alaska,

(b) Brief descriptions of major geothermal projects in Alaska and a list of agencies involved, and

(c) A list of State and Federal agencies and private companies and consultants actively involved in geothermal and energy studies in Alaska.

Task 7. Provide overall project management and complete and report on tasks in a timely manner. All reports called for in the first phase of this grant will be due as originally planned. The Draft Final Report for this second phase of this grant will be due 45 days prior to the completion date. The Final Report itself and the bibliographic document (Task 6) will be due on the completion date. A camera-ready copy of the Final Report and the bibliographic document will be provided in addition to the copies called for in the Report Distribution List.

Grant No. DE-FG07-84ID12524
Alaska Department of Natural Resources, Geological and Geophysical Surveys

Geothermal Studies

Budget Estimate

Salaries	
Geologist III Christopher J. Nye 5-1/2 months x $3,522	$19,371
Geologist Asst. I 2 months x $2,317	4,634
College Intern 2 months x $11.46 per hr.	3,667
Total Salaries	$27,672
Employee Benefits (31.49%) Geologist III Geologist Asst.	 6,100 1,459
Travel	1,600
Subcontracts	2,060
Supplies	1,000
Total Direct Costs	$39,891
Indirect Costs	-0-
Fee	-0-
Total Project Costs	$39,891

Grant No. DE-FG07-84ID12524

REPORT DISTRIBUTION LIST

DE-FG07-84ID12524

U.S. Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls, ID 83402

A ATTN.: Peggy Brookshier, Program Manager
Energy & Technology Division

B ATTN.: Ronald A. King
Contracts Management Division

C ATTN.: E. G. Jones, Director
Financial Management Division

D University of Utah Research Institute
Earth Science Laboratory
391 Chipeta Way, Suite A
Salt Lake City, UT 84108
Attn.: Duncan Foley

E U.S. Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, TN 37830

U.S. DEPARTMENT OF ENERGY

FEDERAL ASSISTANCE REPORTING CHECKLIST

FORM EIA-459A
(10-80)

FORM APPROVED
OMB NO. 1900-0127

1. Identification Number:	2. Program/Project Title:
DE-FG07-84ID12524	Studies in Alaska

3. Recipient: State of Alaska

4. Reporting Requirements:	Frequency	No. of Copies	Addressees
PROGRAM/PROJECT MANAGEMENT REPORTING			
☐ Federal Assistance Milestone Plan			
☐ Federal Assistance Budget Information Form			
☒ Federal Assistance Management Summary Report	Q	1,1,1*	A,B,C
☒ Federal Assistance Program/Project Status Report	Q	1,1,1	A,B,c
☒ Financial Status Report, OMB Form 269	Y,F	1,1	A,C
TECHNICAL INFORMATION REPORTING			
☒ Notice of Energy RD&D	Y	1,1	A,E
☐ Technical Progress Report			
☒ Topical Report	A	1,1,1	A,B,D
☒ Final Technical Report	F	1,1,1	A,B,D

FREQUENCY CODES AND DUE DATES: "THE FINAL REPORT WILL BE ALL-INCLUSIVE AND IS ALL THAT SHOULD BE ENTERED IN THE TIC DATA BASE"

- A - As Necessary; within 5 calendar days after events.
- F - Final; 90 calendar days after the performance of the effort ends.
- Q - Quarterly; within 30 days after end of calendar quarter or portion thereof.
- O - One time after project starts; within 30 days after award.
- X - Required with proposals or with the application or with significant planning changes.
- Y - Yearly; 30 days after the end of program year. (Financial Status Reports 90 days).
- S - Semiannually; within 30 days after end of program fiscal half year.

5. Special Instructions:

*Includes one camera-ready copy.

6. Prepared by: (Signature and Date)	7. Reviewed by: (Signature and Date)
	Ronald A. Kuz

	REPORT	DUE
(1)	Form DOE 538 Notice of Energy RD&D	30 days after award of grant
(2)	Quarterly Management Summary Report	15 days after calendar quarter end
(3)	Project Status Report	15 days after calendar quarter end
(4)	Phase I Final Report (Draft)	Due 45 days prior to original completion date
(5)	Phase I Final Report	Due on original completion date
(6)	Final Report (Draft)	Due 45 days prior to updated completion date
(7)	Final Report	Due on updated completion date
(8)	Financial Status Report - OMB Form 269	Due annually and upon completion

The deliverables resulting from the tasks outlined above which will be delivered to DOE are summarized as follows:

1. The original Final Report (herein referred to as Phase I Final Report) and the Final Report for this addition to the grant--one camera-ready copy plus sixteen additional copies--will be distributed as specified in the attached DOE Form EIA 459A.

2. Reports previously described under Task 8 above will be prepared and issued in the amounts and at the frequency shown.

NOTICE OF FINANCIAL ASSISTANCE AWARD

(See Instructions on Reverse)

6 Jan 86

Under the authority of Public Law 93-410 and
subject to legislation, regulations and policies applicable to *(cite legislative program title)*:
Geothermal RD&D Act of 1977

1. PROJECT TITLE
Geothermal Studies in Alaska

2. INSTRUMENT TYPE
☒ GRANT ☐ COOPERATIVE AGREEMENT

3. RECIPIENT *(Name, address, zip code, area code and telephone no.)*
State of Alaska
Division of Geological & Geophysical Survey
Pouch M, Juneau, AK 99811

4. INSTRUMENT NO.
DE-FG07-84ID12524

5. AMENDMENT NO.
A002

6. BUDGET PERIOD
FROM: 11/15/85 THRU: 11/15/86

7. PROJECT PERIOD
FROM: 11/15/85 THRU: 11/15/86

8. RECIPIENT PROJECT DIRECTOR *(Name and telephone No.)*
Christopher J. Nye (907) 474-7147

10. TYPE OF AWARD
☐ NEW ☐ CONTINUATION ☐ RENEWAL
☒ REVISION ☐ SUPPLEMENT
Mod. 1.

9. RECIPIENT BUSINESS OFFICER *(Name and telephone No.)*

12. ADMINISTERED FOR DOE BY *(Name, address, zip code, telephone No.)*
Ronald A. King
Department of Energy (208) 526-0790
785 DOE Place
Idaho Falls, ID 83402

11. DOE PROJECT OFFICER *(Name, address, zip code, telephone No.)*
Peggy A. M. Brookshier, DOE
785 DOE Place
Idaho Falls, ID 83402 (208) 526-1403

13. RECIPIENT TYPE
☒ STATE GOV'T ☐ INDIAN TRIBAL GOV'T ☐ HOSPITAL ☐ FOR PROFIT ORGANIZATION ☐ INDIVIDUAL
☐ LOCAL GOV'T ☐ INSTITUTION OF HIGHER EDUCATION ☐ OTHER NONPROFIT ORGANIZATION ☐ C ☐ P ☐ SP ☐ OTHER *(Specify)*

14. ACCOUNTING AND APPROPRIATIONS DATA

a. Appropriation Symbol	b. B & R Number	c. FT/AFP/OC	d. CFA Number
89X0224.91	AM1810/101510	ID-64-91/250	

15. EMPLOYER I.D. NUMBER/SSN

16. BUDGET AND FUNDING INFORMATION

a. CURRENT BUDGET PERIOD INFORMATION		b. CUMULATIVE DOE OBLIGATIONS	
(1) DOE Funds Obligated This Action	$ 39,891	(1) This Budget Period *(Total of lines a.(1) and a.(3))*	$ 39,891
(2) DOE Funds Authorized for Carry Over	$ 0	(2) Prior Budget Periods	$ 27,875
(3) DOE Funds Previously Obligated in this Budget Period	$ 0		
(4) DOE Share of Total Approved Budget	$ 39,891		
(5) Recipient Share of Total Approved Budget	$ -	(3) Project Period to Date *(Total of lines b. (1) and b. (2))*	$ 67,766
(6) Total Approved Budget	$ 39,891		

17. TOTAL ESTIMATED COST OF PROJECT $ _____

(This is the current estimated cost of the project. It is not a promise to award nor an authorization to expend funds in this amount.)

18. AWARD/AGREEMENT TERMS AND CONDITIONS

This award/agreement consists of this form plus the following:

a. Special terms and conditions (if grant) or schedule, general provisions, special provisions (if cooperative agreement)

b. Applicable program regulations *(specify)* N/A *(Date)* _____

c. DOE Assistance Regulations, 10 CFR Part 600, as amended, Subparts A and ☒ B (Grants) or ☐ C (Cooperative Agreements).

d. Application/proposal dated 9/26/84, ☒ as submitted ☐ with changes as negotiated

19. REMARKS This modification revises Part I - Budget Plan and Part II - Statement of Work. This modification adds additional tasks within Scopes to the existing Statement of Work. Additional funds increase total Project Costs to $67,766. Recipient address is also changed. The Budget Period and Project Periods have also been extended to 11/15/86.

20. EVIDENCE OF RECIPIENT ACCEPTANCE

Ross G. Schaff 11/9/85
(Signature of Authorized Recipient Official) *(Date)*

ROSS G. SCHAFF
(Name)

STATE GEOLOGIST
(Title)

21. AWARDED BY

William C. Drake 11/27/85
(Signature) *(Date)*

WILLIAM C. DRAKE
CONTRACTING OFFICER *(Name)*

(Title)

STATEMENT OF WORK

ALASKA DIVISION OF GEOLOGICAL AND GEOPHYSICAL SURVEYS

The purpose of these Geothermal Energy Investigations will be accomplished by performing in the area of Mt. Spurr Volcano, in conjunction with personnel from the University of Alaska-Fairbanks Geophysical Institute, the following tasks:

Task 1. Collect a complete suite of Holocene lavas.

Task 2. Collect a representative suite of other late-Tertiary lavas.

Task 3. Conduct petrographic and microprobe studies of these lavas to detect and document magma mixing and/or crystal fractionation at a range of depths, if appropriate, and if possible, infer magma temperatures.

Task 4. Analyze whole rock samples for appropriate major and trace elements.

Task 5. Prepare a final report, which will include tables of all data, interpretations of the range of chemistry in terms of magmatic processes, a discussion of the derived history of the volcano, and interpret all data (including results of cooperative efforts with the UAF Geophysical Institute and preexisting fumarole gas geochemistry data from the DGGS) in terms of the shallow magmatic system and present magmatic geometry.

Task 6. Prepare and publish a document which will include:

(a) An annotated bibliography of available literature pertaining to geothermal resources in Alaska,

(b) Brief descriptions of major geothermal projects in Alaska and a list of agencies involved, and

(c) A list of State and Federal agencies and private companies and consultants actively involved in geothermal and energy studies in Alaska.

Task 7. Provide overall project management and complete and report on tasks in a timely manner. All reports called for in the first phase of this grant will be due as originally planned. The Draft Final Report for this second phase of this grant will be due 45 days prior to the completion date. The Final Report itself and the bibliographic document (Task 6) will be due on the completion date. A camera-ready copy of the Final Report and the bibliographic document will be provided in addition to the copies called for in the Report Distribution List.

Grant No. DE-FG07-84ID12524
Alaska Department of Natural Resources, Geological and Geophysical Surveys

Geothermal Studies

Budget Estimate

Salaries	
Geologist III Christopher J. Nye 5-1/2 months x $3,522	$19,371
Geologist Asst. I 2 months x $2,317	4,634
College Intern 2 months x $11.46 per hr.	3,667
Total Salaries	$27,672
Employee Benefits (31.49%) Geologist III Geologist Asst.	6,100 1,459
Travel	1,600
Subcontracts	2,060
Supplies	1,000
Total Direct Costs	$39,891
Indirect Costs	-0-
Fee	-0-
Total Project Costs	$39,891

Grant No. DE-FG07-84ID12524

REPORT DISTRIBUTION LIST

DE-FG07-84ID12524

U.S. Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls, ID 83402

A ATTN.: Peggy Brookshier, Program Manager
Energy & Technology Division

B ATTN.: Ronald A. King
Contracts Management Division

C ATTN.: E. G. Jones, Director
Financial Management Division

D University of Utah Research Institute
Earth Science Laboratory
391 Chipeta Way, Suite A
Salt Lake City, UT 84108
Attn.: Duncan Foley

E U.S. Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, TN 37830

U.S. DEPARTMENT OF ENERGY

FEDERAL ASSISTANCE REPORTING CHECKLIST

FORM EIA-459A
(10/80)

FORM APPROVED
OMB NO. 1900-0127

1. Identification Number:	2. Program/Project Title:
DE-FG07-84ID12524	Studies in Alaska

3. Recipient:
State of Alaska

4. Reporting Requirements:	Frequency	No. of Copies	Addressees
PROGRAM/PROJECT MANAGEMENT REPORTING			
☐ Federal Assistance Milestone Plan			
☐ Federal Assistance Budget Information Form			
☒ Federal Assistance Management Summary Report	Q	1,1,1*	A,B,C
☒ Federal Assistance Program/Project Status Report	Q	1,1,1	A,B,c
☒ Financial Status Report, OMB Form 269	Y,F	1,1	A,C
TECHNICAL INFORMATION REPORTING			
☒ Notice of Energy RD&D	Y	1,1	A,E
☐ Technical Progress Report			
☒ Topical Report	A	1,1,1	A,B,D
☒ Final Technical Report	F	1,1,1	A,B,D

FREQUENCY CODES AND DUE DATES: "THE FINAL REPORT WILL BE ALL-INCLUSIVE AND IS ALL THAT SHOULD BE ENTERED IN THE TIC DATA BASE"

A - As Necessary; within 5 calendar days after events.
F - Final; 90 calendar days after the performance of the effort ends.
Q - Quarterly; within 30 days after end of calendar quarter or portion thereof.
O - One time after project starts; within 30 days after award.
X - Required with proposals or with the application or with significant planning changes.
Y - Yearly; 30 days after the end of program year. (Financial Status Reports 90 days).
S - Semiannually; within 30 days after end of program fiscal half year.

5. Special Instructions:

*Includes one camera-ready copy.

6. Prepared by: (Signature and Date)	7. Reviewed by: (Signature and Date)
	Ronald A. Kreiz

	REPORT	DUE
(1)	Form DOE 538 Notice of Energy RD&D	30 days after award of grant
(2)	Quarterly Management Summary Report	15 days after calendar quarter end
(3)	Project Status Report	15 days after calendar quarter end
(4)	Phase I Final Report (Draft)	Due 45 days prior to original completion date
(5)	Phase I Final Report	Due on original completion date
(6)	Final Report (Draft)	Due 45 days prior to updated completion date
(7)	Final Report	Due on updated completion date
(8)	Financial Status Report - OMB Form 269	Due annually and upon completion

The deliverables resulting from the tasks outlined above which will be delivered to DOE are summarized as follows:

1. The original Final Report (herein referred to as Phase I Final Report) and the Final Report for this addition to the grant--one camera-ready copy plus sixteen additional copies--will be distributed as specified in the attached DOE Form EIA 459A.

2. Reports previously described under Task 8 above will be prepared and issued in the amounts and at the frequency shown.

AK-DGGS

STATEMENT OF WORK

The Division of Geological and Geophysical Surveys will perform a synthesis of water, gas, and isotopic geochemical data on Alaska's Copper River Basin mud volcano and mineral spring water. This work includes:

1. Synthesize all available data;

2. Interpret these data in terms of their bearing on identification of geothermal resources

3. Perform mineral-equilibria analyses to determine whether water and gas chemistries are in equilibrium with minerals identified in nearby oil and gas exploration wells

4. Prepare and issue a final report which will include:

   a. Tabulation of all available DGGS geochemical data plus any pertinent data from previous investigations

   b. Discussions of water and gas chemical characteristics, stable isotope composition, (O_{18}, D, C_{13}); and He_3/He_4 ratios

   c. Results of mineral equilibria studies

   d. Discussion of whether or not the geochemical data indicate a geothermal resource under the Klawasi area

5. Provide overall project management and complete and report on tasks in a timely manner. Management reports shall be provided as defined by the attached DOE Form EIA 459A Reporting Requirements Checklist. The required reports are also summarized as follows:

a.	Form DOE 538, Notice of Energy RD&D	Due 30 days after award of grant
b.	Quarterly Management Summary Report	Due 15 days after calendar quarter end
c.	Quarterly Project Status Report	Due 15 days after calendar quarter end
d.	Final Report (Draft)	Due 45 days prior to completion date
e.	Final Report	Due on completion date
f.	Financial Status Report, OMB Form 269	Due on completion date

U.S DEPARTMENT OF ENERGY

FEDERAL ASSISTANCE REPORTING CHECKLIST

FORM EIA 459A
(10-80)

FORM APPROVED
OMB NO 1900-0127

1. Identification Number: DE-FG07-84ID12524 - State of Alaska	2. Program/Project Title: Geothermal Study of Copper River Basin Area
3. Recipient:	

4. Reporting Requirements:	Frequency	No. of Copies	Addressees
PROGRAM/PROJECT MANAGEMENT REPORTING			
☐ Federal Assistance Milestone Plan			
☐ Federal Assistance Budget Information Form			
☒ Federal Assistance Management Summary Report	Q		
☒ Federal Assistance Program/Project Status Report	Q		
☒ Financial Status Report, OMB Form 269	F		
TECHNICAL INFORMATION REPORTING			
☒ Notice of Energy RD&D	O		
☐ Technical Progress Report			
☐ Topical Report			
☒ Final Technical Report	F		

FREQUENCY CODES AND DUE DATES:

A - As Necessary; within 5 calendar days after events.
F - Final: Upon completion date
O - Quarterly; within 15 days after end of calendar quarter or portion thereof.
O - One time after project starts; within 30 days after award.
X - Required with proposals or with the application or with significant planning changes.
Y - Yearly; 30 days after the end of program year. (Financial Status Reports 90 days).
S - Semiannually; within 30 days after end of program fiscal half year.

5. Special Instructions:

6. Prepared by: (Signature and Date)	7. Reviewed by: (Signature and Date)

U.S. DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE

REPORT DISTRIBUTION LIST

Grant No.
DE-FG07-84ID12524

Addressees	Federal Assistance Financial Status Report (Part I)	Federal Assistance Budget Information Form	Federal Assistance Program/Project Status Report	Federal Assistance Management Summary Report	Notice of Energy RD&D Project Initiation, OMB Form 269	Technical Progress Report	Final Technical Report	Topical Report	Number of Report Copies
U. S. Department of Energy Idaho Operations Office 550 Second Street Idaho Falls, ID 83401									
Attn: R. Eldon Bray, Program Mgr. Energy & Technology Division			2	2				8	
Attn: Elizabeth M. Hyster Contracts Management Div.			1	1	1	1		1	
Attn: E. G. Jones, Director Financial Management Div.			1						
U. S. Department of Energy Forrestal Bldg., CE-324 1000 Independence Ave, S.W. Washington, DC 20585 Attn: Ron Toms			1	1				6	
University of Utah Research Institute Earth Science Laboratory 391 Chipeta Way, Suite C Salt Lake City, UT 84108 Attn: Duncan Foley			1	1				1	
U. S. Department of Energy Technical Information Center P. O. Box 62 Oak Ridge, TN 37830					1				

Special Instructions

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

BILL SHEFFIELD, GOVERNOR

☐ P.O. BOX 7028
ANCHORAGE, ALASKA 99510
PHONE: (907) 561-2020

☒ 794 UNIVERSITY AVENUE, BASEMENT
FAIRBANKS, ALASKA 99709
PHONE: (907) 474-7147

October 13, 1986

Ronald A. King
Contracts Management Division
U.S. Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls, ID 83402

Dear Mr. King:

Dr. Christopher Nye was named Project Director in the Notice of Financial Assistance Award for grant DE-FG07-84ID12524 (Geothermal Studies in Alaska) from the Department of Energy to the Alaska Division of Geological and Geophysical Surveys. However, due to drastic reductions in the Division's budget we had to terminate Dr. Nye's position and he is no longer able to act in the capacity of Project Director. I recommend that Dr. Roman Motyka be named Project Director in place of Dr. Nye. Dr. Motyka has been the head of the DGGS geothermal resource investigation program since its inception, and has been Dr. Nye's immediate supervisor during his tenure with DGGS.

I want Dr. Motyka to take overall project responsibility, and specific responsibility for the statewide geothermal bibliography. I also want to maintain Dr. Nye in his role as principal scientific investigator for the Mt. Spurr resource assessment project which is funded under the above-mentioned grant. Dr. Nye can do so from his position as a Research Associate with the Geophysical Institute at the University of Alaska if we contract his services through a Reimbursable Services Agreement. In order to do this, $20,737 needs to be moved from the "salaries" part of award DE-FG907-84ID12524 to "subcontracts". The Reimbursable Services Agreement has already been formally approved by the University of Alaska and by myself, and is now with the State Office of Management and Budget for final approval.

If my suggestions meet with your approval I would like you to take the necessary steps to modify DE-FG07-84ID12524 to name Dr. Roman Motyka as Project Director and to move $20,737 to the "subcontracts" budget category.

This letter also rescinds Dr. Nye's request of 10/6/86 for you to be signatory to the proposal - RSA activity between the Geophysical Institute and the Division of Mining and Geology.

Sincerely,

Pedro Denton
Director

cc: Wyatt Gilbert
Roman Motyka
Christopher Nye
Dick Reger
Peggy Brookshier
William Drake

STATE OF ALASKA

BILL SHEFFIELD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

☐ P.O. BOX 7028
ANCHORAGE, ALASKA 99510
PHONE: (907) 561-2020

☒ 794 UNIVERSITY AVENUE, BASEMENT
FAIRBANKS, ALASKA 99709
PHONE: (907) 474-7147

Ronald A. King
Contracts Management Division
U.S. Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls
ID 83402

October 14, 1986

Dear Mr. King;

This morning I talked with Jay Newgaard, our chief accountant, in order to find out the status of the DOE grant for geothermal work in Alaska (DE-FG07-84ID12524). In the following table I have listed our best estimate of the money that remains, as well as the way the award should be amended in order to allow the RSA to the Geophysical Institute.

	Remaining Amount	New Award Structure
Personal Services	29,116	7,266
Travel	392	1,200
Contractual	195	21,237
Commodities	1,000	1,000
total	$30,703	$30,703

The major reason for this rearrangement is have enough money in the new award for contractual services as specified under Geophysical Grant GI 87-27.

On a separate front, our accounting personnel have not yet received notice of the May 15 extension of the award period for the contract. I expect that the notice of extension is somewhere in the mail between Juneau and Fairbanks or Anchorage. Could you please send a xerox of the notice of extension to me at the Fairbanks address listed above? I will pass a copy on to our accounting personnel. Thank You.

Please call if you have any questions.

Sincerely;

Christopher Nye

October 14, 1986

Ronald A. King
U.S. Department of Energy
Contracts Management Division
Idaho Operations Office
785 DOE Place
Idaho Falls, Idaho 83402

Dear Mr. King:

This morning I talked with Jay Newgaard, our chief accountant, in order to find out the status of the DOE grant for geothermal work in Alaska (DE-FG07-84ID12524). In the following table I have listed our best estimate of the money that remains, as well as the way the award should be amended in order to allow the RSA to the Geophysical Institute.

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Total	$30,703	$30,703

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On a separate front, our accounting personnel have not yet received notice of the May 15 extension of the award period for the contract. I expect that the notice of extension is somewhere in the mail between Juneau and Fairbanks or Anchorage. Could you please send a xerox of the notice of extension to me at the Fairbanks address listed above? I will pass a copy on to our accounting personnel. Thank you.

Please call if you have any questions.

Sincerely,

Christopher Nye

CN/ram

cc: R.D. Reger, W.G. Gilbert, R.J. Motyka
Peggy Brookshier, William Drake

DF 16 Apr. 85

TECHNICAL EVALUATION OF GRANT PROPOSAL

TITLE: Geothermal Studies in Alaska

SUBMITTED TO: DOE-ID

SUBMITTED BY: Alaska Division of Geological and Geophysical Surveys
794 University Avenue, Basement
Fairbanks, AK 99701 (907)474-7147

AMOUNT REQUESTED: $39,891

AMOUNT SUGGESTED: $35,000

PROPOSED DURATION: July 1, 1985 - June 30, 1986

PROJECT DESCRIPTION: In conjunction with Alaska Geophysical Institute, investigate Mt. Spurr, an active volcano, to determine petrologic models of magma evolution. These models will be used to determine the liklihood of the existence of an active magma chamber. A second proposal task would be to compile a literature summary of all literature pertaining to geothermal resources in Alaska.

GENERAL REMARKS:

1. Work Statement: Adequate to define petrology of Mt. Spurr, and coordination with AK Geophysical Inst. will allow a good look at Mt. Spurr.

2. Task changes: May need to delete literature compilation to accommodate reduction in funding.

SPECIFIC REMARKS:

1. Manhours: Adequate to perform Task 1 (petrology).

2. Materials: Adequate, includes lab supplies, etc. No equipment purchases.

3. Subcontracts: None

4. Travel and Per Diem: Includes trips to volcano and Univ. California, Santa Cruz to do rock chemistry. Most travel expenses related to field work are listed under AK Geophysical Inst. proposal.

5. Other Direct Costs: None. Also note that DGGS is not charging any overhead to this project.

6. Proposer's Capability to Meet the Objectives: AK DGGS has met all past objectives under the State Coupled Program (but not always on time). Their reports are very good.

7. Key Personnel Qualifications: PI has a Ph.D. in AK Volcanic Petrology, and, although new to the State Coupled Program, should be able to produce a quality report. Tightly controlled Statement of Work will encourage on-time completion.

8. Anticipated Objectives and Probability of Success: The definition of a magma chamber may or may not be successful, as its existence is largely unknown. If this approach will work, DGGS will be able to define input of heat to any geothermal system. This should be rated:
   100% to meet Statement of Work.
   75% to meet objective of defining magma
   100% to meet objective of understanding magmatic evolution

AK/DGGS - Suggested SOW

All work is to be done in the area of Mt. Spurr Volcano, in conjunction with personnel from the University of Alaska-Fairbanks Geophysical Institute.

1. Collect a complete suite of Holocene lavas.

2. Collect a representative suite of other late Tertiary lavas.

3. Conduct petrographic and microprobe studies of these lavas to detect and document magma mixing and/or crystal fractionation at a range of depths, if appropriate, and, if possible, inter magma temperatures.

4. Analyze whole rock samples for appropriate major and trace elements.

5. Prepare a final report, which will include tables of all data, interpretations of the range of chemistry in terms of magmatic processes, a discussion of the derived history of the volcano, and interpret all data (including results of cooperative efforts with the VAF Geophysical Institute and preexisting tumerole gas geochemistry data from the DGGS) in terms of the shallow magmatic system and present magmatic geometry.

BILL SHEFFIELD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

☐ POUCH 7-028
ANCHORAGE, ALASKA 99510
PHONE: (907) 276-2653

☑ 794 UNIVERSITY AVENUE, BASEMENT
FAIRBANKS, ALASKA 99701
PHONE: (907) 474-7147

September 26, 1984

Mr. Ronald S.H. Toms
Code CE-324
U.S. Dept. of Energy
1000 Independence Ave., S.W.
Washington, D.C. 10585

Mr. Toms:

Please find enclosed, for your consideration, a proposal for geothermal studies in Alaska. Two tasks are proposed: 1) a petrochemical study of young ejecta at Mt. Spurr, and 2) preparation of an annotated bibliography of geothermal activities in Alaska. Work on the first task will be closely coordinated with work proposed by the University of Alaska Geophysical Institute in a separate proposal to DOE.

The bulk of the budget is for the study at Spurr. I propose to use the chemical composition of the ejecta to confirm or disprove the existence of a shallow level magma chamber.

I have tried to keep the budget to a minimum, but I need to spend quite a bit of time analyzing the rocks and there are no internal DGGS funds for my position.

Sincerely,

Christopher J. Nye
Geologist

Enclosure

PROPOSAL

Title: Geothermal Studies in Alaska

Task 1: Petrochemical constraints on the existance and nature of the shallow level magmatic system at Mt. Spurr.

Task 2: Summarization of geothermal energy investigations in Alaska.

Submitted to: Ronald S. H. Toms
Code CE-324
U. S. Department of Energy
1000 Independence Ave. S. W.
Washington D. C. 10585

Submitted by: Christopher J. Nye
Alaska Div. Geol. Geophys. Surveys
794 University Ave., Basement
Fairbanks, Alaska 99701

Amount Requested: $39891

Time Duration: July 1, 1984 - June 30, 1985

Description_and_Work_Statement_--_Task_1

As part of a cooperative DGGS - Univ. of Alaska Geophysical Institute program to assess geothermal resources at Mt. Spurr we propose to collect samples of Holocene lavas and tephras from Mt. Spurr, to measure concentrations of major and trace chemical constituents in these samples, and to use this information to to deduce the nature of the magmatic system providing heat to the edifice.

Magma is the ultimate heat source for volcano hosted geothermal systems. In many areas active volcanoes can be assumed to have shallow level magma chambers. This is not the case at convergent margins, where successive historic eruptions are not neccessarily comagmatic. Possible configurations for magmatic plumbing systems range from intermitantly fed cracks to subcrustal magma chambers to large, upper crustal magma chambers. Evidence is now accumulating which suggests that in calcalkaline volcanoes, which we assume Spurr to be, magma residence is often deep in the crust, or below the crust.

While the fact that Spurr is active cannot be taken as conclusive evidence that there is a shallow magma chamber, relatively vigorous Holocene activity, and the possible presence of a collapse caldera provide hope that such a chamber may exist.

At volcanoes where volcanic stratigraphy for the last few millennia can be accurately determined and collected a geochemical test for a shallow chamber can be readily constructed. Given enough information to overdetermine the set of equations defining the chemical behavior of magmatic systems the following possible scenarios can be tested:

1) each eruption is produce by a separate aliquot of magma introduced from the source region (ie there is no shallow chamber);
2) each eruption is triggered by the introduction of magma from the source region intruding, and mixing with, a crustal magma chamber;
3) each eruption is produced by eruption from a closed, fractionating magma chamber; and
4) sufficient heat is available in the crust to partially melt upper or lower crustal material. This may require additional determination of radiogenic isotopes, which is not covered under this proposal, in order to provide unequivocal information.

In addition it is also sometimes possible to infer the depth of a shallow chamber, if it exists.

Any of the above scenarios is possible, and each has radically different implications for the nature of heat supply to the crust and the nature of the geothermal system. Spurr is uniquely suited to this approach since the exposed lavas at Crater Peak provide, to my knowledge, the best exposed Holocene volcanic stratigraphy of any volcamo in Alaska. Because there is no published information on the mineralogy or geochemistry of Holocene ejecta from Spurr we cannot anticipate the final conclusions.

Specifically, we propose to:

1) collect a complete suite of Holocene lavas;
2) collect a representative suite of other late Tertiary lavas;
3) conduct a petrographic and microprobe study of phases in these lavas to detect and document magma mixing and/or crystal fractionation at a range of depths, if appropriate, and infer magma temperatures, if possible;
4) analyze whole rock samples for major oxides and trace elements including representatives of the alkalies and alkaline earths, rare earth

elements, highly charged small cations and transition metals;
5) interpret the above to determine which magmatic processes produce the observed range of chemistry; and
6) Interpret the above in terms of the nature of the shallow magmatic system.

We will work closely with the UAF Geophysical Institute to insure that constraints from their geophysical work are incorporated in the final model. We will also incorporate the preexisting fumerole gas geochemistry of Roman Motyka (DGGS). We stress that we need a complete set of data to achieve our goals. Any compromise during data collection will rapidly leave the chemical system underdetermined and preclude a unique interpretation.

The product of this will be a single report which:
1) tabulates all data obtained;
2) describes the derived history of the volcano in Holocene time; and
3) interprets the chemical history in terms of the present magmatic geometry.

Description_and_Work_Statement_--_Task_2

Six years have elapsed since the DOE's state-coupled geothermal program in Alaska was initiated. During this period, geothermal projects funded by DOE and by the State of Alaska have produced an explosion in information and knowledge of the State's geothermal resources. Numerous reports, articles, maps and theses pertaining to geothermal energy in Alaska are now, or will shortly become, available. Under this task DGGS proposes to summarize all available literature relating to geothermal resources in Alaska in one document.

The proposed title of the document is "A Summary of Geothermal Energy Investigations in Alaska". The document will include the following;
1) an annotated bibliography of available literature pertaining to geothermal resources in Alaska;
2) brief descriptions of major geothermal projects in Alaska and a list of agencies involved; and
3) a list of State and Federal agencies, and private companies and consultants actively involved in geothermal energy studies in Alaska.

The document is expected to be about 25 double-spaced manuscript pages in length excluding tables and figures. The document will be published at least as a DGGS Report of Investigations but preferably as a DGGS Special Report if sufficient internal funds are available.

Budget

Personal Services:

Position	Time	Salary	Benefits	Total
Geologist III	5 1/2 mos	$3522	$1109	$25470
Geol. Asst. I	2 mos	2317	730	6094
College Intern	2 mos	11.46/hr		3667
				$35231

Travel:

One round trip to UC Santa Cruz for rock and mineral analyses with anticipated minimum per diem for analytical work.	1600

Contractual:

Estimated costs of microprobe, XRF and other instrument time.	2060
Commodities:	1000
Equipment:	___0
Grand Total:	$39891

Explanation:

The Geologist III salary is for Nye for the Spurr project and is the minimum time required to acquire and model the neccessary data. Approximately two and a half months are needed just for data acquisition and reduction. We assume no unanticipated delays in data production and no extended downtimes of neccessary instruments. The DGGS laboratory (free of charge) will be used as much as possible but at this date cannot, and is not anticipated to be able to, produce all the data neccessary for an unambiguous study in a timely manner. The trip to California and contractual expense are for the purpose of acquiring data. The Geological Assistant salary is for Liss for task 2. The College Intern salary is for field assistance for Nye and help in preparing samples, reducing data and drafting figures for Nye and Liss. Field expenses other than salary for DGGS personnel are included in the budget of the separate proposal submitted to DOE by the UAF Geophysical Institute.

Personnel_Background

Dr. Christopher J. Nye, the principal investigatior, has been with the DGGS geothermal group for one year. During this time his principal tasks have been to compile prexisting petrochemical data from young lavas of the Makushin Geothermal Field, to continue with the analytical program in that area, and to produce a detailed map of that area. The map has been released as a DGGS Report of Investigations, the interpretation of the rock geochemical data is in preparation. Dr. Nye graduated from UC Santa Cruz in 1983. His dissertation concerned the detailed geochemistry of two Alaskan volcanoes. A particular concern of this work was investigation detailed enough to constrain both magmagenetic processes and the nature of the shallow system. A resume is appended to this proposal.

Shirley Liss, a Geologic Assistant, has been active with the DGGS Geothermal Group for five years. Ms. Liss has a B.S. in Physics and has done course work equivalent to a B.S. in Geology. One of her tasks with DGGS has been to maintain and update the DGGS geothermal library. Ms. Liss is therefore well qualified to assist in the annotating the library and assisting in the preparation of the document summarizing geothermal activity in Alaska.

Anticipated_Objectives

Task 1:

1) Collect an adequate suite of stratigraphically controlled Holocene and pre-Holocene ejecta.

2) Analyze minerals and rocks for an adequate range of major and trace elements.

3) Model the geochemical data to determine which of several possible processes are governing chemical variations among the samples.

4) Deduce the existance, size and location of the magma chamber.

Task 2:
Preparation, production and publication of a special report containing a bibliography of geothermal energy in Alaska; brief descriptions of major geothermal projects; and a list of agencies and consultants currently active in Alaskan geothermal studies.

Probability_of_Success

Task 1:
1) 90%
2) 100%
3) 90%
4) 80%

Task 2: 100%

RESUME of CHRISTOPHER JOHN NYE

Address

Alaska Division of Geological and Geophysical Surveys
794 University Avenue, basement
Fairbanks
Alaska, 99701 (907) 474-7147

Personal Data

Born: 12/13/52, Rochester NY
Citizenship: United States
SS#: 009-44-2218
Marital Status: Single

Education

Ph.D., 1983, Geology, University of California at Santa Cruz. Thesis title; "Petrology and Geochemistry of Okmok and Wrangell Volcanoes, Alaska"

M.S., 1978, Geology, University of Alaska at Fairbanks. Thesis title; "The Teklanika Formation in the Calico Creek Area, Mt. McKinley National Park, Alaska"

B.S., 1976, Geology, University of Alaska at Fairbanks

Honors and Awards

Texaco Scholarship, 1975; Outstanding Student in the Earth Sciences, 1976; Wilson Award (outstanding science student on campus, Sigma Xi 1976); UC Regents Fellowship, 1978-1979.

Professional Society Memberships

American Geophysical Union, The Geochemical Society, The Mineralogical Society of America.

Professional Experience

7/83-present: Geologist III, Alaska Div. Geol. Geophys. Sur.
7/82-9/82: Field Assistant, Geophysical Institute, UAF
7/80-8/82: Research Assistant, UCSC
1-6/80, 3-6/79, 9-12/78: Teaching Assistant, UCSC
1/78-5/78: Instructor, Geology Department, UAF
5/77-9/77: Geology Assistant I, Alaska Div. Geol. Geophys. Sur.
5/76-5/77: Teaching Assistant, UAF

Publications

Nye, C.J., and Reid, M.R., Geochemistry of primary and least fractionated lavas from Okmok Volcano, central Aleutions: Implications for arc magmagenesis, submitted to J. Geophys. Res.

Nye, C.J., Queen, L.D., and Motyka, R.J., 1984. Geologic map of the Makushin geothermal area, Unalaska Island, Alaska. Alaska Div. Geol. Geophys. Sur. Report of Investigations RI 84-3, 2 sheets, 1:24,000.

Gilbert, W.G., Nye, C.J., and Sherwood, K.W., 1984. Contrasting Triassic sequences in the central Alaska Range. Alaska Div. Geol. Geophys. Sur. Report of Investigations RI 84- , in review.

Nye, Christopher J., 1983. Petrology and geochemistry of Okmok and Wrangell Volcanoes, Alaska. UC Santa Cruz Ph.D. thesis, 208 p.

Nye, Christopher J., 1978. The Teklanika Formation in the Calico Creek area, Mt. McKinley National Park, Alaska. University of Alaska M.S. thesis, 68 p.

Abstracts

Swanson, Samuel E., Romick, Jay D., Neal, Robert J., and Nye, Christopher J., 1984. Magmatism in the oceanic-continental transition in the Aleutian Arc. GSA absracts with programs, in press.

Nye, Christopher J., and Reid Mary R., 1984. High Ti ferrobasalts in an island arc setting. GSA abstracts with programs, 16 (326).

Nye, Christopher J., 1983. Anatomy of a magma mixing event. GSA abstracts with programs 15(654-655).

Nye, Christopher J., Reid, Mary E., and Gill, James B., 1983. High temperature parental magmas from Okmok Volcano, central Aleutians: Implications for arc magmagenesis. EOS 64(892).

Swanson, Samuel E., Nye, Chris, and Motyka, Roman J., 1983. Petrology of the Makushin volcanic field, Unalaska Island, Alaska. EOS 64(335).

Nye, Christopher J., 1982. The Wrangell Volcanoes: Voluminous volcanism associated with microplate accretion. GSA abstracts with programs 14(221).

Reid, Mary, and Nye, Christopher, 1981. Geochemistry of least fractionated basalts from Okmok Volcano, central Aleutians. EOS 62(1092).

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EARTH SCIENCE LABORATORY
391 CHIPETA WAY, SUITE C
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TELEPHONE 801-524-3422

MEMORANDUM

February 25, 1985

TO: Duncan Foley

FROM: Howard Ross

SUBJECT: Evaluation of GM3D gravity model output for Alaska State Team

I have completed a brief review of four gravity model input/output sets submitted by Gene Wescott, Geophysical Institute, University of Alaska on behalf of a student presently working with program GM3D. A first inspection of the output did indeed suggest there may be problems with program GM3D, or in its conversion to the University of Alaska VAX computer system.

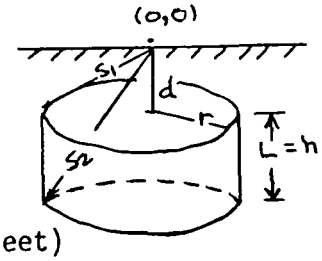
Plotting the source bodies roughly to the scale of the grid interval shows that the prisms are extremely small when compared to the grid interval and for the four computed models only one point (the -207 mg value) was totally over the anomalous prism, and only one point (-108 mg) was over an edge. All other computed data values were at least 0.50 grid intervals from a corner, or farther from an edge of the body. Besides being of small horizontal extent (as compared to the grid interval), the prisms are shallow (0.025 g.i.) and thin (0.05 g.i.). As a result the gravity anomaly attenuates very rapidly as one moves away from the center of the prism.

I made an independent calculation of the maximum anomaly amplitude, by computing the anomaly above a buried vertical cylinder, on its axis. A cylinder of equivalent volume is given by

$$V_c = V_p \quad , \quad \pi r^2 h = x^2 h,$$

so

$$r = \sqrt{\frac{x^2}{\pi}} = 74{,}044.24 \text{ ft.}$$



Using a simple formula from Dobrin (1960),

$$g_z = 2\pi\gamma\sigma\,(L - S_1 + S_2) \qquad (L,\ S_1,\ S_2 \text{ in kilofeet})$$

$$g_z = -207.67 \text{ mg}$$

which compares to the $g_p = -207.09$ mg from GM3D. Thus the data point in question has not been "blown up" but has a correct amplitude of -207.09 mg.

Unfortunately, I was unable to duplicate the model results by using our archive copy of GM3D. We have been awaiting parts to repair our tape drive and GM3D is not routinely available without respooling. Instead I have computed several models using our improved program, GM3, which was accessible. GM3 uses the same numerical algorithms as GM3D, but has some new tests for drive by zero, some output changes, and the +Y1 axis is geographic north. Nonetheless, I have duplicated most of the results of the models submitted and I can see no problem with their version of GM3D.

Copies of several models are included to indicate the importance of a proper grid size, to compare anomaly magnitudes at various places, etc. It is important to note the maximum values, contour intervals and matrix (scaling) factors for our line printer contour maps. Our GM3 version plots out 3 or 4 significant figures and requires annotation of the decimal point. A brief description of the output follows:

Model A-1 single prism, g.i. = 65620 ft.

This grid interval is 0.25 the size of the University of Alaska grid interval, and permits computation points over the center, over an edge, and over a corner with resulting values of -207, -108.1, and -57.2 mg respectively. These agree with data values for equivalent positions on the various University of Alaska plots.

Model A-2 single prism, g.i. = 32810 ft.

Similar to A-1 but with a smaller grid which better illustrates the rapid attenuation of anomaly amplitude near the edge and corners of this shallow, thin prism.

Model A-3

Same prism, large grid interval, offset from center to the southeast quadrant (different from GM3D). Nearest data points (-1.76 mg) are about 0.5 g.i. from corners. Agrees with University of Alaska models.

Model A-4

Five prisms, large grid interval. Duplicates results of University of Alaska output. Note virtues of drawing bodies to scale.

Gene Wescott also mentioned that he may have had a problem with a magnetic model. I recall some discussion of an error in an early version of GM3D when the observation point was located directly over an edge (or corner?) of a prism. If there was such an error we had it corrected in later versions of GM3D and GM3. I have used the same single prism model for calculating a magnetic model at the north magnetic pole (D = 0°, I = 90°), model M-1, and for Arizona field parameters (D = 15°, I = 60°), model M-2.

Although the anomaly contours are a little irregular, I believe this is

because the observation points are so close to the prism. I see no indication of erratic values over corners or edges on this output from our new version, GM3. I suggest that Gene try to duplicate these model results using his program. Have him call me if there is a problem.

Dan (Gene's student?) noted the need for a larger grid, such as 30 x 30. We also had the need and have a larger, variable grid option in our proprietary version, GM3. I suggest he can use a smaller grid interval over individual bodies to get a better result, then piece the results together. Note that GM3D has the capability for offsetting the desired computational grid of (15, 15) from the geographic center of the model.

Howard

Howard P. Ross
Section Head, Geophysics

HPR/jp

Project name: ALASKA STATE COUPLED TEST GMED #1 Subfile #1

A-1

gc. 65620 ft.

Model: 1 PRISM, SMALL GRID

Units in Feet

MAGNETIC PARAMETERS
Earth"s field: 0. gammas.
Inclination = 0. degrees Declination = 0. degrees.

PRISM	X1	X2	Y1	Y2	D1	D2	DC	SC
1	-65620.	65620.	-65620.	65620.	6562.	19686.	-1.50	0.

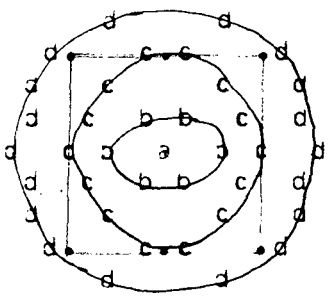
GRID PARAMETERS

Gravity Model

Number of Grid Points in X Direction:	15
Number of Grid Points in Y Direction:	15
Grid Spacing in Feet:	55620.00
X Offset in Feet:	0.00
Y Offset in Feet:	0.00

CONTOURING PARAMETERS
Data Maximum: -0.335E-01
Data Minimum: -207.
Contouring Interval: 50.0

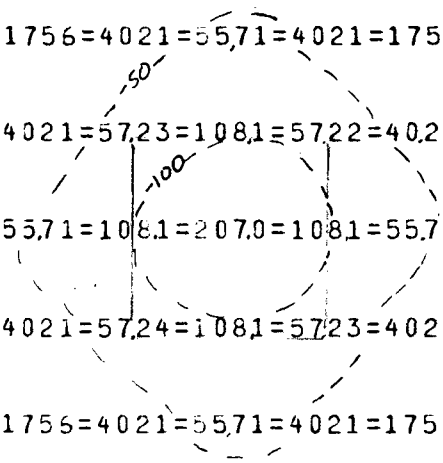
CONTOUR VALUES
(d) = -0.500E 02
(c) = -0.100E 03
(b) = -0.150E 03
(a) = -0.200E 03



center of prism	-207.0
edge of prism	-108.1
corner of prism	- 57.2
1 g.i. from edge	- 55.71
2 g.i. from edge	- 13.81
3 g.i. from edge	- 5.458
4 g.i. from edge	- 2.709

MATRIX FACTOR: 1.0E-04

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	-334	-415	-512	-624	-742	-852	-931	-960	-931	-852	-742	-624	-512	-415	-334
2	-415	-534	-687	-877	-1094	-1311	-1477	-1541	-1477	-1311	-1094	-877	-687	-534	-415
3	-512	-687	-932	-1263	-1685	-2155	-2550	-2709	-2550	-2155	-1685	-1263	-932	-687	-512
4	-624	-877	-1263	-1852	-2719	-3855	-4969	-5458	-4969	-3855	-2719	-1852	-1263	-877	-624
5	-742	-1094	-1685	-2719	-4569	-7707	=1173	=1381	=1173	-7707	-4569	-2719	-1685	-1094	-742
6	-852	-1311	-2155	-3855	-7707	=1756	=4021	=5571	=4021	=1756	-7707	-3855	-2155	-1311	-852
7	-931	-1477	-2550	-4969	=1173	=4021	=5723	=1081	=5722	=4021	=1173	-4969	-2550	-1477	-931
8	-960	-1541	-2709	-5458	=1381	=5571	=1081	=2070	=1081	=5571	=1381	-5458	-2709	-1541	-960
9	-931	-1477	-2550	-4969	=1173	=4021	=5724	=1081	=5723	=4021	=1173	-4969	-2550	-1477	-931
10	-852	-1311	-2155	-3855	-7707	=1756	=4021	=5571	=4021	=1756	-7707	-3855	-2155	-1311	-852
11	-742	-1094	-1685	-2719	-4569	-7707	=1173	=1381	=1173	-7707	-4569	-2719	-1685	-1094	-742
12	-624	-877	-1263	-1852	-2719	-3855	-4969	-5458	-4969	-3855	-2719	-1852	-1263	-877	-624
13	-512	-687	-932	-1263	-1685	-2155	-2550	-2709	-2550	-2155	-1685	-1263	-932	-687	-512
14	-415	-534	-687	-877	-1094	-1311	-1477	-1541	-1477	-1311	-1094	-877	-687	-534	-415
15	-334	-415	-512	-624	-742	-852	-931	-960	-931	-852	-742	-624	-512	-415	-334



Project name: ALASKA STATE COUPLED
TEST SMED #1

A-2

Model: 1 PRISM, SMALL GRID (SMALLEST g.i.)

g.i. 32810 ft.

Units in Feet

MAGNETIC PARAMETERS
Earth"s field: 0. gammas.
Inclination = 0. degrees Declination = 0. degrees.

PRISM	X1	X2	Y1	Y2	D1	D2	DC	SC
1	-65620.	65620.	-65620.	65620.	6562.	19686.	-1.50	0.

GRID PARAMETERS

Gravity Model

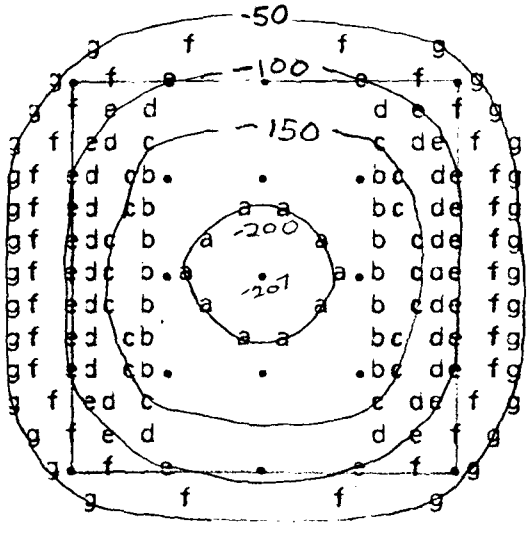
Number of Grid Points in X Direction:	15
Number of Grid Points in Y Direction:	15
Grid Spacing in Feet:	32810.00
X Offset in Feet:	0.00
Y Offset in Feet:	0.00

CONTOURING PARAMETERS

Data Maximum:	-0.281
Data Minimum:	-207.
Contouring Interval:	25.0

CONTOUR VALUES

(g) =	-0.500E 02	—
(f) =	-0.750E 02	
(e) =	-0.100E 03	—
(d) =	-0.125E 03	
(c) =	-0.150E 03	—
(b) =	-0.175E 03	
(a) =	-0.200E 03	—


-50
-100
-150
-200
-207

MATRIX FACTOR: 1.0E-03

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	-280	-350	-436	-536	-642	-740	-810	-835	-810	-739	-642	-536	-436	-350	-280
2	-350	-456	-595	-770	-972	-1173	-1324	-1381	-1324	-1173	-972	-770	-595	-456	-350
3	-436	-595	-823	-1144	-1564	-2028	-2402	-2544	-2402	-2028	-1564	-1144	-823	-595	-436
4	-536	-770	-1144	-1.755	-2726	-4021	-5148	-5571	-5148	-4021	-2726	-1.755	-1144	-770	-536
5	-642	-972	-1564	-2726	-5261	=1045	=1535	=1681	=1535	=1045	-5261	-2726	-1564	-972	-642
6	-739	-1173	-2028	-4021	=1045	=5723	=1035	=1081	=1035	=5722	=1045	-4021	-2028	-1173	-739
7	-810	-1324	-2402	-5148	=1535	=1035	=1911	=1987	=1911	=1035	=1535	-5148	-2402	-1324	-810
8	-835	-1381	-2544	-5571	=1681	=1081	=1987	=2070	=1987	=1081	=1681	-5571	-2544	-1381	-835
9	-810	-1324	-2402	-5148	=1535	=1035	=1911	=1987	=1911	=1035	=1535	-5148	-2402	-1324	-810
10	-740	-1173	-2028	-4021	=1045	=5724	=1035	=1081	=1035	=5723	=1045	-4021	-2028	-1173	-740
11	-642	-972	-1564	-2726	-5261	=1045	=1535	=1681	=1535	=1045	-5261	-2726	-1564	-972	-642
12	-536	-770	-1144	-1.755	-2726	-4021	-5148	-5571	-5148	-4021	-2726	-1.755	-1144	-770	-536
13	-436	-595	-823	-1144	-1564	-2028	-2402	-2544	-2402	-2028	-1564	-1144	-823	-595	-436
14	-350	-456	-595	-770	-972	-1173	-1324	-1381	-1324	-1173	-972	-770	-595	-456	-350
15	-280	-350	-436	-536	-642	-740	-810	-835	-810	-739	-642	-536	-436	-350	-280

Project name: ALASKA STATE COUPLED
TEST GM3D #2
Model: OFFSET PRISM ###1

A-3

c.l. = 26248 ft.
offset to SE quad.

Units in Feet

MAGNETIC PARAMETERS
Earth"s field: 0. gammas.
Inclination = 0. degrees Declination = 0. degrees.

PRISM	X1	X2	Y1	Y2	D1	D2	DC	SC
	West	East	South	North				
1	853060.	984300.	-984300.	-853060.	6562.	19686.	-1.50	0.

GRID PARAMETERS

Gravity Model

Number of Grid Points in X Direction: 15

Number of Grid Points in Y Direction: 15

Grid Spacing in Feet: 262480.00

X Offset in Feet: 0.00

Y Offset in Feet: 0.00

CONTOURING PARAMETERS

Data Maximum: -0.153E-03
Data Minimum: -1.76
Contouring Interval: 0.500

CONTOUR VALUES

(c) = -0.500E 00
(o) = -0.100E 01
(a) = -0.150E 01

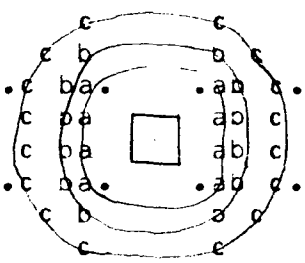
N

W

S

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

0,0



=62,480'

MATRIX FACTOR: 1.0E-06

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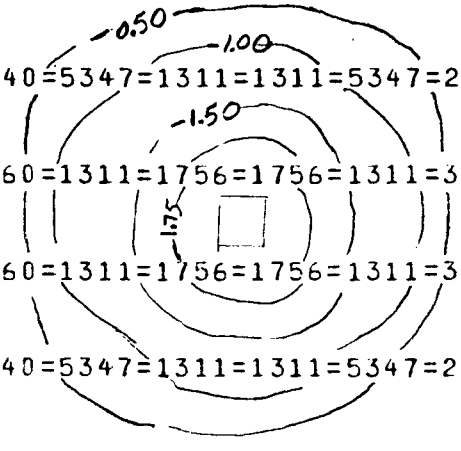
1	-152	-175	-202	-232	-265	-300	-335	-368	-397	-419	-430	-430	-419	-397	-368
2	-175	-205	-241	-281	-327	-377	-430	-482	-527	-562	-581	-581	-562	-527	-482
3	-202	-241	-287	-343	-408	-482	-562	-644	-719	-778	-810	-810	-778	-719	-644
4	-232	-281	-343	-419	-511	-621	-748	-883	-1013	-1119	-1179	-1179	-1119	-1013	-883
5	-265	-327	-408	-511	-644	-810	-1013	-1244	-1483	-1688	-1808	-1808	-1688	-1483	-1244
6	-300	-377	-482	-621	-810	-1064	-1395	-1808	-2273	-2707	-2978	-2978	-2707	-2273	-1808
7	-335	-430	-562	-748	-1013	-1395	-1944	-2707	-3679	-4705	-5412	-5412	-4705	-3679	-2707
8	-368	-482	-644	-883	-1244	-1808	-2707	-4139	-6317	-9116	=1140	=1140	-9116	-6317	-4139
9	-397	-527	-719	-1013	-1483	-2273	-3679	-6317	=1140	=2040	=3060	=3060	=2040	=1140	-6317
10	-419	-562	-778	-1119	-1688	-2707	-4705	-9116	=2040	=5347	=1311	=1311	=5347	=2040	-9116
11	-430	-581	-810	-1179	-1808	-2978	-5412	=1140	=3060	=1311	=1756	=1756	=1311	=3060	=1140
12	-430	-581	-810	-1179	-1808	-2978	-5412	=1140	=3060	=1311	=1756	=1756	=1311	=3060	=1140
13	-419	-562	-778	-1119	-1688	-2707	-4705	-9116	=2040	=5347	=1311	=1311	=5347	=2040	-9116
14	-397	-527	-719	-1013	-1483	-2273	-3679	-6317	=1140	=2040	=3060	=3060	=2040	=1140	-6317
15	-368	-482	-644	-883	-1244	-1808	-2707	-4139	-6317	-9116	=1140	=1140	-9116	-6317	-4139



min @ a g.i. = -1.76 mg

Project name: ALASKA STATE COUPLED
TEST GM3D #4

A-4

five prisms, large grid

Model: FIVE PRISMS, LARGE G.1.

Units in Feet

MAGNETIC PARAMETERS
Earth"s field: 0. gammas.
Inclination = 0. degrees Declination = 0. degrees.

PRISM	X1	X2	Y1	Y2	D1	D2	DC	SC
1	-984300.	-853060.	-984300.	-853060.	6562.	19686.	-1.50	0.
2	-984300.	-853060.	853060.	984300.	6562.	19686.	-1.50	0.
3	853060.	984300.	853060.	984300.	6562.	19686.	-1.50	0.
4	853060.	984300.	-984300.	-853060.	6562.	19686.	-1.50	0.
5	-65620.	65620.	-65620.	65620.	6562.	19686.	-1.50	0.

GRID PARAMETERS

Gravity Model

Number of Grid Points in X Direction: 15

Number of Grid Points in Y Direction: 15

Grid Spacing in Feet: 262480.00

X Offset in Feet: 0.00

Y Offset in Feet: 0.00

CONTOURING PARAMETERS
Data Maximum: -0.555E-02
Data Minimum: -207.
Contouring Interval: 49.0

CONTOUR VALUES
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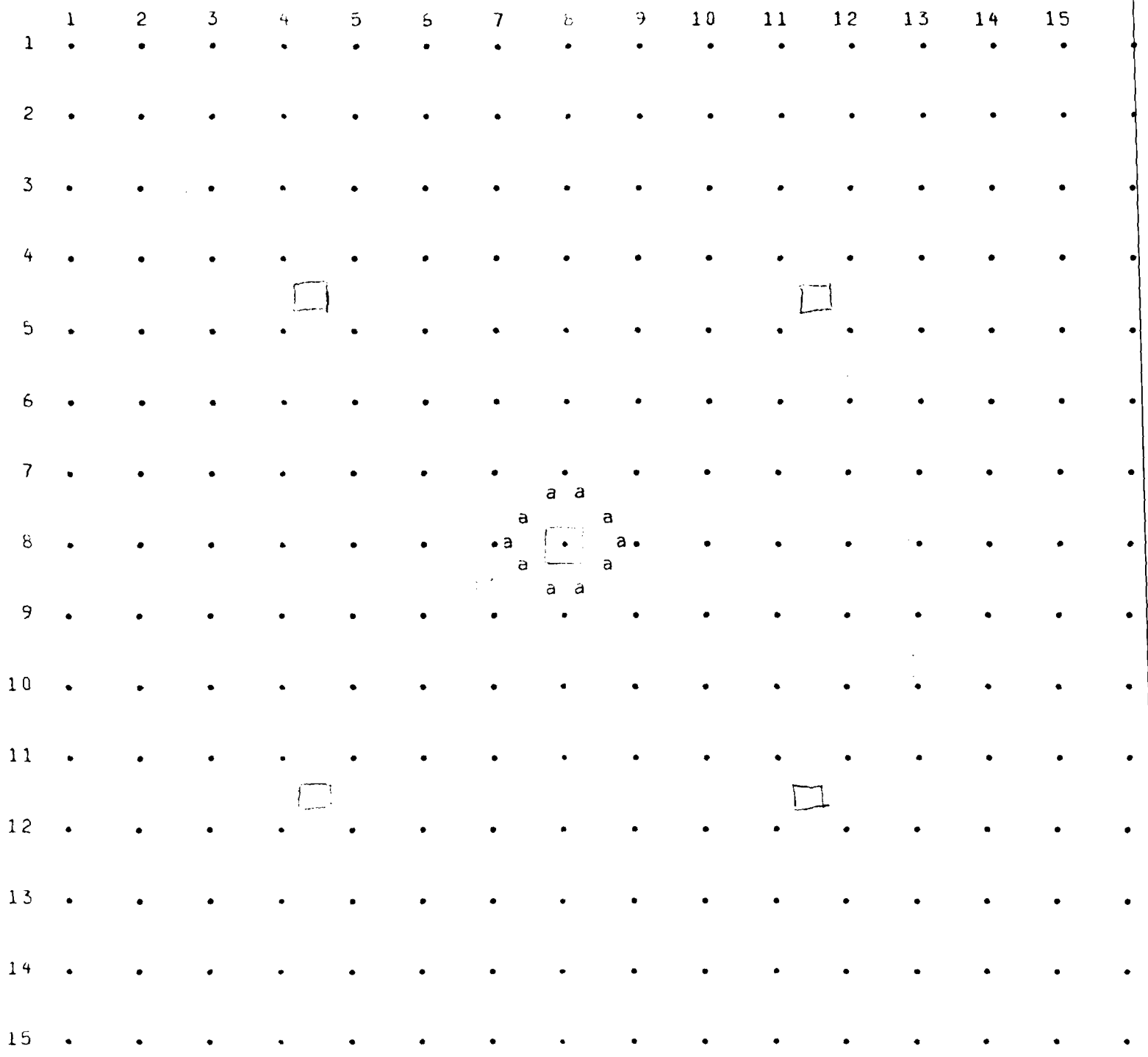
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
a a
a a
a a
a a

MATRIX FACTOR: 1.0E-05

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	-554	-800	-1116	-1389	-1447	-1293	-1117	-1047	-1117	-1293	-1447	-1389	-1116	-800	-554
2	-800	-1347	-2297	-3381	-3465	-2559	-1826	-1591	-1826	-2559	-3465	-3381	-2297	-1347	-800
3	-1116	-2297	-5673	=1353	=1366	-6065	-3017	-2353	-3017	-6065	=1366	=1353	-5673	-2297	-1116
4	-1389	-3381	=1353	=1,761	=1,763	=1415	-4495	-3242	-4495	=1415	=1,763	=1,761	=1353	-3381	-1389
5	-1447	-3465	=1366	=1,763	=1,767	=1474	-5447	-4400	-5447	=1474	=1,767	=1,763	=1366	-3465	-1447
6	-1293	-2559	-6065	=1415	=1474	-8231	-7433	-8578	-7433	-8231	=1474	=1415	-6065	-2559	-1293
7	-1117	-1826	-3017	-4495	-5447	-7433	=2060	=5639	=2060	-7433	-5447	-4495	-3017	-1826	-1117
8	-1047	-1591	-2353	-3242	-4400	-8578	=5639	=2071	=5639	-8578	-4400	-3242	-2353	-1591	-1047
9	-1117	-1826	-3017	-4495	-5447	-7433	=2060	=5639	=2060	-7433	-5447	-4495	-3017	-1826	-1117
10	-1293	-2559	-6065	=1415	=1474	-8231	-7433	-8578	-7433	-8231	=1474	=1415	-6065	-2559	-1293
11	-1447	-3465	=1366	=1,763	=1,767	=1474	-5447	-4400	-5447	=1474	=1,767	=1,763	=1366	-3465	-1447
12	-1389	-3381	=1353	=1,761	=1,763	=1415	-4495	-3242	-4495	=1415	=1,763	=1,761	=1353	-3381	-1389
13	-1116	-2297	-5673	=1353	=1366	-6065	-3017	-2353	-3017	-6065	=1366	=1353	-5673	-2297	-1116
14	-800	-1347	-2297	-3381	-3465	-2559	-1826	-1591	-1826	-2559	-3465	-3381	-2297	-1347	-800
15	-554	-800	-1116	-1389	-1447	-1293	-1117	-1047	-1117	-1293	-1447	-1389	-1116	-800	-554

User: SCP -at MAIN

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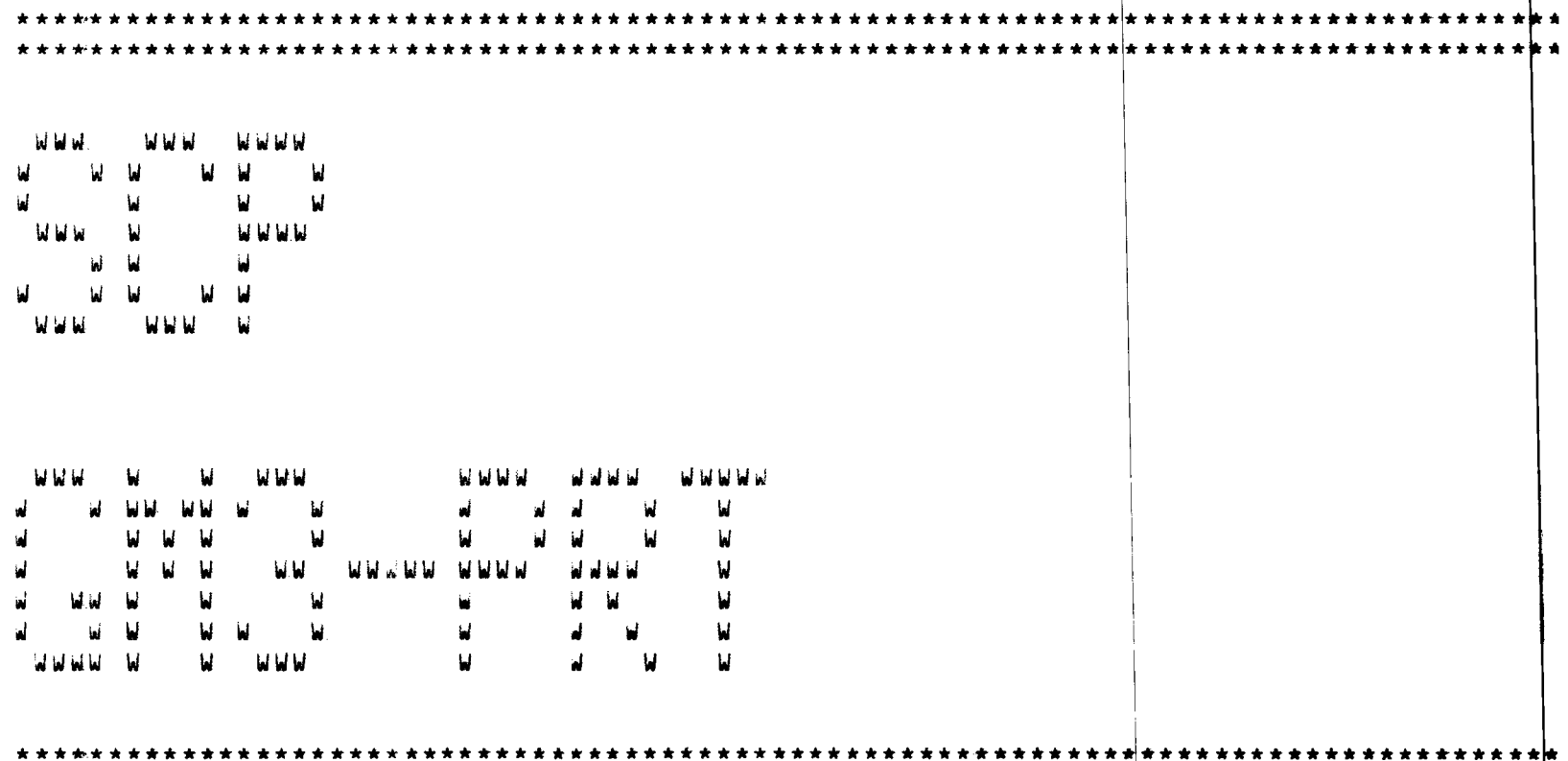

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Started: 85-02-22.11:59:08.Fri ON: PR0 BY: PR0

Project name: ALASKA STATE COUPLED
TEST GMED #1
Model: 1 PRISM, ~~MAGNETIC~~ ANOMALY #1
Gravity ; SMALLEST GRID
Units in Feet

MAGNETIC PARAMETERS
Earth"s field: 60000. gammas.
Inclination = 90. degrees Declination = 0. degrees.

Did not accept magnetization parameters

PRISM	X1	X2	Y1	Y2	D1	D2	DC	SC
1	-65620.	65620.	-65620.	65620.	6562.	19686.	-1.50	1000.

GRID PARAMETERS

Gravity Model

Number of Grid Points in X Direction: 15

Number of Grid Points in Y Direction: 15

Grid Spacing in Feet: 32810.00

X Offset in Feet: 0.00

Y Offset in Feet: 0.00

CONTOURING PARAMETERS

Data Maximum:	-0.281
Data Minimum:	-207.
Contouring Interval:	50.0

CONTOUR VALUES

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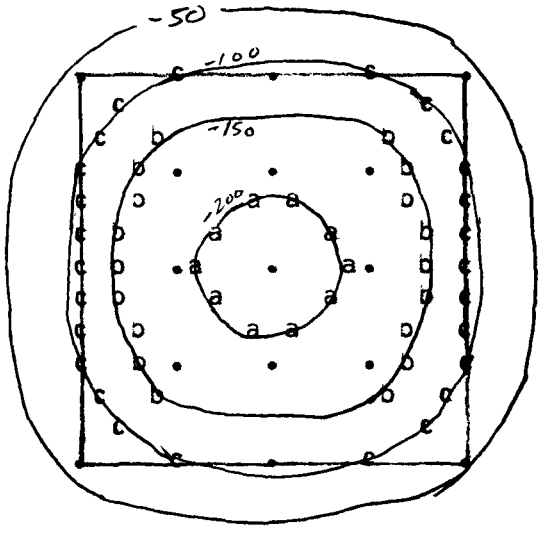
(b) =	-0.150E 03
(a) =	-0.200E 03


-50
-100
-150
-200

MATRIX FACTOR: 1.0E-03

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1	-280	-350	-436	-536	-642	-740	-810	-835	-810	-739	-642	-536	-436	-350	-280
2	-350	-456	-595	-770	-972	-1173	-1324	-1381	-1324	-1173	-972	-770	-595	-456	-350
3	-436	-595	-823	-1144	-1564	-2028	-2402	-2544	-2402	-2028	-1564	-1144	-823	-595	-436
4	-536	-770	-1144	-1755	-2726	-4021	-5148	-5571	-5148	-4021	-2726	-1755	-1144	-770	-536
5	-642	-972	-1564	-2726	-5261	=1045	=1535	=1681	=1535	=1045	-5261	-2726	-1564	-972	-642
6	-739	-1173	-2028	-4021	=1045	=5723	=1035	=1081	=1035	=5722	=1045	-4021	-2028	-1173	-739
7	-810	-1324	-2402	-5148	=1535	=1035	=1911	=1987	=1911	=1035	=1535	-5148	-2402	-1324	-810
8	-835	-1381	-2544	-5571	=1681	=1081	=1987	=2070	=1987	=1081	=1681	-5571	-2544	-1381	-835
9	-810	-1324	-2402	-5148	=1535	=1035	=1911	=1987	=1911	=1035	=1535	-5148	-2402	-1324	-810
10	-740	-1173	-2028	-4021	=1045	=5724	=1035	=1081	=1035	=5723	=1045	-4021	-2028	-1173	-740
11	-642	-972	-1564	-2726	-5261	=1045	=1535	=1681	=1535	=1045	-5261	-2726	-1564	-972	-642
12	-536	-770	-1144	-1755	-2726	-4021	-5148	-5571	-5148	-4021	-2726	-1755	-1144	-770	-536
13	-436	-595	-823	-1144	-1564	-2028	-2402	-2544	-2402	-2028	-1564	-1144	-823	-595	-436
14	-350	-456	-595	-770	-972	-1173	-1324	-1381	-1324	-1173	-972	-770	-595	-456	-350
15	-280	-350	-436	-536	-642	-740	-810	-835	-810	-739	-642	-536	-436	-350	-280

Usen: SCP -at MAIN

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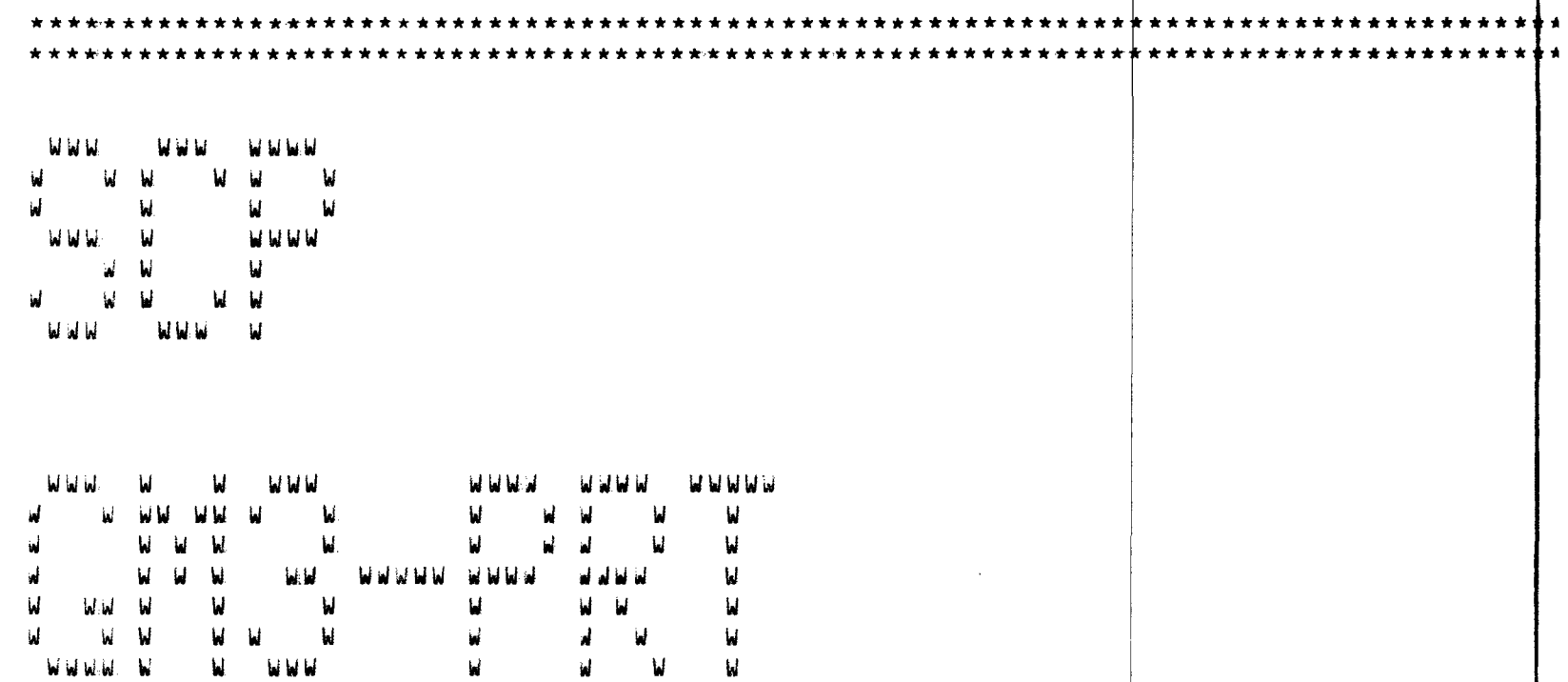

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Started: 85-02-22.09:22:44.Fri ON: PRO BY: PRO

Project name: ALASKA STATE COUPLED
TEST GMED #1
Model: 1 PRISM, SMALL GRID

Units in Feet

MAGNETIC PARAMETERS
Earth"s field: 0. gammas.
Inclination = 0. degrees Declination = 0. degrees.

PRISM	X1	X2	Y1	Y2	D1	D2	DC	SC
1	-65620.	65620.	-65620.	65620.	6562.	19686.	-1.50	0.

CONTRACT DELIVERABLES

ORGANIZATION Alaska Div. Geol. and Geophys. Surveys

PRINCIPAL CONTACT Dr. Roman Motyka PHONE 907-465-2520

CONTRACT NO. DE-FG07-84ID12524 COMPLETION DATE 8-13-85

ORIG. $	OBLIGATED	PAID	RETAINED	REMAINING	NOTES
DOE	27,875			27,875	
STATE	0			0	

$ DATA UPDATED 8-14-85 (no statements received)

CONTRACT	START	TASKS
Original	8-13-84	Synthesize water, gas, and isotopic geochemical data, Copper River Basin mud volcanos and mineral springs 1. synthesize available data 2. interpret data for geothermal resources 3. mineral equilibria studies of water and gas analyses with rocks from nearby oil wells 4. prepare final report 5. management

COMMENTS 5-15-85
Due to a lack of progress on this work, Roman has requested a no-cost extension of one quarter in his letter of 5-10-85. This is probably reasonable.
COMMENTS 8-14-85
The no cost extension is not yet in place, but Roman is gone for the rest of the fiscal year, and probably will return to work on the program in October '85. Numerous phone calls to the Juneau office of the DGGS have not resulted in any answers, other than their tape recorder.

DF/ESL/8-14-85

TASK	DELIVERABLES	DATE DUE	REC'D
1,2,3	see #4		
4	final report, to include:	8-13-85	
	data tables		
	discussion of geochemistry		
	results of equilibria study		
	geothermal interpretation		
	draft final report	6-30-85	
5	quarterly reports	1-15-85	?
		4-15-85	5-13-85
		7-15-85	missing

13 May 85

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

JAY S. HAMMOND, GOVERNOR

230 SOUTH FRANKLIN STREET
JUNEAU, ALASKA 99801
PHONE: (907) 465-3400

Mr. Eldon Bray
Depatment of Energy
Idaho Falls Operations Office
550 Second Street
Idaho Falls, Idaho 83401

May 10, 1985

Dear Eldon:

Little progress has been made on the Copper River geochemistry project during the past quarter.

1. Program ENTHALP, which was received from the Department of Scientific and Industrial Research, New Zealand, has been debugged , is operational and has been successfully used for Makushin geothermal data.

2. We experienced computor formatting compatibility problems with program SOLVEQ, which was obtained from Prof. Mark Reed at the U. of Oregon. The tapes have been returned to Prof. Reed for reformatting.

3. Compilation of Copper River water and gas data onto computor disks has been initiated.

Because of delays experienced in obtaining our micro-computor equipment and copies of fluid-mineral equilibria programs and because of other end-of-fiscal-year program commitments, work on the Copper River project has not progressed as well as originally anticipated. With the summer field season rapidly approaching it is unlikely we will be able to complete this project by August as originally scheduled. I am therefore compelled to request an extension on our contract of one quarter.

We will be obtaining some additional data on the Copper River spring waters and gases this summer under a cooperative program with Global Geochemistry Inc. of California and the Scripps Institute of Oceanography. The goal of the program is identification of mantle-derived gases, particularly methane. The results of this study will have a direct bearing on interpreting whether or not a geothermal resource exists at the Copper River basin and it is possible that some of the results can be incorporated into the present Copper River basin geochemical study.

Sincerely,

Roman J. Motyka
Geologist

cc. Duncan Foley

DOE F 4200.33
(7-82)

U.S. Department of Energy
Procurement Request-Authorization

Formerly PR-799A
(Previous editions are obsolete)

1. To Awarding Office: Contract Management Division

From Initiating Office: Energy Technology & Conservation Advanced Technology Division

3. PR Number —

4. Change/Correction to a PR in Process? ☐ Yes ☐ No

5. If Item 4 is yes, enter PR correction Letter

6. Procurement ☐ Assistance ☐

7. Consistent with Principal Purpose of Program? Yes ☐ No ☐

8. Action Description/Title: *(180 char. max.)* Alaska Dept Natural Resources – Reobligation of Funds From DE-FG07-79R600074

Awardee: If Competitive, has List of Sources been attached? Yes ☐ No ☐ If Non-Competitive, Complete Items 9-11.

9. Name: State of Alaska

10. Division: Dept. Natural Resources

11. Address: 794 University Ave, Basement Fairbanks, Alaska 99701

12. For Procurement Actions Only: Product or Service Code

13. For Assistance Actions Only: CFDA Number

14. Cooperative Agreement ☐

15. Grant ☐

For All Actions

16. Controlled Deliverable

(Recommended)
17. Kind of Award Action

18. Master Bin

19. Desired Award Date Mo Day Year

20. Unsolicited Proposal Number

21. Project Number DE-FG07-84ID12524

22. Government Property _____ F-Furnished, P-Purchased, N-Not involved

FINANCIAL DATA

23. Government Share 14,380.81

24. Awardee Share —

25. Total 14,380.81

FY FUNDS COMMITTED

26. Approp. Symbol	27. B&R Number	28. Dollar Amt.	29. Allotment	30. Object Class	31. AFP	32. CFA

33. From Continuation Sheet

34. Total Funds this PR

35. Project Period from _____ thru _____

36. Budget Period from _____ thru _____

PROJECT MANAGER/INITIATOR

37. Name: R. Eldon Bray

38. Signature: R Eldon Bray

39 Date: 5-1-85

40. Office Code

41. FTS Tel. Number: -5830086

PROGRAM REVIEWING OFFICIAL

42. Name: Charles E. Gilmore

43. Signature

44. Date

PROGRAM OFFICE BUDGET OFFICIAL

45. Name: Dennis R. Bell

46. Signature

CERTIFYING OFFICIAL. I hereby certify that the funds cited in item 34 are available.

47. Name: Frank S. Smith

48. Signature

49. Date

CONTRACTING OFFICER

(7-81)

NOTICE OF FINANCIAL ASSISTANCE AWARD

(See Instructions on Reverse)

Under the authority of Public Law 93-410 and
subject to legislation, regulations and policies applicable to *(cite legislative program title)*:
Geothermal Research, Development and Demonstration Act of 1977

PROJECT TITLE
Geothermal Study of Copper River Basin Area, Alaska

2. INSTRUMENT TYPE
☒ GRANT ☐ COOPERATIVE AGREEMENT

4. INSTRUMENT NO.
DE-FG07-84ID12524

5. AMENDMENT NO.

1. RECIPIENT *(Name, address, zip code, area code and telephone no.)*
State of Alaska, Department of Natural Resources, 794 University Avenue, Basement, Fairbanks, AK 99701

6. BUDGET PERIOD
FROM: 8/13/84 THRU: 8/13/85

7. PROJECT PERIOD
FROM: 8/13/84 THRU: 8/13/85

10. TYPE OF AWARD
☒ NEW ☐ CONTINUATION ☐ RENEWAL
☐ REVISION ☐ SUPPLEMENT

RECIPIENT PROJECT DIRECTOR *(Name and telephone No.)*
Roman J. Motyka (907) ~~479-8125~~ 474-7147

RECIPIENT BUSINESS OFFICER *(Name and telephone No.)*
W. W. Barnwell (907) 786-2171

12. ADMINISTERED FOR DOE BY *(Name, address, zip code, telephone No.)*
Elizabeth M. Hyster (208)526-1229
U. S. Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, ID 83401

1. DOE PROJECT OFFICER *(Name, address, zip code, telephone No.)*
R.Eldon Bray (208)526-0086
U.S. DOE, Idaho Operations Office
550 Second Street, Idaho Falls, ID 83401

3. RECIPIENT TYPE
☒ STATE GOV'T ☐ INDIAN TRIBAL GOV'T ☐ HOSPITAL ☐ FOR PROFIT ORGANIZATION ☐ INDIVIDUAL
☐ LOCAL GOV'T ☐ INSTITUTION OF HIGHER EDUCATION ☐ OTHER NONPROFIT ORGANIZATION ☐ C ☐ P ☐ SP ☐ OTHER *(Specify)*

4. ACCOUNTING AND APPROPRIATIONS DATA

a. Appropriation Symbol	b. B & R Number	c. FT/AFP/OC	d. CFA Number
89X0224.91	AM1510000	ID-44-91/250	

15. EMPLOYER I.D. NUMBER/SSN

16. BUDGET AND FUNDING INFORMATION

a. CURRENT BUDGET PERIOD INFORMATION		b. CUMULATIVE DOE OBLIGATIONS	
1) DOE Funds Obligated This Action	$ 27,875	(1) This Budget Period [Total of lines a.(1) and a.(3)]	$ 27,875
2) DOE Funds Authorized for Carry Over	$ -0-	(2) Prior Budget Periods	$ -0-
3) DOE Funds Previously Obligated in this Budget Period	$ -0-		
4) DOE Share of Total Approved Budget	$ 27,875	(3) Project Period to Date [Total of lines b. (1) and b. (2)]	$ 27,875
5) Recipient Share of Total Approved Budget	$ -0-		
6) Total Approved Budget	$ 27,875		

17. TOTAL ESTIMATED COST OF PROJECT $ _____
(This is the current estimated cost of the project. It is not a promise to award nor an authorization to expend funds in this amount.)

18. AWARD/AGREEMENT TERMS AND CONDITIONS

This award/agreement consists of this form plus the following:

a. Special terms and conditions (if grant) or schedule, general provisions, special provisions (if cooperative agreement)

b. Applicable program regulations *(specify)* N/A *(Date)* _____

c. DOE Assistance Regulations, 10 CFR Part 600, as amended, Subparts A and ☒ B (Grants) or ☐ C (Cooperative Agreements).

d. Application/proposal dated 4/9/84, ☒ as submitted ☐ with changes as negotiated

19. REMARKS
This Grant consists of this NFAA, Part I - Budget Plan, Part II - Conditions, and Part III - Statement of Work. The DOE Financial Assistance Rules (10CFRPart 600), OMB Circular A-102, OMB Circular A-87, and ANSI Standard Z 1.8-1971 are incorporated by reference and attached hereto.

20. EVIDENCE OF RECIPIENT ACCEPTANCE
W. W. Barnwell 8/13/84
(Signature of Authorized Recipient Official) *(Date)*
W. W. Barnwell
(Name)
Deputy Director
(Title)

21. AWARDED BY
Elizabeth M. Hyster 8/9/84
(Signature) *(Date)*
Elizabeth M. Hyster
(Name)
Contracting Officer
(Title)

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

BILL SHEFFIELD, GOVERNOR

POUCH 7-028
ANCHORAGE, ALASKA 99510
PHONE: (907) 276-2653

794 UNIVERSITY AVENUE, BASEMENT
FAIRBANKS, ALASKA 99701
(907) 474-7147

April 9, 1984

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

Dear Mr. Bray:

As per our telephone conversation of April 9, 1984, I have revised our proposal for geothermal studies in Alaska. Please find enclosed the revised proposal entitled "Research and Investigation of Waters and Gases from the Copper River Geothermal Area". The primary objective of this proposal is to unambiguously determine whether a developable geothermal resource underlies the Klawasi mud volcano area in the Copper River basin.

The total cost of the proposed work, $27,875, includes $22,804 for personal services and $5,071 for the purchase of an IBM-XT personal computer. The latter is essential for completion of the tasks outlined in the proposal.

Thank you for your consideration.

Sincerely,

Roman J. Motyka
Project Manager,
DGGS Geothermal Project

Attachment

PROPOSAL

Title: Research and Investigation of Waters and Gases from the Copper River Geothermal Area

Submitted to: Eldon Bray
Department of Energy
Idaho Falls Operations Office
550 Second Street
Idaho Falls, Idaho 83401

Submitted by: Roman J. Motyka
Alaska Division of Geological & Geophysical Surveys
794 University Ave., Basement
Fairbanks, Alaska 99701

Amount Requested: $27,875

Time Duration: July 1, 1984 - June 1, 1985

Description and Work Statement

The primary objective of this proposal is to use the available geochemical data base to determine unambiguously whether or not a geothermal resource underlies the western part of the Copper River Basin.

Two groups of mud volcanoes and mineral springs are located in the Copper River Basin--the Tolsona group west of Glenallen and the Klawasi group east of Glenallen. Although both groups discharge saline waters, the Klawasi group is distinguished by warmer water (20° Celcius) accompanied by vast quantities of carbon dioxide gas. The saline waters from both groups are thought to originate from an over-pressured zone in the Cretaceous marine sediments that underlie the basin. The proximity of the Klawasi group to the extremely large Quaternary volcanoes of the Western Wrangell Mountains has led to the speculation that a geothermal resource underlies the mud volcanoes and is responsible for the production of the CO_2 through thermogenic and geochemical processes. Professors Gene Wescott and Don Turner from the Geophysical Institute, University of Alaska, found gravity, magnetic, self-potential, and helium-soil anomalies in the Klawasi area, the combination of which they have interrupted as possibly indicating geothermal activity. However, geothermometers applied to the Klawasi spring waters are inconclusive--some suggest a cold water source while others indicate subsurface temperatures greater than 150° Celcius.

An extensive geochemical data base now exists for waters and gases emanating from the two groups of springs. Much of this data was acquired by DGGS during field operations in 1981 and 1982. Using an IBM-XT personal computer we now propose to:

1) synthesize all available data;

2) interpret these data in terms of their bearing on identification of geothermal resources; and

3) perform mineral - equilibria analyses to determine whether water and gas chemistries are in equilibrium with minerals identified in nearby oil and gas exploration wells.

The product of this study will be a report which will include:

1) tabulation of all available DGGS geochemical data plus any pertinent data from previous investigations;

2) discussions of water and gas chemical characteristics; stable isotope composition, (^{18}O, D, ^{13}C); and $^{3}He/^{4}He$ ratios;

3) results of mineral equilibria studies; and

4) discussion of whether or not the geochemical data indicate a geothermal resource under the Klawasi area.

The purchase of an IBM-XT personal computer is essential to the completion of the above described work in the man-hours allowed. Purchase of this computer is therefore included under the budget analysis.

Cost Information

Personal Services:

Position	Time	Salary	Benefits	Total
Geologist IV, Fbks	3 mo	$4100/mo	$1291/mo	$16,173
Geologic Asst 1, Fbks	2 1/4 mo	$2241/mo	$706/mo	6,631
				$22,804

Travel:	None
Contractual:	None
Commodities:	None
Equipment:	
IBM PC-XT with 256K RAM, 1 360K floppy disk drive, matched 8087 and 8088 co-processors, green monochrome monitor, and monochrome interface at 30 percent discount	4,386
IBM color graphics monitor and graphics interface at 30 percent discount	493
MS-DOS 2.1 or current version of IBM operating system at 30 percent discount	42
Shipping and handling	150
	$5,071
Grand Total:	$27,875

All travel, contractual, commodities, publication, and overhead costs will be absorbed by DGGS. These costs are estimated to be at least equivalent to the total amount of this proposal.

Proposer's Background

Dr. Roman J. Motyka, the principal investigator for this proposal, has been in the forefront of geothermal investigations in Alaska for the past five nears. Dr. Motyka is the head of the DGGS Geothermal Resource Assessment Program and has conducted state-wide, regional, and site-specific studies of Alaska's geothermal resources. Products of this work include a state-wide geothermal resources map (1:2,500,000); regional resource maps (1:1,000,000); reports on geothermal fluids investigations at the Makushin geothermal area and elsewhere; and several articles on geothermal resources and thermal fluid investigations which have been or will be published in the Transactions of the Geothermal Resources Council, in the Journal of the Alaska Geological Society, and in Chemical Geology. Dr. Motyka is currently involved in the Makushin geothermal drilling project on Unalaska Island.

Dr. Motyka received his Ph.D. in Geology and Geophysics from the Geophysical Institute, University of Alaska in 1983. The title of the dissertation is "Increases and Fluctuations in Thermal Activity at Mount Wrangell, Alaska".

Key Personal Qualifications

Shirley Liss, a geologic assistant, has been active in the DGGS Geothermal Program for four years. Ms. Liss has a Bachelor's Degree in Physics and has also done course work equivalent to a bachelor's degree in geology. One of her tasks has been to maintain and update the DGGS thermal fluids data file. Ms. Liss is therefore well-qualified to organize the Copper River geochemical data base for input into the IBM-XT computer. Ms. Liss also has a background in computer programming and will assist in the mineral-equilibria and water-rock interaction studies. Ms. Liss will also assist in drafting figures and preparation of reports.

Anticipated Objectives

1) Gain a better understanding of the water and gas geochemistry of the Copper River basin mud volcano and mineral spring waters.

2) Determine whether fluid geochemistry is in equilibrium with mineral phases.

3) Unambiguously determine whether or not a geothermal resource underlies the Klawasi area.

Probability of Success

1) 100 percent

2) 80 percent

3) 60 percent

PROPOSAL

Title: Research and Investigation of Waters and Gases from the Copper River Geothermal Area

Submitted to: Eldon Bray
Department of Energy
Idaho Falls Operations Office
550 Second Street
Idaho Falls, Idaho 83401

Submitted by: Roman J. Motyka
Alaska Division of Geological & Geophysical Surveys
794 University Ave., Basement
Fairbanks, Alaska 99701

Amount Requested: $27,875

Time Duration: July 1, 1984 - June 1, 1985

Description and Work Statement

The primary objective of this proposal is to use the available geochemical data base to determine unambiguously whether or not a geothermal resource underlies the western part of the Copper River Basin.

Two groups of mud volcanoes and mineral springs are located in the Copper River Basin--the Tolsona group west of Glenallen and the Klawasi group east of Glenallen. Although both groups discharge saline waters, the Klawasi group is distinguished by warmer water (20° Celcius) accompanied by vast quantities of carbon dioxide gas. The saline waters from both groups are thought to originate from an over-pressured zone in the Cretaceous marine sediments that underlie the basin. The proximity of the Klawasi group to the extremely large Quaternary volcanoes of the Western Wrangell Mountains has led to the speculation that a geothermal resource underlies the mud volcanoes and is responsible for the production of the CO_2 through thermogenic and geochemical processes. Professors Gene Wescott and Don Turner from the Geophysical Institute, University of Alaska, found gravity, magnetic, self-potential, and helium-soil anomalies in the Klawasi area, the combination of which they have interrupted as possibly indicating geothermal activity. However, geothermometers applied to the Klawasi spring waters are inconclusive--some suggest a cold water source while others indicate subsurface temperatures greater than 150° Celcius.

An extensive geochemical data base now exists for waters and gases emanating from the two groups of springs. Much of this data was acquired by DGGS during field operations in 1981 and 1982. Using an IBM-XT personal computer we now propose to:

1) synthesize all available data;

2) interpret these data in terms of their bearing on identification of geothermal resources; and

3) perform mineral - equilibria analyses to determine whether water and gas chemistries are in equilibrium with minerals identified in nearby oil and gas exploration wells.

The product of this study will be a report which will include:

1) tabulation of all available DGGS geochemical data plus any pertinent data from previous investigations;

2) discussions of water and gas chemical characteristics; stable isotope composition, (^{18}O, D, ^{13}C); and $^{3}He/^{4}He$ ratios;

3) results of mineral equilibria studies; and

4) discussion of whether or not the geochemical data indicate a geothermal resource under the Klawasi area.

The purchase of an IBM-XT personal computer is essential to the completion of the above described work in the man-hours allowed. Purchase of this computer is therefore included under the budget analysis.

Cost Information

Personal Services:

Position	Time	Salary	Benefits	Total
Geologist IV, Fbks	3 mo	$4100/mo	$1291/mo	$16,173
Geologic Asst 1, Fbks	2 1/4 mo	$2241/mo	$706/mo	6,631
				$22,804

Travel:	None
Contractual:	None
Commodities:	None
Equipment:	
IBM PC-XT with 256K RAM, 1 360K floppy disk drive, matched 8087 and 8088 co-processors, green monochrome monitor, and monochrome interface at 30 percent discount	4,386
IBM color graphics monitor and graphics interface at 30 percent discount	493
MS-DOS 2.1 or current version of IBM operating system at 30 percent discount	42
Shipping and handling	150
	$5,071
Grand Total:	$27,875

All travel, contractual, commodities, publication, and overhead costs will be absorbed by DGGS. These costs are estimated to be at least equivalent to the total amount of this proposal.

Proposer's Background

Dr. Roman J. Motyka, the principal investigator for this proposal, has been in the forefront of geothermal investigations in Alaska for the past five nears. Dr. Motyka is the head of the DGGS Geothermal Resource Assessment Program and has conducted state-wide, regional, and site-specific studies of Alaska's geothermal resources. Products of this work include a state-wide geothermal resources map (1:2,500,000); regional resource maps (1:1,000,000); reports on geothermal fluids investigations at the Makushin geothermal area and elsewhere; and several articles on geothermal resources and thermal fluid investigations which have been or will be published in the Transactions of the Geothermal Resources Council, in the Journal of the Alaska Geological Society, and in Chemical Geology. Dr. Motyka is currently involved in the Makushin geothermal drilling project on Unalaska Island.

Dr. Motyka received his Ph.D. in Geology and Geophysics from the Geophysical Institute, University of Alaska in 1983. The title of the dissertation is "Increases and Fluctuations in Thermal Activity at Mount Wrangell, Alaska".

Key Personal Qualifications

Shirley Liss, a geologic assistant, has been active in the DGGS Geothermal Program for four years. Ms. Liss has a Bachelor's Degree in Physics and has also done course work equivalent to a bachelor's degree in geology. One of her tasks has been to maintain and update the DGGS thermal fluids data file. Ms. Liss is therefore well-qualified to organize the Copper River geochemical data base for input into the IBM-XT computer. Ms. Liss also has a background in computer programming and will assist in the mineral-equilibria and water-rock interaction studies. Ms. Liss will also assist in drafting figures and preparation of reports.

Anticipated Objectives

1) Gain a better understanding of the water and gas geochemistry of the Copper River basin mud volcano and mineral spring waters.

2) Determine whether fluid geochemistry is in equilibrium with mineral phases.

3) Unambiguously determine whether or not a geothermal resource underlies the Klawasi area.

Probability of Success

1) 100 percent

2) 80 percent

3) 60 percent

TECHNICAL EVALUATION

OF A

GRANT PROPOSAL

TITLE: Geothermal Studies in Alaska

SUBMITTED TO: Department of Energy
Idaho Operations Office
Idaho Falls, ID

SUBMITTED BY: Division of Geological & Geophysical Surveys
State of Alaska, Department of Natural Resources
794 University Avenue, Basement
Fairbanks, AK 99701

AMOUNT REQUESTED: $27,875

PROPOSED DURATION: July 1, 1984 - June 1, 1985

PROJECT DESCRIPTION: The proposer offers to use an available geochemical data base to determine unambiguously whether or not a geothermal resource underlies the western part of the Copper River Basin in Alaska.

GENERAL REMARKS:

1. Work Statement: The proposed work statement and schedule are compatible with DOE's technical requirements except as noted below.

2. Task Changes: Task 1, "Summarization of geothermal energy investigations in Alaska" is found not to be compatible with DOE's technical requirements. Discussions held between the proposer and DOE-ID have resulted in the deletion of Task 1.

3. Cost Information: The cost information provided did not separate the costs for Tasks 1 and 2. The proposer was requested to resubmit a cost proposal for Task 2 only. The proposer submitted a second letter which provided cost information adequate for evaluation.

SPECIFIC REMARKS:

1. Manhours: The proposed quantity of manhours and the mix of personnel utilized for Task 2 are reasonable and appropriate.

2. Material Costs: The proposer requests purchasing an IBM-XT PC computer system to perform the Task 2 workscope within the hours budgeted. The proposed purchase appears to be reasonable and appropriate for the performance of the task. Other material costs are to be borne by the proposer.

3. Subcontracts: The proposed activity does not include any subcontracting.

4. Travel and Per Diem: Travel and per diem costs are to be borne by the proposer.

5. Other Direct Costs: The proposal includes base salary plus benefits. All other direct costs, such as commodities, publications, and overhead, are the responsibility of the proposer.

6. Proposer's Capability to Meet the Objectives: The proposer possesses unique experience developed through previous DOE contracts and other agency involvements. The proposer is considered to be fully capable of meeting the proposal's objectives.

7. Key Personnel Qualifications: The key person, Dr. Roman J. Motyka, who will assume responsibility for this activity, has proper training and experience in the required discipline, making him fully qualified for this task. Dr. Motyka is the head of the Division of Geological and Geophysical Survey's Geothermal Resource Assessment Program and has conducted state-wide, regional, and site-specific studies of Alaska's geothermal resources. He will be assisted by Ms. Shirley Liss who has been active in the same DGGS program for years. Ms. Liss has a Bachelor of Science Degree in Physics and has completed course work equivalent to a Bachelor's Degree in Geology. Geological and geophysical work has been very satisfactorily performed by DGGS under Contract No. DE-FC07-79ET-27105, and it is expected that the proposer is capable of performing the tasks of this proposal in a fully satisfactory fashion.

8. Anticipated Objectives and Probability of Success: The anticipated objective of this activity is to determine unambiguously whether or not a geothermal resource underlies the western part of the Copper River Basin in Alaska. The performance of the tasks will result in gaining a better understanding of the water and gas geochemistry of the Basin's mud volcano and mineral spring waters. There is a strong likelihood that the effort will determine whether fluid chemistry is in equilibrium with mineral phases, and unambiguously determine whether or not a geothermal resource underlies the Klawasi area.

4/16/84
Date

Susan M. Pristarick for
R. Eldon Bray
General Engineer
Advanced Technology Division

STATEMENT OF WORK

The Division of Geological and Geophysical Surveys will perform a synthesis of water, gas, and isotopic geochemical data on Alaska's Copper River Basin mud volcano and mineral spring water. This work includes:

1. Synthesize all available data

2. Interpret these data in terms of their bearing on identification of geothermal resources

3. Perform mineral-equilibria analyses to determine whether water and gas chemistries are in equilibrium with minerals identified in nearby oil and gas exploration wells

4. Prepare and issue a final report which will include:

   a. Tabulation of all available DGGS geochemical data plus any pertinent data from previous investigations

   b. Discussions of water and gas chemical characteristics, stable isotope composition, (O_{18}, D, C_{13}); and He_3/He_4 ratios

   c. Results of mineral equilibria studies

   d. Discussion of whether or not the geochemical data indicate a geothermal resource under the Klawasi area

5. Provide overall project management and complete and report on tasks in a timely manner. Management reports shall be provided as defined by the attached DOE Form EIA 459A Reporting Requirements Checklist. The required reports are also summarized as follows:

a.	Form DOE 538, Notice of Energy RD&D	Due 30 days after award of grant
b.	Quarterly Management Summary Report	Due 15 days after calendar quarter end
c.	Quarterly Project Status Report	Due 15 days after calendar quarter end
d.	Final Report (Draft)	Due 45 days prior to completion date
e.	Final Report	Due on completion date
f.	Financial Status Report, OMB Form 269	Due on completion date

U.S. DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE

REPORT DISTRIBUTION LIST

Addressees	Number of Report Copies																							
	Federal Assistance Management Plan	Federal Assistance Budget Information Form	Federal Assistance Management Summary Report	Federal Assistance Program/Project Status Report	Financial Status Report, OMB Form 269	Notice of Energy RD&D	Technical Progress Report	Topical Report	Final Technical Report															
U. S. Department of Energy Idaho Operations Office 550 Second Street Idaho Falls, ID 83401																								
Attn: R. Eldon Bray, Program Mgr. Energy & Technology Division					2	2			8															
Attn: Elizabeth M. Hyster Contracts Management Div.					1	1	1	1	1															
Attn: E. G. Jones, Director Financial Management Div.					1																			
U. S. Department of Energy Forrestal Bldg., CE-324 1000 Independence Ave, S.W. Washington, DC 20585 Attn: Ron Toms					1	1			6															
University of Utah Research Institute Earth Science Laboratory 391 Chipeta Way, Suite C Salt Lake City, UT 84108 Attn: Duncan Foley					1	1			1															
U. S. Department of Energy Technical Information Center P. O. Box 62 Oak Ridge, TN 37830							1																	

Special Instructions

U.S DEPARTMENT OF ENERGY

FEDERAL ASSISTANCE REPORTING CHECKLIST

FORM EIA 459A
(10/80)

FORM APPROVED
OMB NO 1900-0127

1. Identification Number: DE-FG07	2. Program/Project Title: Geothermal
3. Recipient:	

4. Reporting Requirements:	Frequency	No. of Copies	Addressees
PROGRAM/PROJECT MANAGEMENT REPORTING			
☐ Federal Assistance Milestone Plan			
☐ Federal Assistance Budget Information Form			
☒ Federal Assistance Management Summary Report	Q		
☒ Federal Assistance Program/Project Status Report	Q		
☒ Financial Status Report, OMB Form 269	F		
TECHNICAL INFORMATION REPORTING			
☒ Notice of Energy RD&D	0		
☐ Technical Progress Report			
☐ Topical Report			
☒ Final Technical Report	F		

FREQUENCY CODES AND DUE DATES:

A - As Necessary; within 5 calendar days after events.
F - Final; Upon completion date
Q - Quarterly; within 15 days after end of calendar quarter or portion thereof.
O - One time after project starts; within 30 days after award.
X - Required with proposals or with the application or with significant planning changes.
Y - Yearly; 30 days after the end of program year. (Financial Status Reports 90 days).
S - Semiannually; within 30 days after end of program fiscal half year.

5. Special Instructions:

6. Prepared by: (Signature and Date)	7. Reviewed by: (Signature and Date)

JUSTIFICATION FOR NON-COMPETITIVE AWARDS

I recommend that negotiations be conducted only with those organizations listed below for the services described herein in accordance with DOE-PR 9-3.805-501.

Organization

State of Washington, Department of Natural Resources
State of Washington, Energy Office
State of Oregon, Dept. of Geology & Mineral Industries
State of Oregon, Department of Energy
State of Alaska, Department of Commerce & Economic Development, Office of Energy
University of Alaska, Geophysical Institute
State of Alaska, Department of Natural Resources
New Mexico State University, Energy Institute
State of New Mexico Energy & Minerals Department
Idaho Department of Water Resources
State of Utah, Utah Geological & Mineral Survey
State of Utah, Division of Water Rights
State of Montana, Dept. of Natural Resources & Conservation
State of Montana, College of Mineral Science & Technology

1. Description of Supplies or Services to be Supported

A. The actions with the above named universities and state government agencies are for geothermal resource assessment and to promote geothermal technology transfer within the participating states. Emphasis will be placed on detailed studies within areas with high temperature resources and/or expansion of work previously conducted within the states.

B. The work to be provided by each university or state agency will be tailored to the needs within each state and DOE objectives for continued resource assessment and technology transfer.

2. History, Estimated Future Requirements, and Long-Range Objectives

A. The State Teams Programs were initiated approximately seven years ago. At the program peak DOE-ID was administering 39 geothermal contracts, cooperative agreements, or grants with universities and state agencies. Eight of the above mentioned organizations are at present in the final phases of their agreements with DOE; the remainder have completed the work, and their agreements were closed out.

B. This work is a continuation of the previous program in the sense that it is for geothermal resource assessment and technology transfer. However, the new emphasis will be in accordance with the generic guidelines set forth in C below and will investigate higher temperature systems.

C. All work will be within the generic guidelines of DOE which are to implement these activities within states which:

1. Have potential for high temperature geothermal resources
2. Whose resource assessment efforts will support R&D investigations required by magma and Cascades research programs
3. Have existing resource and energy groups actively supporting geothermal development
4. Are currently providing outstanding technology transfer and institutional problem mitigation activities

D. It is not anticipated that DOE will be able to develop competition for this work. The performing state agencies and universities were designated by the Governor's Office of each participating state. An attempt to stimulate competition would be contrary to DOE's policy of cooperation with state governments.

3. Estimated Cost

A. The program funding level of $1,925,000 was designated by the FY-84 Appropriations Bill and DOE-HQ. The funding levels for the individual states range from $ 90,000 to $145,000 and were established by ID and HQ based on the prior state teams annual funding levels, the amount and quality of work previously accomplished at these levels, and the amount of productive work remaining to be done.

B. The FY-84 funding level for the portion of the program to be administered at DOE-ID is $1,295,000 of the total program funding of $1,925,000. This level of funding is lower than any of the previous seven years; the amount to be funded in future years is uncertain.

C. It is the intent of this program to expand the knowledge of higher temperature resources within individual states. This work was performed in previous years by the organizations within each state which were designated by the respective Governor's Office. Any change in contractors at this time would increase costs and delay the program and could only be undertaken with the consent of the Governor's Office in each state.

4. Schedule Requirements

A. The basis for the rapid emplacement of the subject program is the imminent close-out of the agreements DOE now has with several of the organizations we wish to have perform under the FY-84 program. The agreements presently in place are scheduled for various completion dates ranging from almost immediately to September 1984.

B. It is important to get the work started as soon as possible because the existing expertise may be disbanded if the work presently contracted for is completed prior to the emplacement of this subject program. The existing expertise has been developed to a great extent under the previous DOE-ID contracts and a lapse in DOE funding could result in lack of financial support for the organizations. This cadre of experienced expertise is critical for high quality resource assessment and technology transfer, and it is doubtful that any other organizations can perform as well in the respective states as those which are listed above. Rapid emplacement of this program will help ensure the retention of the existing expertise.

C. It is doubtful that any savings can be realized or that competition can be increased by relaxing schedules.

5. Exclusive Capacity & Capability

It was determined at the beginning of the previous program to use universities and state agencies to perform the work because these organizations had already performed research in the particular areas, had basic staffs and departments capable of performing the research, and were designated by the state executives. The experience of these organizations has been further enhanced by the work they have conducted for DOE during the past seven years.

RECOMMENDED:

R E Wood

R. E. Wood, Director
Energy and Technology Division

CONCUR:

George C. Wingerson
Office of the Chief Counsel

J. F. Marmo 2/5/84

J. F. Marmo, Director
Contracts Management Division

APPROVED:

Troy E Wade

Troy E. Wade, Manager
Idaho Operations Office

2/7/84
Date

U.S. DEPARTMENT OF ENERGY

DOE F 4220.2 (6-80) (Formerly PR-415)

SMALL BUSINESS/LABOR SURPLUS SET-ASIDE REVIEW

I.D. NO.

ITEM TITLE/DESCRIPTION
Alaska, State of
Department of Natural Resources
FY84 Geothermal Grant

SMALL BUSINESS SIZE STANDARD RECOMMENDED BY S.B. SPECIALIST
EMPLOYEES NUMBER _____
DOLLAR $ _____
SIC CODE: _____

PROGRAM OFFICE: Energy Tech & Cons.

PROCURING ACTIVITY: Contracts Mgmt Div.

SB/LS PARTICIPATION WAS CONSIDERED IN THE PREPARATION OF THIS PROCUREMENT ITEM AND FOLLOWING IS RECOMMENDED:

- ☐ Small Business Set-Aside _____ % $ _____
- ☐ Labor Surplus Set-Aside _____ % $ _____
- ☐ SBA Section 8(a) Procurement
- ☒ Set-Aside Action Not Recommended

NAME AND LOCATION OF PROPOSED SOURCE: (If Sole Source)
State of Alaska
Dept Natural Resources

- ☐ Small Business
- ☐ Minority
- ☐ Labor Surplus Firm
- ☒ Other

SET-ASIDE NOT FEASIBLE BECAUSE:

- ☐ No Reasonable Expectation of Receiving Sufficient Offers from SB/LS Firms to Assure Award*
- ☐ Program Objectives Dictate Broadest Possible Solicitation to Obtain "Best Available" Expertise*
- ☐ Solicitation if for "Best Idea/Approach" R&D Effort
- ☐ Continuing and Directly Related R&D Effort. Competitive Procurement Not Feasible for Economic and/or Technical Reasons
- ☐ Procurement is for Completion or Within-Scope Expansion of Current Contract
- ☐ This is for Extension of Current Services to Allow Preparation/ Award of Competitive Follow on Procurement
- ☐ Sole Source as Determined Under Current DOE Policy Directives
- ☐ Funding of Unsolicited Proposal Under Current DOE Policy Directives
- ☒ Other*

*Explanation Required

EXPLANATION/ADDITIONAL COMMENT:
Supplementary Appropriation by Congress for FY84 state Teams geothermal activity in promoting technology utilization within participating states.

SMALL BUSINESS SPECIALIST CONSULTED (Check One) ☒ Yes ☐ No

583-0086
TELEPHONE

R E Olson Bray
P.R. REQUESTOR

4-13-84
DATE

SMALL BUSINESS SPECIALIST'S ENDORSEMENT

- ☐ Accepts ☐ Requests Reevaluation
- ☐ Request Solicitation of SB/LS Sources Attached
- ☐ Request Special SB/LS/MB Incentive Provisions (Attached)
- ☐ Other Comments/Attached

_____ SMALL BUSINESS SPECIALIST _____ DATE

REEVALUATION OF RECOMMENDATIONS/FINDINGS

- ☐ Reaffirmed
- ☐ Set-Aside Feasible

_____ AUTHORIZING PROGRAM OFFICIAL _____ DATE

REVIEWED BY SBA

- ☐ Request Solicitation of SB Sources Attached
- SBA Form 70 Attached ☐ Yes ☐ No

_____ SBA REPRESENTATIVE _____ DATE

PROCUREMENT OFFICER'S ACTION

- ☐ SB/LB Set-Aside ☐ Set-Aside Not Initiated
- ☐ Other Recommendations/Request Noted and Appropriate Action Taken

_____ PROCUREMENT OFFICER _____ DATE

CONTRACT NO.(S) SB/MB/OTHER

ORIGINAL-CONTRACT FILE (FULLY EXECUTED)

U.S. Department of Energy

Procurement Request-Authorization

1. To Awarding Office: Chicago Field Management Division	3. PR Number — •
	4. Change/Correction to a PR in Process? ☐ Yes ☐ No
	5. If item 4 is yes, enter PR correction Letter
2. From initiating Office: Energy Technology & Conservation, Advanced Technology Division	6. ☐ Procurement ☐ Assistance
	7. Consistent with Principal Purpose of Program? ☐ Yes ☐ No

8. Action Description/Title (180 char. max.) Alaska, State of - Dept of Natural Resources FY 84 Geothermal Grant

If award is competitive, has list of sources been attached? ☐ Yes ☐ No — If Non-Competitive, Complete Items 9-11.

9. Name: State of Alaska	11. Address: 794 University Ave, Basement, Fairbanks, Alaska 99701
10. Division: Dept Natural Resources	
12. For Procurement Actions Only: Product or Service Code	
13. For Assistance Actions Only: CFDA Number	14. Cooperative Agreement ☐ 15. Grant ☐

16. Controlled Deliverable For All Actions	17. Kind of Award Action (Recommended)	18. Master Bin	19. Desired Award Date Mo Day Year
			ASAP

20. Unsolicited Proposal Number — 21. Project Number

22. Government Property ____ F-Furnished, P-Purchased, N-Not involved

FINANCIAL DATA

23. Government Share	24. Awardee Share	25. Total
27,875		27,875

FY FUNDS COMMITTED

26. Approp. Symbol	27. B&R Number	28. Dollar Amt.	29. Allotment	30. Object Class	31. AFP	32. CFA

33. From Continuation Sheet	35. Project Period from ____ thru ____
34. Total Funds this PR	36. Budget Period from ____ thru ____

PROJECT MANAGER/INITIATOR

37. Name	38. Signature	39 Date	40. Office Code / 41. FTS Telephone Number
R. Eldon Bray	R Eldon Bray	4-13-84	583-0086

PROGRAM REVIEWING OFFICIAL

42. Name	43. Signature	44. Date
Charles E. Gilmore		

PROGRAM OFFICE BUDGET OFFICIAL

45. Name	46. Signature
Dennis R. Bell	

CERTIFYING OFFICIAL. I hereby certify that the funds cited in item 34 are available

47. Name	48. Signature	49. Date
Frank S. Smith		

CONTRACTING OFFICE

9 Dec. '85

BILL SHEFFIELD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

☐ POUCH 7-028
ANCHORAGE, ALASKA 99510
PHONE: (907) 276-2653

794 UNIVERSITY AVENUE, BASEMENT
FAIRBANKS, ALASKA 99701
(907) 474-7147

December 6, 1985

Ron King
United States Department of Energy
785 DOE Place
Idaho Falls
Idaho 83402

Ron;

We would like DOE's permission to release the report included in this package as a DGGS "Public Data File". Public data files are reports meant for the immediate distribution of data which has not gone through the review process, either for lack of time of for lack of suitability as a professional publication. The reason for our desire for this early release of information follows.

The Alaska Division of Oil and Gas (DOG) held a geothermal lease sale in the Spurr area in 1983. There was little industry interest in the sale, and the sole bidder chose an area which does not appear to be of optimum geothermal potential. This fall the lease-holder applied for a geothermal prospecting permit in order to prospect outside of their lease area. DOG cannot issue a prospecting permit without issuing a call for applications and comments to see if there is any other interest in the area. DOG issued this call on November 21, 1985, with a response deadline of December 20, 1985. If there is sufficient interest in the area then a competitive lease sale may be held, perhaps as early as this spring.

The original intent of DOG was that people interested in the geothermal potential at Spurr would be able to talk to me directly and I could inform them of what had been done during the joint University of Alaska/DGGS investigation last summer. Within the Alaska State system unpublished data is considered to be public and must be released, even verbally, at anyone's request. In deciding on the timing of the call for applications and in setting the proposed geothermal lease date no one realized that DOE would require us to formally release the data.

We would like, then, to issue this report so that information can be available during the current lease process. Our final reports will not be ready in time.

I will be out of town from 12/8 through 12/16, but will call you when I return.

Sincerely,

Christopher Nye
Geologist

cc:
Peggy Brookshire
Duncan Foley

P.S. I'm sending the whole thing because it includes spring & fumerole chemistry now

Chris

Public-data File 85-

PRELIMINARY REPORT ON GEOTHERMAL RESOURCE INVESTIGATIONS AT MT. SPURR, ALASKA

By

E.M. Wescott[1], D.L. Turner[1], C.J. Nye[2], J.E. Beget[3] and R.M. Motyka[2]

Alaska Division of
Geological and Geophysical Surveys

in cooperation with

University of Alaska Geophysical Institute

December, 1985

THIS REPORT HAS NOT BEEN READ BY THE DIRECTOR, HAS NOT RECIEVED OFFICIAL DGGS PUBLICATION STATUS, AND SHOULD NOT BE QUOTED AS SUCH.

[1]Geophysical Institute, University of Alaska, Fairbanks, Alaska, 99701
[2]Alaska Division of Geological and Geophysical Surveys, 794 University Avenue - Basement, Fairbanks, Alaska 99709
[3]Geology and Geophysics Program, University of Alaska, Fairbanks, Alaska, 99701

15 Oct

BILL SHEFFIELD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

☐ POUCH 7-028
ANCHORAGE, ALASKA 99510
PHONE: (907) 274-9681

☐ P.O. BOX 80007
COLLEGE, ALASKA 99708
PHONE: (907) 474-7147

POUCH M
JUNEAU, ALASKA 99811
(907) 465-2520

October 8, 1985

Dr. Duncan Foley
University of Utah Research Institute
Earth Science Laboratory
391 Chipeta Way, Suite A
Salt Lake City, Utah 84108

Dear Duncan,

I'm back on the job and will dilligently endeavor to complete the Copper River work. Please find enclosed a copy of the quarterly project report that I sent to DOE, Idaho Falls.

Also note my current address and telephone number as given above.

Happy trails,

Roman J. Motyka,
Geologist

P.S. Would you be willing to review over Akutan report for publication as a DGGS Report of Investigation?