COLLEGE OF
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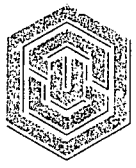
GL0009415

February 18, 1991

I N V O I C E

Dr. Howard P. Ross
University of Utah Research Institute
391 Chipeta WAy, Suite C
Salt Lake City, Utah 84108



Robert Duncan
College of Oceanography
Oregon State University
Oceanography Admin. Bldg.104
Corvallis, Oregon 97331-5503

OREGON
STATE
UNIVERSITY

Oceanography Adm Bldg 104
Corvallis, Oregon
97331-5503

RE: three K-Ar radrometric age determinations for basaltic rock samples provided from the Santiam Pass core by Mr. Britt Hill. K-analysis, Ar measurement, data reduction and age calculations supervised by Dr. R. Duncan. Results appended.

TOTAL COSTS $1200.00

Please reference: IX0019/30-061-6778KAR/0502

Please make check payable to: OREGON STATE UNIVERSITY

Please mail check to: Kathy Courtright
College of Oceanography
Oregon State University
Oceanography Admin. Bldg. 104
Corvallis, Oregon 97331-5503

Thank you.

Telephone
503·737·3504
Fax
503·737·2064

kardate --- Calculated Results

B3303 SP 3303 RAD SP-1647 Santiam Pass bas. andesite, 1-22

		errors
Sample Weight .....=	4.94085	
Percent Potassium .....=	0.760000	
40/38 measured .....=	0.144740	7.000000E-05
38/36 measured .....=	2265.44	12.0000
Fractionation Factor .....=	1.00900	6.830000E-04
Corrected Ratio for 40/38 ..=	0.146043	
Corrected Ratio for 38/36 ..=	2285.83	
Radiogenic Argon .....=	1.455268E-07	
Radiogenic Argon per gram ..=	2.945380E-08	
Air Argon per gram .....=	1.588320E-07	
Argon 40 / Potassium 40 ....=	5.796644E-05	
Percent Radiogenic Argon ...=	15.6431	
Age * 10**6 years .....=	0.997425	1.00 +/- 0.03 Ma
Precision in 10**6 years ...=	3.090061E-02	

kardate --- Calculated Results

B3301 SP 3301 RAD SP-2290' Santiam Pass basaltic andesite,

		errors
Sample Weight .....=	4.92716	
Percent Potassium .....=	0.660000	
40/38 measured .....=	0.295270	2.000000E-04
38/36 measured .....=	1020.18	3.92000
Fractionation Factor .....=	1.01100	6.830000E-04
Corrected Ratio for 40/38 ..=	0.298518	
Corrected Ratio for 38/36 ..=	1031.40	
Radiogenic Argon .....=	1.150576E-07	
Radiogenic Argon per gram ..=	2.335170E-08	
Air Argon per gram .....=	3.625825E-07	
Argon 40 / Potassium 40 ....=	5.292046E-05	
Percent Radiogenic Argon ...=	6.05069	
Age * 10**6 years .....=	0.910621	0.91 +/- 0.06 Ma
Precision in 10**6 years ...=	5.774955E-02	

kardate --- Calculated Results

B3312 SP 3312 RAD SP-3044 (R) Santiam Pass (B.Hill), 1-30-

		errors
Sample Weight .....=	5.12670	
Percent Potassium .....=	0.450000	
40/38 measured .....=	0.277130	1.600000E-04
38/36 measured .....=	1127.90	2.41000
Fractionation Factor .....=	1.00800	6.830000E-04
Corrected Ratio for 40/38 ..=	0.279347	
Corrected Ratio for 38/36 ..=	1136.92	
Radiogenic Argon .....=	1.623642E-07	
Radiogenic Argon per gram ..=	3.167031E-08	
Air Argon per gram .....=	3.154225E-07	
Argon 40 / Potassium 40 ....=	1.052662E-04	
Percent Radiogenic Argon ...=	9.12445	
Age * 10**6 years .....=	1.81090	✓ 1.81 +/- 0.05 Ma
Precision in 10**6 years ...=	4.776945E-02	

NEIL GOLDSCHMIDT
GOVERNOR

Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE

910 STATE OFFICE BLDG., 1400 SW 5th AVE., PORTLAND, OR 97201-5528
PHONE (503) 229-5580 FAX (503) 229-5639

October 23, 1990

To: Interested Persons, Program for Scientific Drilling in the Cascades

From: Brittain Hill, DOGAMI

Subject: Update on the Santiam Pass Drilling Project

A 929 meter (3046') geothermal observation hole has been completed near Santiam Pass on the axis of the High Cascades of Oregon. The hole was drilled by Tonto Drilling Services from 140 meters to TD using HQ diamond core rods, with >99.5% core recovery. Caliper and sonic logs were run on the open hole by Dr. David Blackwell, Southern Methodist University. The hole was conditioned with heavy drilling mud and completed on 9/14/90 with 1.9" I.D. water-filled black pipe to TD. A preliminary, non-equilibrated bottom hole temperature is 24°C, with gradients of ≈50°C/km from 700-900 meters and ≈90°C/km from 905-920 meters.

The hole lithologies consist of ≈95% basaltic to andesitic flows and dikes, with ≈5% volcanic sediments. Preliminary magnetic stratigraphy indicates that rocks greater than 1 million years old were sampled. Detailed core studies, including K-Ar geochronology and major element geochemistry, are currently in progress. The core is stored at the O.S.U. College of Oceanography Core Lab, and core abstracts are being sent to DOGAMI and the University of Utah Research Institute.

The hole will remain open for research through September, 1991. Interested researchers should contact Brittain Hill at the Department of Geoscience, Oregon State University, Corvallis, OR 97331-5506 (503-737-1201, FAX 503-737-1200) to coordinate studies. Opportunities for core studies also exist for the Santiam Pass hole, and for several other 200-550 meter High Cascade cores and drill cuttings.

Initial scientific results from the Santiam Pass drilling project will also be presented at the Fall Meeting of the American Geophysical Union in San Francisco. Preliminary results of ongoing research will be presented by George Priest, David Blackwell, and Brittain Hill, in an informal evening session at the Cathedral Hill Hotel on Monday, December 3, 1990. The meeting will start at 7:30 P.M. in Telegraph Hill A.

UNIVERSITY OF UTAH RESEARCH INSTITUTE
UURI
391 CHIPETA WAY, SUITE C
SALT LAKE CITY, UTAH 84108-1295
TELEPHONE 801-524-3422

December 4, 1990

Mr. Brittain Hill
Department of Geology and Mineral Industries
910 State Office Building
1400 SW 5th Ave.
Portland, OR 97201-5528

Dear Brittain:

Enclosed are the analytical results of the detailed ICP analyses for the 20 samples from Santiam Pass drill hole #77-24. I regret that we did not get these results to you before the AGU. The analyses were completed while I was out of town, and the lab director wished to discuss the results with me before sending them on.

Please call me if you have any questions about these data. Better yet, please feel free to discuss the results with our analytical lab director, Ruth Kroneman, at (801) 524-3434.

I look forward to learning more about the interpretations of data from SP 77-24.

Regards,

Howard

Howard Ross
SCP Project Manager

encl.

NEIL GOLDSCHMIDT
GOVERNOR

Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE

910 STATE OFFICE BLDG., 1400 SW 5th AVE., PORTLAND, OR 97201-5528
PHONE (503) 229-5580 FAX (503) 229-5639

October 11, 1990

Dr. Howard Ross
Earth Science Lab, UURI
391 Chipeta Way, Suite C
Salt Lake City, UT 84108

Dear Howard;

Enclosed are 20 sample splits from the Santiam Pass drill core for ICP analysis. I've sent 3 boxes of core abstracts to you under separate cover (sent 10/9/90 from Corvallis, OR via UPS).

Please have the analyst return any excess sample to me, along with a note on the sample preparation technique i.e. tungsten-carbide shatterbox etc. I am also sending splits of these sample up to Washington State University for XRF analysis, so we should have a full suite of geochemical analysis on these samples. Hopefully the results will be in before the fall AGU meeting.

Thin sections are being prepared on 6 possible units for K-Ar dating; I'll select the final 3 once I've had a chance to look at the thin sections, hopefully by the end of next week. Bob Duncan is ready to analyze as soon as I give him the samples.

Magmatically,

Brittain Hill

SAMPLES RECEIVED - Drill Hole Santiam Pass (SP) 77-24

#478	#968	#1783	#2360
#614	#999	#1955	#2614
#662	#1126	#2149	#2699
#733	#1291	#2290	#2993
#811	#1647	#2472	#3044

Oct. 22, 1990
H.P. Ross

HR Copy

From Ruth Kroneman
Dec. 3, 1990

FE (item #5) reports Fe as Fe_2O_3 ie Ferric

FEO added at bottom is Fe as FeO ie Ferrous

DOGAM1 DH(SP)77-24

1 #478

ELEMENT			CONCENTRATION	
NA	% OX.		3.82	
K	% OX.		1.03	
CA	% OX.		8.61	
MG	% OX.		5.64	
FE	% OX.		3.76	Fe_2O_3 Ferric
AL	% OX.		16.87	
SI	% OX.		52.30	
TI	% OX.		1.23	
P	% OX.		0.387	
SR	PPM		763	
BA	% OX.		0.054	
V	PPM		260	
CR	PPM		99	
MN	% OX.		0.147	
CO	PPM		81	
NI	PPM		86	
CU	PPM		74	
MO	PPM	<	50.0	
PB	PPM		41	
ZN	PPM		104	
CD	PPM		12	
AG	PPM		3	
AU	PPM	<	4.00	
AS	PPM	<	25.0	
SB	PPM	<	30.0	
BI	PPM	<	100	
U	PPM	<	2500	
TE	PPM	<	50.0	
SN	PPM		40	
W	PPM	<	1200	
LI	PPM		9	
BE	PPM		3.1	
B	PPM	<	400	
ZR	PPM		117	
LA	PPM		104	
CE	PPM	<	10.0	
TH	PPM	<	150	
FEO	%		5.23	Ferrous
LOI	%	<	0.5	
	TOTAL		~~93.842~~ 99.072	

DOGAM1 DH(SP)77-24

2 #614

ELEMENT		CONCENTRATION
NA	% OX.	3.51
K	% OX.	0.718
CA	% OX.	9.13
MG	% OX.	6.17
FE	% OX.	2.93
AL	% OX.	17.66
SI	% OX.	52.00
TI	% OX.	0.940
P	% OX.	0.151
SR	PPM	702
BA	% OX.	0.033
V	PPM	< 250
CR	PPM	79
MN	% OX.	0.127
CO	PPM	87
NI	PPM	108
CU	PPM	70
MO	PPM	< 50.0
PB	PPM	22
ZN	PPM	78
CD	PPM	11
AG	PPM	< 2.00
AU	PPM	< 4.00
AS	PPM	< 25.0
SB	PPM	< 30.0
BI	PPM	< 100
U	PPM	< 2500
TE	PPM	< 50.0
SN	PPM	41
W	PPM	< 1200
LI	PPM	5
BE	PPM	1.6
B	PPM	< 400
ZR	PPM	79
LA	PPM	122
CE	PPM	216
TH	PPM	< 150
FeO	%	4.98
LOI	%	< 0.5
	TOTAL	~~93.358~~ 98.338

DOGAM1 DH(SP)77-24

3 #662

ELEMENT		CONCENTRATION
NA	% OX.	4.16
K	% OX.	0.655
CA	% OX.	8.45
MG	% OX.	4.68
FE	% OX.	3.13
AL	% OX.	16.85
SI	% OX.	53.70
TI	% OX.	1.57
P	% OX.	0.222
SR	PPM	606
BA	% OX.	0.026
V	PPM	< 250
CR	PPM	51
MN	% OX.	0.151
CO	PPM	64
NI	PPM	30
CU	PPM	86
MO	PPM	< 50.0
PB	PPM	16
ZN	PPM	94
CD	PPM	12
AG	PPM	< 2.00
AU	PPM	< 4.00
AS	PPM	35
SB	PPM	< 30.0
BI	PPM	< 100
U	PPM	< 2500
TE	PPM	< 50.0
SN	PPM	33
W	PPM	< 1200
LI	PPM	8
BE	PPM	1.9
B	PPM	< 400
ZR	PPM	85
LA	PPM	33
CE	PPM	128
TH	PPM	< 150
FeO	%	6.65
LOI	%	< 0.5
	TOTAL	~~93.591~~ 100.241

DOGAM1 DH(SP)77-24

4 #733

ELEMENT		CONCENTRATION
NA	% OX.	4.05
K	% OX.	0.796
CA	% OX.	7.39
MG	% OX.	3.98
FE	% OX.	2.16
AL	% OX.	18.03
SI	% OX.	59.30
TI	% OX.	0.875
P	% OX.	0.164
SR	PPM	783
BA	% OX.	0.029
V	PPM	< 250
CR	PPM	46
MN	% OX.	0.101
CO	PPM	46
NI	PPM	41
CU	PPM	29
MO	PPM	< 50.0
PB	PPM	< 10.0
ZN	PPM	68
CD	PPM	7
AG	PPM	< 2.00
AU	PPM	< 4.00
AS	PPM	69
SB	PPM	< 30.0
BI	PPM	< 100
U	PPM	< 2500
TE	PPM	< 50.0
SN	PPM	30
W	PPM	< 1200
LI	PPM	7
BE	PPM	2.4
B	PPM	1164
ZR	PPM	88
LA	PPM	43
CE	PPM	13
TH	PPM	< 150
FeO	%	4.09
LOI	%	< 0.5
	TOTAL	~~96.878~~ 100.968

DOGAM1 DH(SP)77-24

5 #811

ELEMENT		CONCENTRATION
NA	% OX.	3.98
K	% OX.	0.914
CA	% OX.	7.97
MG	% OX.	4.86
FE	% OX.	2.40
AL	% OX.	17.30
SI	% OX.	54.00
TI	% OX.	1.07
P	% OX.	0.297
SR	PPM	703
BA	% OX.	0.040
V	PPM	< 250
CR	PPM	81
MN	% OX.	0.129
CO	PPM	55
NI	PPM	65
CU	PPM	37
MO	PPM	< 50.0
PB	PPM	31
ZN	PPM	86
CD	PPM	12
AG	PPM	3
AU	PPM	< 4.00
AS	PPM	< 25.0
SB	PPM	< 30.0
BI	PPM	< 100
U	PPM	< 2500
TE	PPM	< 50.0
SN	PPM	36
W	PPM	< 1200
LI	PPM	9
BE	PPM	2.6
B	PPM	< 400
ZR	PPM	119
LA	PPM	13
CE	PPM	124
TH	PPM	< 150
FeO	%	5.27
LOI	%	< 0.5
	TOTAL	~~92.947~~ 98.217

DOGAM1 DH(SP)77-24

6 #968

ELEMENT			CONCENTRATION
NA	% OX.		3.92
K	% OX.		0.865
CA	% OX.		8.19
MG	% OX.		4.98
FE	% OX.		2.79
AL	% OX.		16.52
SI	% OX.		56.30
TI	% OX.		1.13
P	% OX.		0.358
SR	PPM		740
BA	% OX.		0.040
V	PPM	<	250
CR	PPM		90
MN	% OX.		0.137
CO	PPM		54
NI	PPM		74
CU	PPM		36
MO	PPM	<	50.0
PB	PPM		46
ZN	PPM		93
CD	PPM		11
AG	PPM		4
AU	PPM	<	4.00
AS	PPM	<	25.0
SB	PPM	<	30.0
BI	PPM	<	100
U	PPM	<	2500
TE	PPM	<	50.0
SN	PPM		38
W	PPM	<	1200
LI	PPM		7
BE	PPM		2.8
B	PPM	<	400
ZR	PPM		129
LA	PPM		49
CE	PPM		105
TH	PPM	<	150
FeO	%		5.37
LOI	%	<	0.05
	TOTAL		~~95.226~~ 100.596

DOGAM1 DH(SP)77-24

7 #999

ELEMENT		CONCENTRATION
NA	% OX.	3.85
K	% OX.	1.15
CA	% OX.	8.17
MG	% OX.	5.53
FE	% OX.	2.53
AL	% OX.	16.46
SI	% OX.	52.10
TI	% OX.	1.29
P	% OX.	0.364
SR	PPM	796
BA	% OX.	0.051
V	PPM	< 250
CR	PPM	99
MN	% OX.	0.143
CO	PPM	49
NI	PPM	80
CU	PPM	73
MO	PPM	< 50.0
PB	PPM	33
ZN	PPM	101
CD	PPM	12
AG	PPM	5
AU	PPM	< 4.00
AS	PPM	< 25.0
SB	PPM	< 30.0
BI	PPM	< 100
U	PPM	< 2500
TE	PPM	< 50.0
SN	PPM	41
W	PPM	< 1200
LI	PPM	12
BE	PPM	3.0
B	PPM	< 400
ZR	PPM	115
LA	PPM	< 5.00
CE	PPM	< 10.0
TH	PPM	< 150
FeO	%	6.43
LOI	%	< 0.5
	TOTAL	~~91.636~~ 98.046

DOGAM1 DH(SP)77-24

8 #1126

ELEMENT		CONCENTRATION
NA	% OX.	3.93
K	% OX.	0.985
CA	% OX.	8.10
MG	% OX.	5.26
FE	% OX.	4.55
AL	% OX.	16.72
SI	% OX.	55.89
TI	% OX.	1.14
P	% OX.	0.420
SR	PPM	744
BA	% OX.	0.039
V	PPM	< 250
CR	PPM	91
MN	% OX.	0.137
CO	PPM	43
NI	PPM	71
CU	PPM	42
MO	PPM	< 50.0
PB	PPM	40
ZN	PPM	89
CD	PPM	11
AG	PPM	6
AU	PPM	< 4.00
AS	PPM	< 25.0
SB	PPM	< 30.0
BI	PPM	< 100
U	PPM	< 2500
TE	PPM	< 50.0
SN	PPM	41
W	PPM	< 1200
LI	PPM	10
BE	PPM	2.8
B	PPM	< 400
ZR	PPM	123
LA	PPM	20
CE	PPM	190
TH	PPM	< 150
FeO	%	3,77
LOI	%	< 0,5
	TOTAL	~~97.173~~ 100.943

DOGAM1 DH(SP)77-24

9 #1291

ELEMENT		CONCENTRATION
NA	% OX.	3.89
K	% OX.	0.872
CA	% OX.	8.49
MG	% OX.	5.17
FE	% OX.	4.43
AL	% OX.	15.98
SI	% OX.	54.00
TI	% OX.	1.16
P	% OX.	0.420
SR	PPM	726
BA	% OX.	0.041
V	PPM	< 250
CR	PPM	104
MN	% OX.	0.139
CO	PPM	48
NI	PPM	81
CU	PPM	64
MO	PPM	< 50.0
PB	PPM	41
ZN	PPM	90
CD	PPM	13
AG	PPM	8
AU	PPM	< 4.00
AS	PPM	< 25.0
SB	PPM	< 30.0
BI	PPM	< 100
U	PPM	< 2500
TE	PPM	< 50.0
SN	PPM	43
W	PPM	< 1200
LI	PPM	10
BE	PPM	2.6
B	PPM	< 400
ZR	PPM	129
LA	PPM	33
CE	PPM	151
TH	PPM	< 150
FeO	%	4,07
LOI	%	< 0,5
	TOTAL	~~94.577~~ 98.647

DOGAM1 DH(SP)77-24

10 #1647

ELEMENT			CONCENTRATION
NA	% OX.		4.17
K	% OX.		0.989
CA	% OX.		7.63
MG	% OX.		4.26
FE	% OX.		3.12
AL	% OX.		16.32
SI	% OX.		54.80
TI	% OX.		1.24
P	% OX.		0.335
SR	PPM		553
BA	% OX.		0.044
V	PPM		297
CR	PPM		59
MN	% OX.		0.142
CO	PPM		45
NI	PPM		66
CU	PPM		63
MO	PPM		67
PB	PPM		62
ZN	PPM		99
CD	PPM		14
AG	PPM		13
AU	PPM	<	4.00
AS	PPM	<	25.0
SB	PPM	<	30.0
BI	PPM	<	100
U	PPM	<	2500
TE	PPM	<	50.0
SN	PPM		55
W	PPM	<	1200
LI	PPM		13
BE	PPM		1.6
B	PPM	<	400
ZR	PPM		106
LA	PPM		83
CE	PPM		23
TH	PPM	<	150
FeO	%		5.39
LOI	%	<	0.5
	TOTAL		~~93.051~~ 98.441

DOGAM1 DH(SP)77-24

11 #1783

ELEMENT		CONCENTRATION
NA	% OX.	3.91
K	% OX.	1.13
CA	% OX.	8.52
MG	% OX.	4.82
FE	% OX.	3.05
AL	% OX.	16.16
SI	% OX.	54.89
TI	% OX.	1.13
P	% OX.	0.440
SR	PPM	666
BA	% OX.	0.055
V	PPM	354
CR	PPM	74
MN	% OX.	0.137
CO	PPM	48
NI	PPM	67
CU	PPM	74
MO	PPM	66
PB	PPM	68
ZN	PPM	98
CD	PPM	14
AG	PPM	16
AU	PPM	< 4.00
AS	PPM	< 25.0
SB	PPM	< 30.0
BI	PPM	< 100
U	PPM	< 2500
TE	PPM	< 50.0
SN	PPM	53
W	PPM	< 1200
LI	PPM	12
BE	PPM	2.5
B	PPM	< 400
ZR	PPM	144
LA	PPM	72
CE	PPM	51
TH	PPM	< 150
FeO	%	5.20
LOI	%	< 0.5
	TOTAL	~~94.252~~ 99.452

DOGAM1 DH(SP)77-24

12 #1955

ELEMENT		CONCENTRATION
NA	% OX.	3.47
K	% OX.	0.719
CA	% OX.	9.39
MG	% OX.	6.53
FE	% OX.	2.62
AL	% OX.	14.50
SI	% OX.	52.20
TI	% OX.	1.53
P	% OX.	0.497
SR	PPM	509
BA	% OX.	0.040
V	PPM	455
CR	PPM	135
MN	% OX.	0.171
CO	PPM	59
NI	PPM	108
CU	PPM	75
MO	PPM	74
PB	PPM	69
ZN	PPM	106
CD	PPM	16
AG	PPM	13
AU	PPM	< 4.00
AS	PPM	< 25.0
SB	PPM	< 30.0
BI	PPM	< 100
U	PPM	< 2500
TE	PPM	< 50.0
SN	PPM	51
W	PPM	< 1200
LI	PPM	9
BE	PPM	3.1
B	PPM	< 400
ZR	PPM	124
LA	PPM	79
CE	PPM	153
TH	PPM	< 150
FeO	%	7.62
LOI	%	< 0.5
	TOTAL	~~91.680~~ 99.300

DOGAM1 DH(SP)77-24

13 #2149

ELEMENT		CONCENTRATION
NA	% OX.	3.47
K	% OX.	0.711
CA	% OX.	9.00
MG	% OX.	8.82
FE	% OX.	4.16
AL	% OX.	14.33
SI	% OX.	50.40
TI	% OX.	1.36
P	% OX.	0.409
SR	PPM	618
BA	% OX.	0.037
V	PPM	335
CR	PPM	230
MN	% OX.	0.160
CO	PPM	52
NI	PPM	219
CU	PPM	65
MO	PPM	< 50.0
PB	PPM	31
ZN	PPM	101
CD	PPM	12
AG	PPM	3
AU	PPM	< 4.00
AS	PPM	< 25.0
SB	PPM	< 30.0
BI	PPM	< 100
U	PPM	< 2500
TE	PPM	< 50.0
SN	PPM	47
W	PPM	< 1200
LI	PPM	6
BE	PPM	1.8
B	PPM	< 400
ZR	PPM	120
LA	PPM	< 5.00
CE	PPM	167
TH	PPM	< 150
FeO	%	6.01
LOI	%	< 0.05
	TOTAL	~~92.860~~ 98.870

DOGAM1 DH(SP)77-24

14 #2290

ELEMENT			CONCENTRATION
NA	% OX.		4.02
K	% OX.		0.828
CA	% OX.		8.29
MG	% OX.		5.21
FE	% OX.		3.28
AL	% OX.		17.13
SI	% OX.		52.20
TI	% OX.		1.21
P	% OX.		0.455
SR	PPM		690
BA	% OX.		0.042
V	PPM		342
CR	PPM		112
MN	% OX.		0.138
CO	PPM		36
NI	PPM		72
CU	PPM		50
MO	PPM	<	50.0
PB	PPM		17
ZN	PPM		94
CD	PPM		11
AG	PPM	<	2.00
AU	PPM	<	4.00
AS	PPM	<	25.0
SB	PPM	<	30.0
BI	PPM	<	100
U	PPM	<	2500
TE	PPM	<	50.0
SN	PPM		40
W	PPM	<	1200
LI	PPM		9
BE	PPM		3.3
B	PPM	<	400
ZR	PPM		118
LA	PPM	<	5.00
CE	PPM		78
TH	PPM	<	150
FeO	%		5.66
LOI	%	<	0.5
	TOTAL		~~92.794~~ 98.454

DOGAMI DH(SP)77-24

15 #2360

ELEMENT		CONCENTRATION
NA	% OX.	4.17
K	% OX.	0.889
CA	% OX.	8.16
MG	% OX.	5.24
FE	% OX.	3.66
AL	% OX.	15.33
SI	% OX.	53.50
TI	% OX.	1.28
P	% OX.	0.511
SR	PPM	663
BA	% OX.	0.044
V	PPM	263
CR	PPM	113
MN	% OX.	0.149
CO	PPM	38
NI	PPM	74
CU	PPM	97
MO	PPM	< 50.0
PB	PPM	29
ZN	PPM	101
CD	PPM	11
AG	PPM	< 2.00
AU	PPM	< 4.00
AS	PPM	< 25.0
SB	PPM	< 30.0
BI	PPM	< 100
U	PPM	< 2500
TE	PPM	< 50.0
SN	PPM	44
W	PPM	< 1200
LI	PPM	10
BE	PPM	3.5
B	PPM	< 400
ZR	PPM	127
LA	PPM	19
CE	PPM	< 10.0
TH	PPM	< 150
FeO	%	5.47
LOI	%	< 0.5
	TOTAL	~~92.937~~ 98.407

DOGAM1 DH(SP)77-24

16 #2472

ELEMENT			CONCENTRATION
NA	% OX.		3.90
K	% OX.		0.799
CA	% OX.		8.58
MG	% OX.		5.58
FE	% OX.		6.05
AL	% OX.		15.22
SI	% OX.		54.40
TI	% OX.		1.23
P	% OX.		0.507
SR	PPM		660
BA	% OX.		0.044
V	PPM		314
CR	PPM		128
MN	% OX.		0.153
CO	PPM		39
NI	PPM		84
CU	PPM		68
MO	PPM	<	50.0
PB	PPM		35
ZN	PPM		97
CD	PPM		12
AG	PPM		5
AU	PPM	<	4.00
AS	PPM	<	25.0
SB	PPM	<	30.0
BI	PPM	<	100
U	PPM	<	2500
TE	PPM	<	50.0
SN	PPM		44
W	PPM	<	1200
LI	PPM		10
BE	PPM		2.2
B	PPM	<	400
ZR	PPM		130
LA	PPM	<	5.00
CE	PPM		274
TH	PPM	<	150
FeO			3.50
LOI		<	0.5
	TOTAL		~~96.464~~ 99.964

DOGAM1 DH(SP)77-24

17 #2614

ELEMENT		CONCENTRATION
NA	% OX.	3.99
K	% OX.	0.822
CA	% OX.	8.51
MG	% OX.	4.69
FE	% OX.	4.57
AL	% OX.	14.98
SI	% OX.	54.30
TI	% OX.	1.34
P	% OX.	0.509
SR	PPM	680
BA	% OX.	0.040
V	PPM	< 250
CR	PPM	57
MN	% OX.	0.139
CO	PPM	37
NI	PPM	58
CU	PPM	56
MO	PPM	< 50.0
PB	PPM	28
ZN	PPM	97
CD	PPM	11
AG	PPM	< 2.00
AU	PPM	< 4.00
AS	PPM	< 25.0
SB	PPM	< 30.0
BI	PPM	< 100
U	PPM	< 2500
TE	PPM	< 50.0
SN	PPM	38
W	PPM	< 1200
LI	PPM	9
BE	PPM	3.0
B	PPM	< 400
ZR	PPM	129
LA	PPM	40
CE	PPM	< 10.0
TH	PPM	< 150
FeO	%	4.57
LOI	%	< 0.5
	TOTAL	~~93.880~~ 98.450

DOGAM1 DH(SP)77-24

18 #2699

ELEMENT			CONCENTRATION
NA	% OX.		3.99
K	% OX.		0.841
CA	% OX.		8.42
MG	% OX.		4.72
FE	% OX.		4.45
AL	% OX.		17.38
SI	% OX.		52.30
TI	% OX.		1.34
P	% OX.		0.511
SR	PPM		680
BA	% OX.		0.040
V	PPM	<	250
CR	PPM		55
MN	% OX.		0.142
CO	PPM		39
NI	PPM		57
CU	PPM		36
MO	PPM	<	50.0
PB	PPM		17
ZN	PPM		97
CD	PPM		10
AG	PPM	<	2.00
AU	PPM	<	4.00
AS	PPM	<	25.0
SB	PPM	<	30.0
BI	PPM	<	100
U	PPM	<	2500
TE	PPM	<	50.0
SN	PPM		36
W	PPM	<	1200
LI	PPM		8
BE	PPM		3.5
B	PPM	<	400
ZR	PPM		129
LA	PPM		33
CE	PPM	<	10.0
TH	PPM	<	150
FeO	%		4.65
LOI	%	<	0.5
	TOTAL		~~94.142~~ 98.792

DOGAMI DH(SP)77-24

19 #2993

ELEMENT		CONCENTRATION
NA	% OX.	3.68
K	% OX.	0.782
CA	% OX.	8.34
MG	% OX.	5.47
FE	% OX.	3.94
AL	% OX.	16.64
SI	% OX.	51.20
TI	% OX.	1.48
P	% OX.	0.512
SR	PPM	536
BA	% OX.	0.041
V	PPM	< 250
CR	PPM	80
MN	% OX.	0.157
CO	PPM	41
NI	PPM	84
CU	PPM	33
MO	PPM	< 50.0
PB	PPM	32
ZN	PPM	105
CD	PPM	12
AG	PPM	< 2.00
AU	PPM	< 4.00
AS	PPM	< 25.0
SB	PPM	< 30.0
BI	PPM	< 100
U	PPM	< 2500
TE	PPM	< 50.0
SN	PPM	35
W	PPM	< 1200
LI	PPM	7
BE	PPM	2.5
B	PPM	< 400
ZR	PPM	131
LA	PPM	41
CE	PPM	32
TH	PPM	< 150
FeO	%	5.96
LOI	%	< 0.5
	TOTAL	~~92.239~~ 98.199

DOGAMI DH(SP)77-24

20 #3044

ELEMENT			CONCENTRATION
NA	% OX.		3.68
K	% OX.		0.649
CA	% OX.		9.33
MG	% OX.		3.95
FE	% OX.		2.87
AL	% OX.		20.69
SI	% OX.		52.50
TI	% OX.		0.842
P	% OX.		0.129
SR	PPM		717
BA	% OX.		0.028
V	PPM	<	250
CR	PPM		44
MN	% OX.		0.095
CO	PPM		36
NI	PPM		55
CU	PPM		62
MO	PPM	<	50.0
PB	PPM		23
ZN	PPM		63
CD	PPM		8
AG	PPM	<	2.00
AU	PPM	<	4.00
AS	PPM	<	25.0
SB	PPM	<	30.0
BI	PPM	<	100
U	PPM	<	2500
TE	PPM	<	50.0
SN	PPM		39
W	PPM	<	1200
LI	PPM		3
BE	PPM		2.0
B	PPM	<	400
ZR	PPM		57
LA	PPM		53
CE	PPM	<	10.0
TH	PPM	<	150
FeO	%		3.75
LOI	%	<	0.5
	TOTAL		~~94.758~~ 98.508

NEIL GOLDSCHMIDT
GOVERNOR

Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE

910 STATE OFFICE BLDG., 1400 SW 5th AVE., PORTLAND, OR 97201-5528
PHONE (503) 229-5580 FAX (503) 229-5639

October 23, 1990

To: Interested Persons, Program for Scientific Drilling in the Cascades

From: Brittain Hill, DOGAMI

Subject: Update on the Santiam Pass Drilling Project

A 929 meter (3046') geothermal observation hole has been completed near Santiam Pass on the axis of the High Cascades of Oregon. The hole was drilled by Tonto Drilling Services from 140 meters to TD using HQ diamond core rods, with >99.5% core recovery. Caliper and sonic logs were run on the open hole by Dr. David Blackwell, Southern Methodist University. The hole was conditioned with heavy drilling mud and completed on 9/14/90 with 1.9" I.D. water-filled black pipe to TD. A preliminary, non-equilibrated bottom hole temperature is 24°C, with gradients of ≈50°C/km from 700-900 meters and ≈90°C/km from 905-920 meters.

The hole lithologies consist of ≈95% basaltic to andesitic flows and dikes, with ≈5% volcanic sediments. Preliminary magnetic stratigraphy indicates that rocks greater than 1 million years old were sampled. Detailed core studies, including K-Ar geochronology and major element geochemistry, are currently in progress. The core is stored at the O.S.U. College of Oceanography Core Lab, and core abstracts are being sent to DOGAMI and the University of Utah Research Institute.

The hole will remain open for research through September, 1991. Interested researchers should contact Brittain Hill at the Department of Geoscience, Oregon State University, Corvallis, OR 97331-5506 (503-737-1201, FAX 503-737-1200) to coordinate studies. Opportunities for core studies also exist for the Santiam Pass hole, and for several other 200-550 meter High Cascade cores and drill cuttings.

Initial scientific results from the Santiam Pass drilling project will also be presented at the Fall Meeting of the American Geophysical Union in San Francisco. Preliminary results of ongoing research will be presented by George Priest, David Blackwell, and Brittain Hill, in an informal evening session at the Cathedral Hill Hotel on Monday, December 3, 1990. The meeting will start at 7:30 P.M. in Telegraph Hill A.

Mr. Howard Ross
University of Utah Research Institute
Earth Science Lab
391 Chipeta Wy, Suite C
Salt Lake City UT 84108

NEIL GOLDSCHMIDT
GOVERNOR

Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE
910 STATE OFFICE BLDG., 1400 SW 5th AVE., PORTLAND, OR 97201-5528 PHONE (503) 229-5580

July 7, 1989

Ken K. Osborne
Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls, ID 83402

Dear Ken:

Enclosed are two fully executed copies of Grant No. DE-FC07-89ID12834. This grant funds Phase I of the Santiam Pass project.

We will have the deliverables for this Phase I work to you shortly. Please consider beginning preparation of the Phase II modification now, so we can get the on with the drilling on schedule.

Thank you for your help with the project. We are very excited about this opportunity and look forward to working with you.

Sincerely,

George R. Priest
Regional Geologist

CC Don Hull
John Beaulieu
Joel Renner
Sam Aoki
Marshall Reed
Howard Ross

NEIL GOLDSCHMIDT
GOVERNOR

Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE
910 STATE OFFICE BLDG., 1400 SW 5th AVE., PORTLAND, OR 97201-5528 PHONE (503) 229-5580

rec 2/8/89 from Kowalski

January 25, 1989

MEMORANDUM

To: Interested Persons
From: George R. Priest G.P.
Subject: Opportunity for Cooperative Drilling Venture in the Cascades

The Oregon Department of Geology and Mineral Industries (DOGAMI) plans to cooperate in the drilling of a diamond core hole in the Santiam Pass area of the High Cascades as part of scientific drilling program. Drilling is planned for the summer of 1989, if $200,000 of support from the U.S. Department of Energy, Geothermal Technology Division (USDOE-GTD) is forthcoming.

This memorandum is being circulated to offer interested organizations an opportunity to participate in this project. We are particularly interested in soliciting additional financial support for the drilling in order to increase the potential depth of the hole.

The hole will be drilled for scientific research. Lithologic and geophysical data from the hole will aid in our understanding of the structure, volcanic history, and dynamic processes of mass and fluid flow which have formed this active volcanic arc.

Temperature data from the hole will aid in our understanding of the amount of heat that is currently flowing into the High Cascades from deep sources not directly related to individual active volcanos. These data on "regional" heat flow can put constraints on estimates of total heat production, earthquake potential, and magma production in large segments of the volcanic arc.

Lithologic data from the hole will help us unravel the volcanic history and internal structure. We are particularly interested in knowing the amount of downward displacement that has occurred since the volcanic arc began to rapidly sink into a fault-bounded trough at about 5.4 Ma. Hard data on the post-5.4-Ma displacement will constrain models that account for this event by volcanic loading and removal of magma from beneath the arc.

Several potential sites have been examined in the field (see attached map). Three of the sites are in reversely polarized bedrock on the east flank of the High Cascades at elevations of 3560 ft.; one site is in normally polarized bedrock at the drainage divide (the volcanic axis) at an elevation of about 4800 ft.

The drainage divide has probably had the highest volcanic production rate. The area has therefore also probably experienced the largest vertical displacement from volcanic loading, and measurements of deep conductive heat flow there should give us a measure of the amplitude of the regional heat flow anomaly. The maximum heat flow and subsidence can therefore be measured at the drainage divide by drilling deep enough to be sure that (1) the measured heat flow is not disturbed by lateral and vertical ground water flow, and (2) pre-5.4-Ma rocks are penetrated. We estimate that a drilling depth of about 4,000 ft. will be necessary at the 4800 ft. elevation (see attached explanation).

The $200,000 budget is clearly inadequate to support drilling at the preferred site at the drainage divide (see attached analysis of costs). If we cannot obtain additional support from cooperating organizations, we will likely drill a shallower hole at one of the lower-elevation, second-priority sites.

We would be interested in combining the USDOE-GTD support with support from a consortium of interested organizations to drill the drainage divide at Santiam Pass. We envision a cooperative project aimed primarily at scientific research with all data made available to the public. Our hope is that the applicability of the data to areas throughout the Cascades will attract a broad base of support.

If your organization is interested in contributing (1) <u>any level of support</u>, or (2) <u>advice about additional objectives</u> for this project, please <u>reply in writing by February 17, 1989</u>. We will have to make final decisions by March 17, 1989. I will try to schedule a meeting to discuss various options among cooperating investigators sometime between these two dates.

ATTACHMENT - SANTIAM PASS DRILLING PROJECT

RATIONALE FOR DEPTH OF HOLES

Our analysis of temperature-depth data from the High Cascades indicates that conductive gradients characteristic of deep (6000-9000 ft.) gradients can be expected below a depth of about 500-1800 ft, depending on elevation and local groundwater conditions. Examples include the Pucci Chairlift hole on Mount Hood (elevation 5351 ft., conductive below 984 ft. depth), the Clackamas Thermal Gradient Hole near Austin Hot Springs (elevation 3800 ft., conductive below 722 ft.depth), and the Geo Operator N-1 hole at Newberry Volcano (elevation 5850 ft., conductive below 1800 ft. depth). At least 300-500 ft of linear temperature gradient is necessary to obtain a meaningful heat flow measurement, so a minimum drilling depth of about 2100-2300 ft. is generally necessary in young (<6 Ma) volcanic rock. Our experience has shown that the chances of obtaining useful temperature data at these drilled depths is vastly increased at lower-elevation sites. At high-elevation sites like Santiam Pass it is generally better to drill deeper than these minimum depths.

Penetration of pre-5.4-Ma rock will be necessary to estimate the amount of subsidence of the volcanic arc in the Santiam Pass area. Estimates of the amount of post-5.4-Ma subsidence in the High Cascades vary, but a case can be made that the amount could be thousands of feet (e.g. research of E.M. Taylor, Oregon State University). I have constructed speculative cross sections based on available geologic data that suggest that a drilled depth of at least 3000 ft will be necessary to reach pre-5.4-Ma rock at Santiam Pass.

I conclude from the above arguments that the minimum depth for a hole at the drainage divide at Santiam Pass is about 3100 ft. A drilled depth of about 4000 ft. would probably ensure that the objectives of the hole would be met.

ESTIMATE OF COST

We estimate that at least $250,000 of <u>additional</u> drilling support will be needed to reach 4000 ft. About $140,000 of additional support would be needed to provide drill-site geologists, well logging, core curation, and minimal analysis of the core and logs. Therefore about $390,000 of additional support is required to make the higher elevation site a viable project. Combined with the USDOE-GTD support, the total budget would be about $590,000.

It must be emphasized that this budget does not include support for detailed geochemical analysis of the core or for many important scientific experiments that could be done (e.g. in situ stress tests and vertical seismic profiling). We hope that these projects could be funded separately through agencies like the National Science Foundation.

Copied from Priest (1988 ...
Redbook Conference

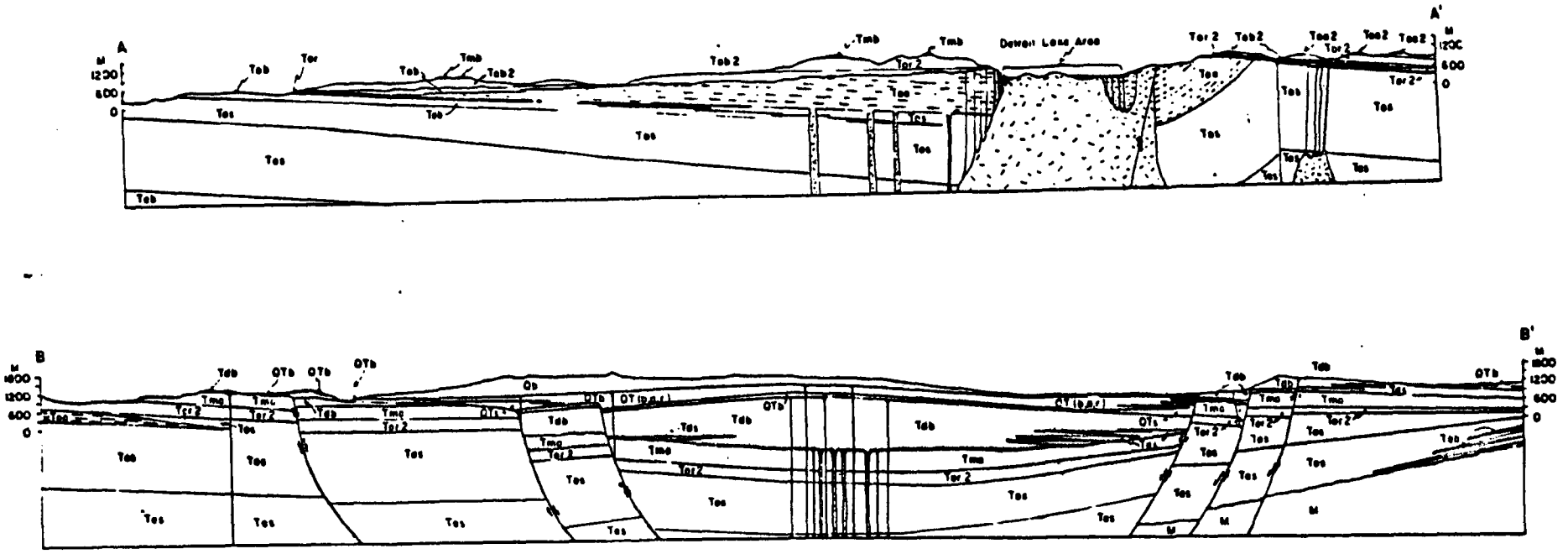
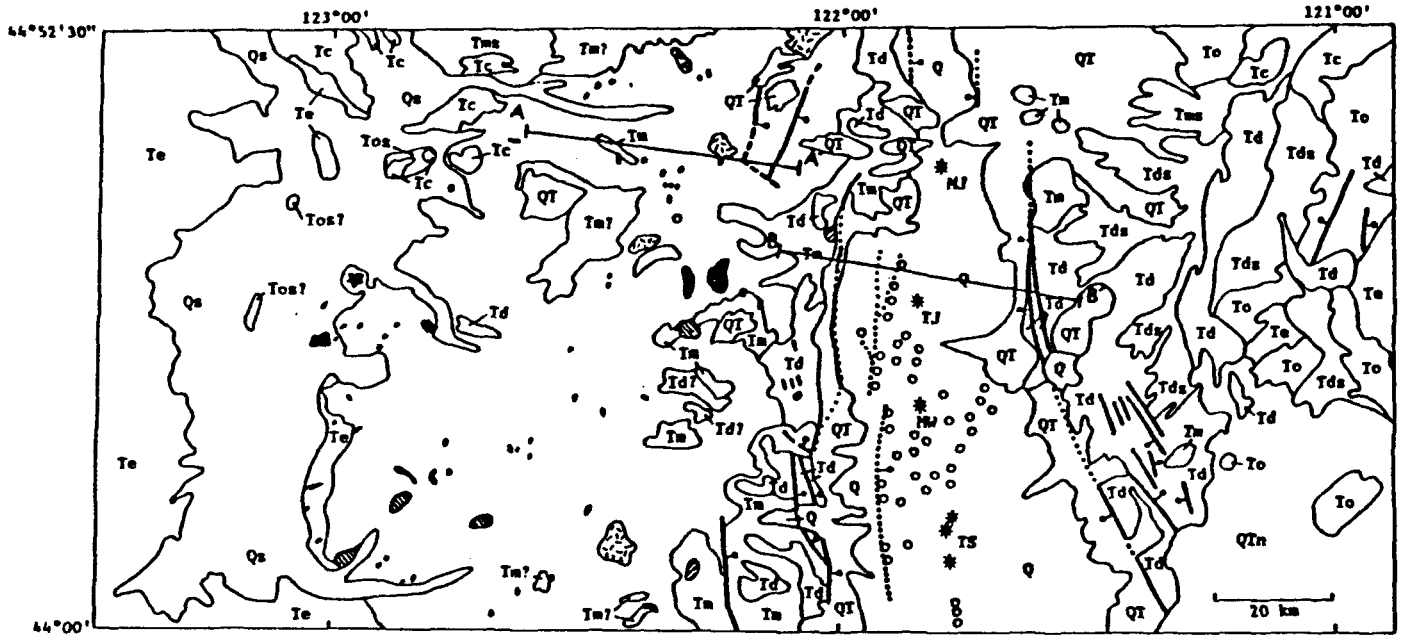


Fig. 5. Cross sections A-A' and B-B' of the geologic map (Figure 4). Note that time-rock units of Figure 4 are broken into more units on the cross sections to show geologic relationships. Unit To is broken into two units: Unit and unit . Units are defined by age (Q = 0.730-0 Ma, QT = 3.9-0.731 Ma, Td = 7.42-4.0 Ma, Tm = 16.9-7.5 Ma, To = 43.2-17 Ma, To_1 = 43.2-25.1 Ma, To_2 = 25.0-17.0 Ma, Te = pre-43.2-Ma Eocene units, and M = Mesozoic rocks), and lithology (b = mafic lava flows, a = andesite, r = dacite and rhyodacite, s = continental volcaniclastic rocks). For example, Tdb is a unit composed mainly of 7.4-4.0-Ma mafic lava flows.

Copied from paper by Priest (1988 USGS Redbook Conference)

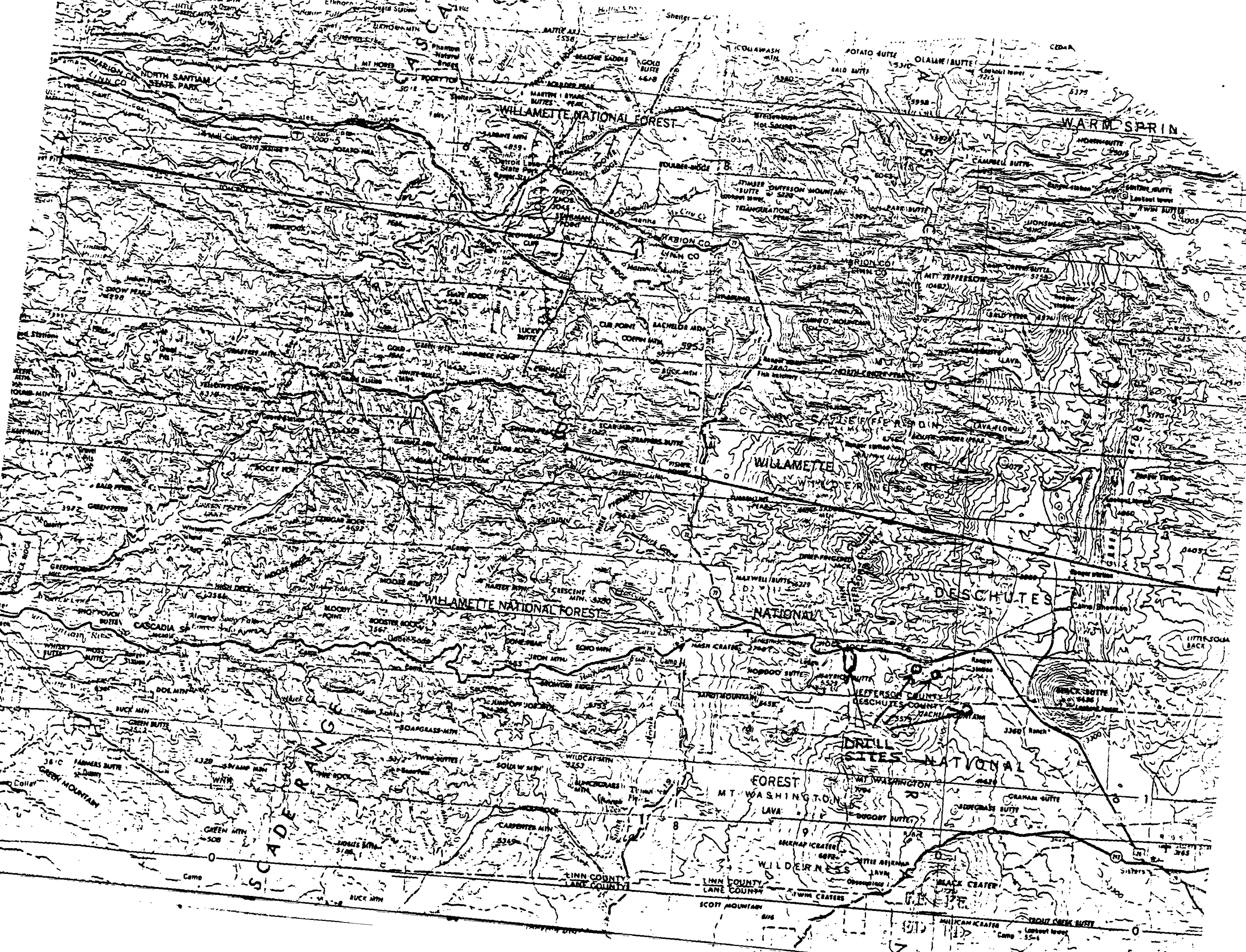


EXPLANATION

- Q 0.730 to 0 Ma volcanic rocks
- Qs 0.730 to 0 Ma sediments
- QT 3.9 to 0.731 Ma volcanic rocks
- QTn Volcanic rocks of Newberry Crater
- Td 7.4 to 4.0 Ma volcanic rocks
- Tds 7.4 to 4.0 Ma sedimentary rocks
- Tm 16.9 to 7.5 Ma volcanic rocks
- Tms 16.9 to 7.5 Ma sedimentary rocks
- Tc Columbia River Basalt Group
- To 43.2 to 17.0 Ma volcanic rocks
- Tos 43.2 to 17.0 Ma sedimentary rocks
- Te Eocene rocks (pre-Cascade and fore-arc rocks)

- Diorite to granodiorite intrusive
- Basaltic intrusive
- Andesitic intrusive
- Dacitic intrusive
- Contact
- Fault--Dashed where inferred; dotted where concealed; bar and ball on downthrown side
- 0.730 to 0 Ma monogenetic vent
- 0.730 to 0 Ma composite cone
  - MJ Mt. Jefferson
  - TJ Three Fingered Jack
  - MW Mt. Washington
  - TS Three Sisters

Fig. 4. Generalized geologic map of the study area modified from Walker and Duncan (1989) and Sherrod and Smith (1989).


WARM SPRIN
WILLAMETTE NATIONAL FOREST
WILLAMETTE NATIONAL FOREST
WILLAMETTE
DESCHUTES
NATIONAL
DRILL SITES
NATIONAL
FOREST
MT WASHINGTON
WILDERNESS
NORTH SANTIAM STATE PARK
MARION CO
LINN CO
LINN COUNTY
LANE COUNTY
JEFFERSON COUNTY
DESCHUTES COUNTY
CASCADIA
BLACK BUTTE
MT JEFFERSON
SCOTT MOUNTAIN
GREEN MOUNTAIN

NEIL GOLDSCHMIDT
GOVERNOR

Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE
910 STATE OFFICE BLDG., 1400 SW 5th AVE., PORTLAND, OR 97201-5528 PHONE (503) 229-5580

March 29, 1989

Kenny K. Osborne
Contract Specialist
Department of Energy
785 DOE Place
Idaho Falls, ID 83402

Dear Kenny:

As per our conversation of March 27, I have made several minor modifications in the Statement of Work for the subject unsolicited proposal. The modifications do nothing more than bring the statement of work into compliance with the specifications of our unsolicited proposal.

Changes and editorial comments by myself and the State Geologist are shown on the attached original. Also enclosed is a final typed copy with all revisions in final form.

I hope that we can get the final contract by the target date of April 10, 1989. The drilling schedule may suffer if we do not.

Please call me if you have any questions.

Sincerely,

George R. Priest

George R. Priest
Regional Geologist

GRP:ch
priest/osb3-29

Enclosure

cc: Don Hull
John Beaulieu

SPECIAL REQUIREMENTS

(ATTACHMENT TO FEDERAL ASSISTANCE REPORTING CHECKLIST)

1. QUARTERLY TECHNICAL PROGRESS REPORTS

Camera-ready copies of the Quarterly Technical Progress Report shall be delivered to the Project Manager. This report should summarize all project work accomplished to date and that which is planned for the next quarter. The report should be written in summary form; one to six single-space typewritten pages, with no more than three to four reproducible illustrations; in a format suitable for direct incorporation into the DOE EOR Quarterly Progress Review. The report shall include a list of manuscripts published during the quarter. (Sample formats for this and other required reports will be provided by the Project Manager.)

2. FINAL REPORTS

A technical report summarizing Phase I activities will be submitted and approved prior to performance of Phase II. Three (3) draft copies of the final report covering Phase I and Phase II are to be submitted to the Project Manager within 45 days of completion of the grant, detailing the results of all project work accomplished, problems encountered, and conclusions reached. The report shall document and summarize work for the period, including implications of results and recommendations for future work, based upon the experiences and results gained. The report shall include tables, graphs, photos and diagrams in sufficient detail to comprehensively explain the results achieved under the contract.

3. GOVERNMENT REVIEW/APPROVAL ACCEPTANCE OF REPORTS

The Government will be allowed thirty (30) days from the date of receipt to review the draft of the Annual or Final Report and to notify the contractor of approval or recommended changes to be made in the final copy. If the Government does not approve or recommend changes within the specified time frame (30 days), the report will be deemed approved.

Within twenty (20) days of receipt of a notice of approval of the draft Annual or Final Report from the Contracting Officer, the Contractor shall furnish the Government with a reproducible master (camera-ready) copy for photocopying and the required number of copies of the Annual or Final Report in final form, including all modifications and additions as recommended by the Government in its review of the draft Annual or Final Report.

State of Oregon, Department of Geology and Mineral Industries
Grant No. DE-FG07-89ID 12834

STATEMENT OF WORK

1.0 INTRODUCTION

The goal of this grant is to support research in resource assessment in the Cascade Range of Oregon. The U.S. Geological Survey and the geothermal industry have identified the Cascade volcanic province as a region of high geothermal resource potential. The Oregon Department of Geology and Mineral Industries (DOGAMI) has been funded by DOE since 1979 for geothermal resource assessment activities, and a recent DOE initiative supported cost shared drilling with industry.

The principal objective of this grant is to obtain temperature gradient, heat flow, and hydrologic information along the axis of Cascade volcanism. This is in contrast with earlier deep drilling which tested local known or perceived hot spots, generally associated with major volcanic complexes. Favorable results from the drilling program to be conducted in this grant would likely stimulate and guide industry in additional resource exploration and development.

This project will be completed in two phases. Phase I will include all site selection, site identification, permitting and pre-drilling environmental studies to satisfy NEPA requirements. Phase II will include drilling, data acquisition, interpretation, core curation and final reporting as described in 4.0, Technical Tasks.

Phase I will be funded at a level of approximately 10 percent of the total project amount. Phase II funding will be contingent on the satisfactory completion of Phase I activities, when a final report of Phase I activities has been submitted to, and accepted by, DOE.

2.0 SCOPE

The technical objectives of this grant are to conduct resource assessment along the axis of Cascade volcanism away from major volcanic centers. The proposed drilling will also provide the first drilling in a proposed deep continental drilling transect across the Santiam Pass area. Following a review of geologic, geophysical, and geochemical data, a site will be selected and a 600 m to 650 m temperature gradient hole will be drilled. Temperature and other geophysical logs will be completed, and the temperature gradient and heat flow will be determined. Hydrologic and lithologic information will

also be determined. All data will be interpreted and the results presented in a final report. All project work will be completed and a final report submitted within 24 months.

3.0 APPLICABLE DOCUMENTS

The research described herein is abstracted from an unsolicited proposal titled "Investigation of the Thermal Regime of the Volcanic Axis of the High Cascades, Oregon", dated May 28, 1988 and revised January 10, 1989, and submitted by the Oregon Department of Geology and Mineral Industries. Previous studies and recommendations for scientific drilling in the Santiam Pass area were submitted to DOE in DOGAMI Open File Report 0-86-3, titled "Investigation of the Thermal Regime and Geologic History of the Cascade Volcanic Arc: First Phase of a Program for Scientific Drilling in the Cascade Range". This report was a deliverable under DOE Grant No. DE-FG07-84ID12526.

4.0 TECHNICAL TASKS

The following tasks will be accomplished in two Phases under this Grant. Phase II tasks will be completed subject to the satisfactory completion of Phase I tasks, DOE-ID approval of the preliminary Environmental Analysis or Action Description Memorandum, whichever is required, and the availability of funding.

Phase I

4.1 Site Selection. Compile all geophysical and geochemical data for this area, and relevant data for adjacent areas. Interpret geoscience data and evaluate environmental factors, and select the optimum feasible drill site in conjunction with relevant county, state, and federal regulatory personnel. Identify the drill site in writing and on a detailed topographic map.

4.2 Permitting and Environmental Studies. Prepare a detailed plan of operations, and obtain all necessary permits for drilling. Perform necessary environmental assessments to conform with DOE-ID/NEPA environmental requirements.

4.3 Complete a technical report summarizing Tasks 4.1 and 4.2 and submit as a Phase I Final Report to DOE.

Phase II

4.4 Solicit bids for drilling and select a qualified drilling contractor.

4.5 Drilling and Data Acquisition. Complete a diamond cored drill hole to greatest depth possible with available support. Log the hole using accepted geophysical logging procedures. If feasible, airlift at any deep thermal (>50°C) aquifers that have sufficient flow, and take down-hole fluid samples from these aquifers. Set a string of 6.4 cm diameter pipe to final depth and surround with heavy mud. Demobilize rig. Monitor temperatures for a period of one year, recording not less than two complete temperature logs. Plug hole and abandon site in accordance with existing regulations following completion of temperature monitoring.

4.6 Compile a geologic map at a scale of 1:62,500 which covers the area from Santiam Junction on the west to Green Ridge on the east, and from Three Fingered Jack volcano on the north to Mount Washington on the south.

4.7 Interpret geophysical logs and drill cuttings, and prepare a lithologic log for the drill hole. Prepare temperature gradient profiles, measure thermal conductivities for all major lithologic units, and determine heat flow. Correlate subsurface rock units with surface lithologies using petrologic, mineralogic, and geochemical analyses. Prepare an east-west cross section passing through the drill site and the area of the geologic map. Complete geochemical analyses for any fluids recovered as down hole samples. Interpret water-rock interaction and the location of and importance of fluid pathways.

4.8 Core Curation. To the extent feasible with available support, curate drill core using accepted methods established by the DOE. Complete core photography and initial sample dissemination from a

temporary facility near the drill site. Drill core will be transmitted to permanent storage upon completion of the technical studies, but not later than the delivery data of the final report. Permanent storage will be either at DOGAMI or the UURI Geothermal Sample Library, with core abstracts at the other facility.

4.9 Reporting. Complete an integrated interpretation of all data obtained during the project, and prepare a final technical report describing the methodologies used, the data obtained, the interpretation developed, and the significance of the results. Document all new data in appendices, and submit drill logs to Petroleum Information Service, Denver, Colorado for distribution to the public. The technical results may be presented at appropriate public forums.

5.0 REPORTS, DATA, AND OTHER DELIVERABLES

5.1 Management Records

Reports will be due as indicated on the Federal Assistance Reporting Checklist and the Report Distribution List.

5.2 A Phase I Final Report shall be completed which summarizes all Phase I activities. This report will include a detailed discussion of the site selection data, environmental actions and approvals and copies of appropriate drilling and land use permits.

5.3 Final Report

A detailed final technical report will be prepared which will describe the drilling history and the methodologies of all technical studies employed during the project. All new data will be presented in the report together with interpretations and significance of the results. Deliverables will include a final geologic map and appropriate representations of the compiled geochemical and geophysical data maps, lithologic and temperature logs for the drill hole, and a geologic cross section across the area of the drill hole. A draft final report will be submitted for review and comment not less than 45 days prior to the scheduled delivery of the final report.

6.0 SCHEDULE

Phase I. To be completed within five months of receipt of grant.

Phase II. To be completed within 24 months of receipt of grant.

7.0 SPECIAL CONDITIONS

DOGAMI may wish to reenter the subject hole and extend the drilling at some later date with non-DOE funds. If this should be the case, DOGAMI will accept all legal responsibility for the future conduct of the drilling and for later plugging and abandonment of the drill hole. DOGAMI will provide the necessary legal documents, fully executed, to DOE to show that this transfer of responsibility has been accomplished.

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: Investigation of the thermal regime of the high cascades, Oregon

3. Recipient:
Oregon Department of Geology and Mineral Industries

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,F	1,1,1	A,C,D
☐ Federal Assistance Program/Project Status Report			
☒ Financial Status Report, OMB Form 269	Q,F	1,1,1	A,B,D
TECHNICAL INFORMATION REPORTING			
☒ Notice of Energy RD&D	O,X,Y	1,1,1	A,B,C
☒ Technical Progress Report	Q	1,1,1	A,B,C
☒ Topical Report	A	1,1,1	A,B,C
☒ Final Technical Report	F	1,1,1	A,B,C

FREQUENCY CODES AND DUE DATES:

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:

A. Project Manager
Isamu Aoki
U.S. Department of Energy
785 DOE Place
Idaho Falls, Idaho 83402

B. Earth Science Laboratory
University of Utah
Research Institute
ATTN: Howard Ross
391 Chipeta Way
Salt Lake City, UT 84108

C. Contracting Officer
Trudy A. Thorne
U.S. Department of Energy
785 DOE Place
Idaho Falls, Idaho 83402

D. Chief, Financial Management Br.
U.S. Department of Energy
785 DOE Place
Idaho Falls, Idaho 83402

SEE ATTACHED SPECIAL REQUIREMENTS

6. Prepared by: (Signature and Date)	7. Reviewed by: (Signature and Date)
Isamu Aoki 3/14/89	Kenny K. Osborne 3/21/89

SPECIAL REQUIREMENTS

(ATTACHMENT TO FEDERAL ASSISTANCE REPORTING CHECKLIST)

1. QUARTERLY TECHNICAL PROGRESS REPORTS

Camera-ready copies of the Quarterly Technical Progress Report shall be delivered to the Project Manager. This report should summarize all project work accomplished to date and that which is planned for the next quarter. The report should be written in summary form; four to six single-space typewritten pages, with no more than three to four reproducible illustrations; in a format suitable for direct incorporation into the DOE EOR Quarterly Progress Review. The report shall include a list of manuscripts published during the quarter. (Sample formats for this and other required reports will be provided by the Project Manager.)

2. FINAL REPORTS

A technical report summarizing Phase I activities will be submitted and approved prior to performance of Phase II. Three (3) draft copies of the final report covering Phase I and Phase II are to be submitted to the Project Manager within 45 days of completion of the grant, detailing the results of all project work accomplished, problems encountered, and conclusions reached. The report shall document and summarize work for the period, including implications of results and recommendations for future work, based upon the experiences and results gained. The report shall include tables, graphs, photos and diagrams in sufficient detail to comprehensively explain the results achieved under the contract.

3. GOVERNMENT REVIEW/APPROVAL ACCEPTANCE OF REPORTS

The Government will be allowed thirty (30) days from the date of receipt to review the draft of the Annual or Final Report and to notify the contractor of approval or recommended changes to be made in the final copy. If the Government does not approve or recommend changes within the specified time frame (30 days), the report will be deemed approved.

Within twenty (20) days of receipt of a notice of approval of the draft Annual or Final Report from the Contracting Officer, the Contractor shall furnish the Government with a reproducible master (camera-ready) copy for photocopying and the required number of copies of the Annual or Final Report in final form, including all modifications and additions as recommended by the Government in its review of the draft Annual or Final Report.

State of Oregon, Department of Geology and Mineral Industries
Grant No. DE-FG07-89ID 12834

STATEMENT OF WORK

1.0 INTRODUCTION

The goal of this grant is to support research in resource assessment in the Cascade Range of Oregon. The U. S. Geological Survey and the geothermal industry have identified the Cascade volcanic province as a region of high geothermal resource potential. The Oregon Department of Geology and Mineral Industries (DOGAMI) has been funded by DOE since 1979 for geothermal resource assessment activities, and a recent DOE initiative supported cost shared drilling with industry.

The principal objective of this grant is to obtain temperature gradient, heat flow, and hydrologic information along the axis of Cascade volcanism. This is in contrast with earlier deep drilling which tested local known or perceived hot spots, generally associated with major volcanic complexes. Favorable results from the drilling program to be conducted in this grant would likely stimulate and guide industry in additional resource exploration and development.

This project will be completed in two phases. Phase I will include all site selection, site identification, permitting and pre-drilling environmental studies to satisfy NEPA requirements. Phase II will include drilling, data acquisition, interpretation, core curation and final reporting as described in 4.0, Technical Tasks.

for this work this funding is in doubt.

Phase I will be funded at a level of approximately 10 percent of the total project amount. Phase II funding will be contingent on the satisfactory completion of Phase I activities, ~~and the availability of funds~~ when a final report of Phase I activities has been submitted to, and accepted by, DOE.

2.0 SCOPE

The technical objectives of this grant are to conduct resource assessment along the axis of Cascade volcanism away from major volcanic centers. The proposed drilling will also provide the first drilling in a proposed deep continental drilling transect across the Santiam Pass area. Following a review of geologic, geophysical, and geochemical data, a site will be selected and a 600 m to 650 m temperature gradient hole will be drilled. Temperature and other geophysical logs will be completed, and the temperature gradient and heat flow will be determined.

Hydrologic and lithologic information will also be determined. All data will be interpreted and the results presented in a final report. All project work will be completed and a final report submitted within 24 months.

3.0 APPLICABLE DOCUMENTS

The research described herein is abstracted from an unsolicited proposal titled "Investigation of the Thermal Regime of the Volcanic Axis of the High Cascades, Oregon", dated May 28, 1988 and revised January 10, 1989, and submitted by the Oregon Department of Geology and Mineral Industries. Previous studies and recommendations for scientific drilling in the Santiam Pass area were submitted to DOE in DOGAMI Open File Report 0-86-3, titled "Investigation of the Thermal Regime and Geologic History of the Cascade Volcanic Arc: First Phase of a Program for Scientific Drilling in the Cascade Range". This report was a deliverable under DOE Grant No. DE-FG07-84ID12526.

4.0 TECHNICAL TASKS

The following tasks will be accomplished in two Phases under this Grant. Phase II tasks will be completed subject to the satisfactory completion of Phase I tasks, DOE-ID approval of the preliminary Environmental Analysis or Action Description Memorandum, whichever is required, and the availability of funding.

Phase I

4.1 Site Selection. Compile a geologic map at a scale of 1:62,500 which covers the area from Santiam Junction on the west to Green Ridge on the east, and from Three Fingered Jack volcano on the north to Mount Washington on the south. Compile all geophysical and geochemical data for this area, and relevant data for adjacent areas. Interpret geoscience data and evaluate environmental factors, and select the optimum feasible drill site in conjunction with relevant county, state, and federal regulatory personnel. Identify the drill site in writing and on a detailed topographic map.

4.2 Permitting and Environmental Studies. Prepare a detailed plan of operations, and obtain all necessary permits for drilling. Perform necessary environmental assessments to conform with DOE-ID/NEPA environmental requirements.

4.3 Complete a technical report summarizing Tasks 4.1 and 4.2 and submit as a Phase I Final Report to DOE. Include the draft geologic map (Task 4.1) as part of this deliverable.

Phase II

4.4 Solicit bids for drilling and select a qualified drilling contractor.

4.5 Drilling and Data Acquisition. Complete a diamond cored drill hole to ~~600 m to 650 m~~. Log the hole using accepted geophysical logging procedures. Airlift at any deep aquifers and take down-hole fluid samples from these aquifers. Set a string of 6.4 cm diameter pipe to final depth and surround with heavy mud. Demobilize rig. Monitor temperatures for a period of one year, recording not less than three complete temperature logs. Plug hole and abandon site in accordance with existing regulations following completion of temperature monitoring.

4.6 Interpret geophysical logs and drill cuttings, and prepare a lithologic log for the drill hole. Prepare temperature gradient profiles, measure thermal conductivities for all major lithologic units, and determine heat flow. Correlate subsurface rock units with surface lithologies using petrologic, mineralogic, and geochemical analyses. Prepare an east-west cross section passing through the drill site and the area of the geologic map. Complete geochemical analyses for any fluids recovered as down hole samples. Interpret water-rock interaction and the location of and importance of fluid pathways.

4.7 Core Curation. Curate drill core using accepted methods established by the DOE. Complete core photography and initial sample dissemination from a temporary facility near the drill site. Drill core will be transmitted to permanent storage upon completion of the technical studies, but not later than the delivery date of the final report. Permanent storage will be either at DOGAMI or the UURI Geothermal Sample Library, with core abstracts at the other facility.

4.8 Reporting. Complete an integrated interpretation of all data obtained during the project, and prepare a final technical report describing the methodologies used, the data obtained, the interpretation developed, and the significance of the results. Document all new data in appendices, and submit drill logs to Petroleum Information Service, Denver, Colorado for distribution to the public. The technical results may be presented at appropriate public forums.

delete

5.0 REPORTS, DATA, AND OTHER DELIVERABLES

5.1 Management Records

Reports will be due as indicated on the Federal Assistance Reporting Checklist and the Report Distribution List.

5.2 A Phase I Final Report shall be completed which summarizes all Phase I activities. This report will include a detailed discussion of the site selection data, ~~the draft geologic map~~, environmental actions and approvals and copies of appropriate drilling and land use permits.

5.3 Final Report

A detailed final technical report will be prepared which will describe the drilling history and the methodologies of all technical studies employed during the project. All new data will be presented in the report together with interpretations and significance of the results. Deliverables will include a final geologic map and appropriate representations of the compiled geochemical and geophysical data maps, lithologic and temperature logs for the drill hole, and a geologic cross section across the area of the drill hole. A draft final report will be submitted for review and comment not less than 45 days prior to the scheduled delivery of the final report.

6.0 SCHEDULE

Phase I. To be completed within five months of receipt of grant.

Phase II. To be completed within 24 months of receipt of grant. ~~Drilling will begin not later than August 1, 1989~~.

7.0 SPECIAL CONDITIONS

DOGAMI may wish to reenter the subject hole and extend the drilling at some later date with non-DOE funds. If this should be the case, DOGAMI will accept all legal responsibility for the future conduct of the drilling and for later plugging and abandonment of the drill hole. DOGAMI will provide the necessary legal documents, fully executed, to DOE to show that this transfer of responsibility has been accomplished.

TECHNICAL EVALUATION OF UNSOLICITED PROPOSAL
UNSOLICITED PROPOSAL NUMBER:

"INVESTIGATION OF THE THERMAL REGIME
OF THE
VOLCANIC AXIS OF THE HIGH CASCADES, OREGON"

SUBMITTED BY THE
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
STATE OF OREGON

COST ANALYSIS

1. General Remarks:

a. The Contractor's proposed work statement and schedule are compatible with DOE technical requirements.

The project is proposed as a two phase program consistent with DOE environmental requirements which are applicable to geologic drilling/testing projects.

The Contractor's Statement of Work and task descriptions are acceptable. The tasks as redefined by DOE are:

Phase I

Task 1. Site Selection
Task 2. Permitting and Environmental Studies
Task 3. Phase I Technical Reporting

Phase II

Task 4. Select Drilling Contractor
Task 5. Drilling and Data Acquisition
Task 6. Interpret Geological, Geophysical, and Geochemical Data
Task 7. Core Curation
Task 8. Reporting

Each task is outlined in detail in the Unsolicited Proposal and in the revised DOE Statement of Work. Each task is broken down into clearly defined subtasks. The proposal is consistent with the DOE-Geothermal Technology Division Cascades geothermal studies.

The proposal is for 24 months with a total funding of $199,998 from DOE.

b. The Contractor's Statement of Work has been modified to include conformance with DOE-ID/NEPA environmental requirements, and to specify Phase I deliverables.

The Statement of Work is otherwise comprehensive and clearly written to accomplish the proposed objectives of this research proposal.

c. Additional cost information is required from the Oregon-Department of Geology and Mineral Industries regarding the $96,790 drilling subcontract.

Since a specific site has not yet been named mobilization/demobilization costs, a footage cost rate, and any other cost factors should be identified. All other cost information is comprehensive and adequate.

2. Specific Remarks

a(1) Man-hours

The quantity of personnel time is reasonable for the proposed effort. Only the time of the Senior Geologist will be charged to the project. The time of the Principal Investigator, Dr. George Priest, will be contributed by DOGAMI. DOGAMI technical staff resources including editors, librarian, cartographer, chemist, and secretary will also be contributed by the State of Oregon.

Geologist III	Phase I	2.5 months
Geologist III	Phase II	3.0 months

a(2) The labor mix is appropriate for the proposed effort.

The Principal Investigator (Dr. Priest) has already contributed substantial time to Phase I of this project and will provide management and technical expertise as required. The Senior Geologist will be committed to the project for a total of 5.5 man-months. DOGAMI technical staff will be available to the project for minor support at no direct cost to DOE. The Principal Investigator and the Senior Geologist will be responsible for all aspects of management, subcontractor supervision, data interpretation and technical writing.

b. Material

The cost of materials, supplies, analytical costs and services are appropriate for the proposed project.

The cost of materials, supplies, analytical services is $4,440. This cost is reasonable and low for a drilling program with associated analytical costs ($3,390) which is the main cost item.

c. Subcontracts

The following subcontracts are requested and judged to be essential to the project.

Environmental Consultants	$ 2,100
Geophysics	$31,000
Drilling	$96,790
Total Subcontracts	$129,890

d. Government Furnished Property (GFP)

There is no request for the government to furnish any property.

e. Travel

The travel costs are reasonable and appropriate.

The travel costs are listed at $5,350 including truck costs and per diem. All costs are directly related to the field project and are therefore essential to the project. Any costs associated with presentation of the results will be the responsibility of the Contractor.

f. Other Direct Costs

The Other Direct Costs are appropriate for the report preparation.

The Other Direct Costs are for preparation and publication of reports, for a total cost of $6000. This cost includes editing and is reasonable considering the high quality of reports produced by DOGAMI.

_____

Project Manager

_____

Date

_____

Acceptance by Contracts Specialist

_____

Date

BCD
JOEL
Howard

NEIL GOLDSCHMIDT
GOVERNOR

Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE
910 STATE OFFICE BLDG., 1400 SW 5th AVE., PORTLAND, OR 97201-5528 PHONE (503) 229-5580

January 12, 1989

J.P. Anderson
Chief, R&D Branch
Contract Management Division
U.S. Department of Energy
785 DOE Place
Idaho Falls, ID 83402

Dear Mr. Anderson:

Thank you for your letter of December 27, 1988. We are comfortable with a two-phase approach to the funding for the proposed drilling project at Santiam Pass. We also understand that NEPA requirements for environmental analysis must be met before the drilling can proceed. In fact we have already begun to assemble appropriate environmental data on a preferred drill site. We should be able to proceed very quickly with an environmental analysis once support for the analysis is secured from your agency.

Obtaining appropriate permits for drilling will probably not be a time consuming task. As explained previously to your staff, we already had all State and local permits for a preferred drill site last summer. We did not drill because support was not forthcoming from your office. We will probably choose to drill at this same preferred drill site, unless some unknown factor causes us to change our minds.

A revised budget and statement of work is attached, reflecting the change to two-phase funding, environmental analysis, and a reduced total budget. Our proposal of May 25, 1988 was for $211,928. Your staff indicated that only $200,000 is available; I reduced the budget accordingly.

Be warned that this reduction in support impacted the drilling budget, and will probably preclude our reaching the target depth of 2,100 ft. We feel we can reach about 2,000 ft. with this support, if no serious problems are encountered. This depth should still accomplish the project objectives.

I cannot stress too strongly the need to provide support for Phase I as soon as possible. We will need to have environmental analysts visit the site by late April or early May, 1989, if we are to be in the field drilling in June, 1989. Please let us know if this schedule is feasible.

Thank you again for you interest in our proposal. Please feel free to contact me if you need any clarifications.

Sincerely,

George R. Priest

George R. Priest
Regional Geologist

Encl.
CC: Dr. J. (Ted) Mock, DOE-HQ
Dr. Marshall J. Reed, DOE-HQ
Mr. Isamu Aoki, DOE-Idaho Falls
Ms. Trudy A. Thorne, DOE-Idaho Falls
Don Hull - DOGAMI
John Beaulieu - DOGAMI

STATEMENT OF WORK

For

INVESTIGATION OF THE THERMAL REGIME

OF THE

VOLCANIC AXIS OF THE HIGH CASCADES, OREGON

Date of Submission:	January 10, 1989
Submitted by:	Oregon Department of Geology and Mineral Industries
Address:	910 State Office Building Portland, OR 97201
Start Date:	March 1, 1989
Duration:	24 months
Principal Investigator:	George R. Priest
USDOE Funding Requested:	$199,998

AUTHORIZED OFFICIAL:

Signature: _____

Donald A. Hull

State Geologist

Date: _____

STATEMENT OF WORK

INTRODUCTION

This proposal is aimed at drilling a 600-650-m temperature-gradient hole in the Santiam Pass area of the Cascade Range (Figure 1). Details of the justification and technical basis for this project were submitted earlier in a May 25, 1988 unsolicited proposal to USDOE. The hole will be drilled by pursuing a two-phase procedure.

PHASE I- SITE SELECTION

A drill site will be selected by (1) analysis of existing geological, geophysical, and geochemical data, (2) field reconnaissance, and (3) analysis of environmental and institutional constraints. After the site is selected, relevant county, state, and federal permits will be obtained, and an environmental assessment of impacts from the drilling project will then be produced. This information will be submitted to USDOE for review and approval. Phase II will begin after approval of the site is received from USDOE.

Deliverables

The following will be delivered to USDOE:

1. Summary of permits obtained.
2. Environmental assessment (EA) of the project.

Schedule

Phase I will begin March 1, 1989. Field work will be completed by April 15, 1989. The EA and summary of permits will be submitted for USDOE review on May 1, 1989. It is essential that the USDOE review be completed by May 15, 1989, so that Phase II may begin. **Unless this schedule is met, the project will be in danger of missing the window of opportunity for drilling during the short field season in this area.**

PHASE II - DRILLING AND ANALYSIS

Task 1: Contracting

Bids for the drilling will be solicited from qualified contractors. A drilling contractor will then be selected based on cost, experience of the drilling personnel, and the quality of the drilling equipment.

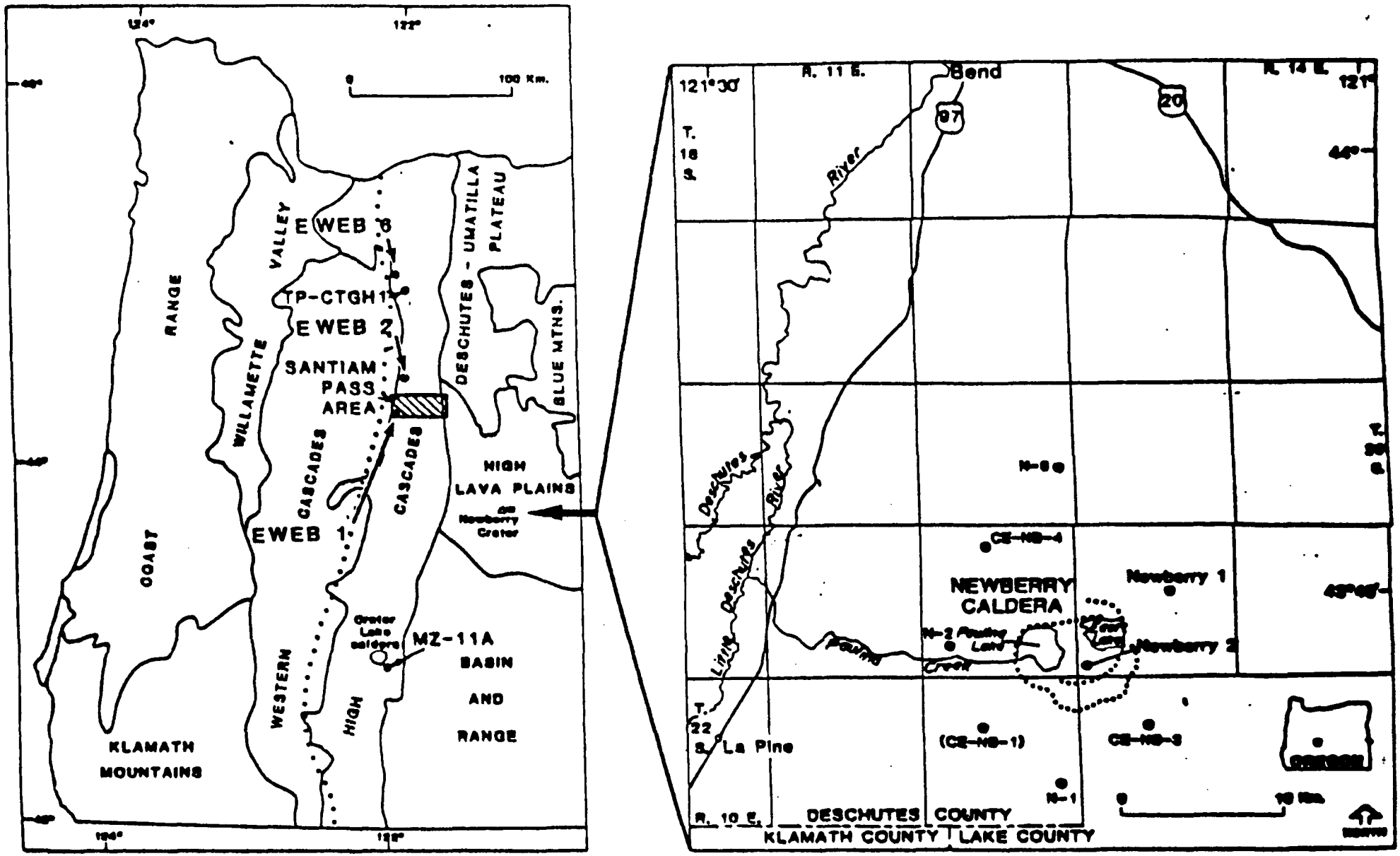


Figure 1. Physiographic provinces of western Oregon (after Dicken, 1950), showing the Santiam Pass study area and locations of recently drilled temperature-gradient holes. Also shown is the edge of the High Cascade heat-fl anomaly from Black and others (1983).as a dotted line.

Task 2: Drilling

The hole will be diamond cored to about 600-650m with a shallow casing string set at about 152 m. It will then be logged utilizing standard geophysical logging methods. A capped, water-filled string of 6.4 cm diameter pipe will be set in the hole to total depth and surrounded with heavy mud. The hole will then be temperature logged sequentially over a 12-month period. The detailed procedure is as follows:

1. Prepare site with 1.2 m by 1.8 m cellar with cement floor.
2. Excavate sump and prepare water supply system.
3. Mobilize rig and rig up.
4. Drill PQ (11.7 cm) to 152 m.
5. Ream to 12.7 cm and set 11.4 cm casing.
6. Drill HQ to 600-650m.
7. Run full suite of logs.
8. Air lift any deep aquifers and take down-hole fluid samples of aquifers.
9. Set 6.4 cm pipe (water-filled, capped, and surrounded by heavy mud).
10. Rig down and demobilize rig.
11. Monitor temperatures over following year.
12. Pull pipe and abandon, cement any aquifers, and put in 15 m surface plug.
13. Restore site.

Task 3: Preliminary Data Analysis

This proposal does not cover all possible data that could be generated from the project, but the following is considered the most essential data. Geophysical logs and samples from the drill hole will be analyzed in order to determine the physical properties and the geologic evolution of fluids and rocks. Heat flow will be calculated by measuring thermal conductivities from all major lithologic units and obtaining precise ($\pm$ 0.01^{o}C) temperature logs of the hole. Detailed lithologic logs will be produced utilizing mineralogic and geochemical analysis of drill core. Correlation of subsurface to surface rock units will be attempted utilizing the lithologic logs, petrographic analysis, geochemical analysis, and isotopic ages of rock units. An east-west cross section passing through the drill site and the area of the previously mentioned geologic map will be produced. If significant thermal fluid or hydrothermal alteration is found, water-rock reactions will be examined by analysis of altered rocks and by geochemical analysis of fluids obtained from down-hole sampling.

Task 4: Core Curation

Core samples collected during this program will be temporarily stored at a facility conveniently close to the drill site. Initial sample dissemination will occur at this site. The facilities of the Oregon Department of Geology and Mineral Industries (DOGAMI) will be available for temporary storage. Permanent storage of total or skeletonized core will be either at the DOGAMI facility or at an appropriate U.S. Department of Energy repository. This latter point is open for negotiation.

Task 5: Reporting

In addition to quarterly progress reports, a final technical report summarizing the results of the project will be submitted to USDOE at the end of the contract period. Results from the drill hole will also be reported in appropriate public forums and publications as the data are generated.

All logs will be acquired in analog and digital form. All will be calibrated immediately before and after logging, and a 60-m repeat run will be acquired. Copies of all logs will be filed with Petroleum Information Service, Denver, Colorado, where interested researchers may obtain them for reproduction costs only.

Deliverables

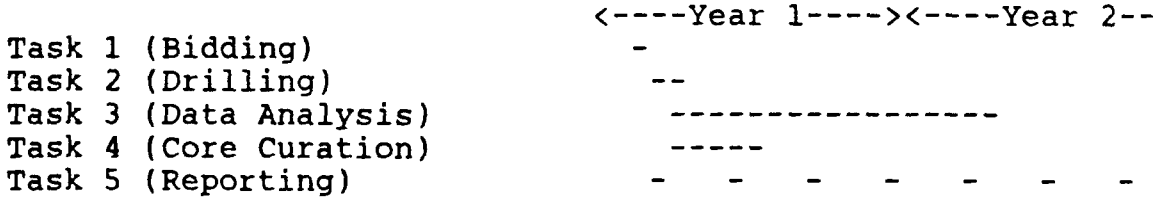
The following will be delivered to USDOE:

1. Quarterly progress report
s
2. A final technical report which will include

   (a) Interpretive summaries of all data
   (b) A geologic cross section across the study area

Project Schedule

Phase II will begin on May 16, 1989 and end on March 1, 1991. The following are estimated times for various tasks:



QUALIFICATIONS AND DUTIES OF KEY PERSONNEL

Introduction

The project will be managed by DOGAMI. DOGAMI staff will provide overall project management and will be responsible for generation of all geologic and geochemical data. Drilling and geophysical studies, including geophysical logging, will be subcontracted to qualified organizations or individuals.

Oregon Department of Geology and Mineral Industries (DOGAMI)

DOGAMI has pursued geothermal resource assessment for 17 years. The agency developed many of the exploration techniques utilized by the industry today in volcanic terrains. The result of these efforts is that Oregon now has one of the most complete geothermal data bases in the United States.

Principal Investigator

The principal investigator is George R. Priest, Regional Geologist for DOGAMI. Dr. Priest has extensive experience in both mineral and geothermal exploration. He has managed numerous drilling programs and conducted original research in the geosciences. His resume was previously submitted.

Dr. Priest will provide executive management for the project. He will supervise field personnel and coordinate the project activities with relevant government and industrial groups. He will be responsible for guiding the development of all geologic and geochemical data from project. He will be assisted by a senior geologist, and by technical staff at DOGAMI. The technical staff includes an editor, an assistant editor, two full-time cartographers, a chemist, a part-time technical librarian, a business manager, treasurer, and secretarial staff. The Department has a full geotechnical library, a fully equipped laboratory capable of atomic absorption spectrometry, X-ray diffraction, and petrography, including transmitted and reflected light techniques.

The senior geologist will be hired during the project. The senior geologist will have, as a minimum, a M.S. degree in geological science, at least three years of active research experience with the volcanic geology of the northwest, including familiarity with drilling problems unique to this area.

Geophysical Subcontractor

A qualified geophysicist will be selected to supervise all geophysical studies. This contractor will be responsible for (1) analysis of existing geophysical data during site selection, (2) geophysical logging and down-hole fluid sampling, (3) measurement of thermal conductivities of all rock units, (4) interpretation of geophysical logs, including calculation of heat flow. The geophysical logging vehicle utilized must, as a minimum, be capable of logging temperature to $\pm$ 0.01°C and obtaining other standard geophysical logs such as gamma ray, caliper, fluid resistivity, self potential, and sonic logs. The contractor must be able to take down-hole fluid samples, preferably from the same vehicle which does the geophysical logging.

Heat-flow analysis is the most critical element of the geophysical studies. The contractor must therefore have a demonstrated research record in heat flow studies of the northwestern United States.

Drilling Subcontractor

Drilling will be subcontracted to a company with a demonstrated record of successful diamond coring of young volcanic rocks. Preference will be given to companies that have experience in the High Cascades of Oregon. The contractor must have drilling equipment which can handle the hole diameters and casing sizes specified in the drilling task above.

REFERENCES CITED

Black, G.L., Blackwell, D.D., and Steele, J.L., 1983, Heat flow in the Oregon Cascades, in Priest, G.R., and Vogt, B.F., eds., Geology and geothermal resources of the central Oregon Cascade Range: Oregon Department of Geology and Mineral Industries Special Paper 15, p. 69-76.

Dicken, S.N., 1950, Oregon Geography: Eugene, Oreg., University of Oregon Cooperative Bookstore, 104 p.

PHASE I

Personnel

Geologist III (2.5 mo. @ $2,840/mo)	$7,100	
x 1.4695 O.P.E. (see attachment)		$10,433

Services and Supplies

Travel		
Truck (@ $33/day X 10)	330	
per diem (@ $46/day X 10 days)	460	
Supplies (Maps, incidental supplies)	50	
Subtotal		$ 840
Subcontracts		
Environmental Consultants		$ 2,100
Subtotal		$13,373
Indirect Cost (@ 18.6%; see attachment)		2,487
TOTAL		**$15,860**

PHASE II

Personnel

Geologist III (3 mo. @ $2,840/mo)	$8,520	
x 1.4695 O.P.E. (see attachment)		$12,520

Services and Supplies

Travel		
Truck (@ $600/mo. X 1.5 mo. X 2)	1,800	
per diem (@ $46/day X 30 days)	2,760	
Editing, drafting, publication of Open-File Report	6,000	
Analytical costs		
Isotopic ages (4 X $400)	1,600	
Rock chemistry (35 X $30 ea)	1,050	
Thin sections (70 X $5 ea)	350	3390
X-ray diffraction (5 X $50 ea)	250	
Water samples (2 X $70 ea)	140	
Supplies (Samples bags, coreboxes)	1,000	
Subtotal		$ 14,950
Subcontracts		
Geophysics (heat flow analysis; well logs)	$31,000	
Drilling	96,790	
Subtotal		$127,790
Subtotal		$155,260
Indirect Cost (@ 18.6%)		28,818
TOTAL		**$184,138**

GEOLOGY AND MINERAL INDUSTRIES

O.P.E. (other payroll expense)

(July 1, 1985)

Direct O.P.E.			31.95
FICA		7.12	
PERS		17.23	
Other		7.6	
SAIF, WCB	.5		
Medical	5.2		
Dental	1.0		
Other, ERB, Metro, Assessments	.9		
Indirect O.P.E.			15.0
Sick leave			
Vacation			
Holidays			
Personal leave			
Other			
TOTAL			46.95

OMB Approval No. 0348-0043

APPLICATION FOR FEDERAL ASSISTANCE

2. DATE SUBMITTED	Applicant Identifier
1-10-89	
3. DATE RECEIVED BY STATE	State Application Identifier
4. DATE RECEIVED BY FEDERAL AGENCY	Federal Identifier

1. TYPE OF SUBMISSION:

Application	Preapplication
☒ Construction	☐ Construction
☐ Non-Construction	☐ Non-Construction

5. APPLICANT INFORMATION

Legal Name: Oregon Department of Geology and Mineral Industries

Organizational Unit: Oregon Department of Geology and Mineral Industries

Address (give city, county, state, and zip code):
910 State Office Bldg
Multnomah County
Portland, Oregon 97201

Name and telephone number of the person to be contacted on matters involving this application (give area code):
George R. Priest
(503) 229-5580

6. EMPLOYER IDENTIFICATION NUMBER (EIN): ☐☐ – ☐☐☐☐☐☐☐

7. TYPE OF APPLICANT: (enter appropriate letter in box) [A]

A State — H Independent School Dist
B County — I State Controlled Institution of Higher Learning
C Municipal — J Private University
D Township — K Indian Tribe
E Interstate — L Individual
F Intermunicipal — M Profit Organization
G Special District — N Other (Specify) _____

8. TYPE OF APPLICATION:

☐ New ☐ Continuation ☒ Revision

If Revision, enter appropriate letter(s) in box(es): [S] [ ]

A Increase Award B Decrease Award C Increase Duration
D Decrease Duration Other (specify)

Revise to two-phase program

9. NAME OF FEDERAL AGENCY:
U.S. Department of Energy

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: ☐☐.☐☐☐

TITLE:

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:
Investigation of the Thermal Regime of the Volcanic Axis of the High Cascades, Oregon

12. AREAS AFFECTED BY PROJECT (cities, counties, states, etc.):
Santiam Pass, Jefferson and/or Deschutes Counties, Oregon

13. PROPOSED PROJECT:

Start Date	Ending Date
3-1-89	3-1-91

14. CONGRESSIONAL DISTRICTS OF:

a Applicant	b Project
Les AuCoin	Robert F. Smith

15. ESTIMATED FUNDING:

a Federal	$ 199,998	.00
b Applicant	$ Ø	.00
c State	$ Ø	.00
d Local	$ Ø	.00
e Other	$	.00
f Program Income	$	.00
g TOTAL	$ 199,998	.00

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?

a. YES THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON

DATE _____

b. NO ☐ PROGRAM IS NOT COVERED BY E.O. 12372

☐ OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT?

☐ Yes If "Yes," attach an explanation ☒ No

18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT, THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED

a Typed Name of Authorized Representative	b Title	c Telephone number
Donald A. Hull	State Geologist	(503) 229-5580

d Signature of Authorized Representative: O-K Signature for Don Hull

e Date Signed:

Previous Editions Not Usable

Standard Form 424 (REV 3-89)
Prescribed by OMB Circular A-102

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FEDERAL ASSISTANCE BUDGET INFORMATION FORM

FORM FIA 459C
(10/80)

FORM APPROVED
OMB No 1900 0127

1 Program/Project Identification No	2 Program/Project Title: Investigation of the Thermal Regime of the Volcanic Axis of the High Cascades, Oregon
3 Name and Address: Oregon Department of Geology and Mineral Industries, 910 State Office Bldg, Portland, OR	4 Program/Project Start Date: March 1, 1989 5 Completion Date: March 1, 1991

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 ITRVAHCO		$ 199,998	$	$	$	$ 199,998
2						
3						
4						
5 TOTALS		$ 199,998	$	$	$	$ 199,998

SECTION B - BUDGET CATEGORIES

6 Object Class Categories	Grant Program, Function or Activity				Total (5)
	(1) Phase I	(2) Phase II	(3)	(4)	
a Personnel	$ 7,100	$ 8,520	$	$	$ 15,620
b Fringe Benefits	3,333	4,000			7,333
c Travel	790	4,560			5,350
d Equipment					
e Supplies	50	4,390			4,440
f Contractual	2,100	31,000			33,100
g Construction Drilling		96,790			96,790
h Other Publication		6,000			6,000
i Total Direct Charges	13,373	155,260			168,633
j Indirect Charges (18.6%)	2,487	28,878			31,365
k TOTALS	$ 15,860	$ 184,138	$	$	$ 199,998
7 Program Income	$	$	$	$	$

NEIL GOLDSCHMIDT
GOVERNOR

Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE
910 STATE OFFICE BLDG., 1400 SW 5th AVE., PORTLAND, OR 97201-5528 PHONE (503) 229-5580

January 25, 1989

MEMORANDUM

To: Interested Persons
From: George R. Priest G.P.
Subject: Opportunity for Cooperative Drilling Venture in the Cascades

The Oregon Department of Geology and Mineral Industries (DOGAMI) plans to cooperate in the drilling of a diamond core hole in the Santiam Pass area of the High Cascades as part of scientific drilling program. Drilling is planned for the summer of 1989, if $200,000 of support from the U.S. Department of Energy, Geothermal Technology Division (USDOE-GTD) is forthcoming.

This memorandum is being circulated to offer interested organizations an opportunity to participate in this project. We are particularly interested in soliciting additional financial support for the drilling in order to increase the potential depth of the hole.

The hole will be drilled for scientific research. Lithologic and geophysical data from the hole will aid in our understanding of the structure, volcanic history, and dynamic processes of mass and fluid flow which have formed this active volcanic arc.

Temperature data from the hole will aid in our understanding of the amount of heat that is currently flowing into the High Cascades from deep sources not directly related to individual active volcanos. These data on "regional" heat flow can put constraints on estimates of total heat production, earthquake potential, and magma production in large segments of the volcanic arc.

Lithologic data from the hole will help us unravel the volcanic history and internal structure. We are particularly interested in knowing the amount of downward displacement that has occurred since the volcanic arc began to rapidly sink into a fault-bounded trough at about 5.4 Ma. Hard data on the post-5.4-Ma displacement will constrain models that account for this event by volcanic loading and removal of magma from beneath the arc.

Several potential sites have been examined in the field (see attached map). Three of the sites are in reversely polarized bedrock on the east flank of the High Cascades at elevations of 3560 ft.; one site is in normally polarized bedrock at the drainage divide (the volcanic axis) at an elevation of about 4800 ft.

The drainage divide has probably had the highest volcanic production rate. The area has therefore also probably experienced the largest vertical displacement from volcanic loading, and measurements of deep conductive heat flow there should give us a measure of the amplitude of the regional heat flow anomaly. The maximum heat flow and subsidence can therefore be measured at the drainage divide by drilling deep enough to be sure that (1) the measured heat flow is not disturbed by lateral and vertical ground water flow, and (2) pre-5.4-Ma rocks are penetrated. We estimate that a drilling depth of about 4,000 ft. will be necessary at the 4800 ft. elevation (see attached explanation).

The $200,000 budget is clearly inadequate to support drilling at the preferred site at the drainage divide (see attached analysis of costs). If we cannot obtain additional support from cooperating organizations, we will likely drill a shallower hole at one of the lower-elevation, second-priority sites.

We would be interested in combining the USDOE-GTD support with support from a consortium of interested organizations to drill the drainage divide at Santiam Pass. We envision a cooperative project aimed primarily at scientific research with all data made available to the public. Our hope is that the applicability of the data to areas throughout the Cascades will attract a broad base of support.

If your organization is interested in contributing (1) <u>any level of support</u>, or (2) <u>advice about additional objectives</u> for this project, please <u>**reply in writing by February 17, 1989**</u>. We will have to make final decisions by March 17, 1989. I will try to schedule a meeting to discuss various options among cooperating investigators sometime between these two dates.

ATTACHMENT - SANTIAM PASS DRILLING PROJECT

RATIONALE FOR DEPTH OF HOLES

Our analysis of temperature-depth data from the High Cascades indicates that conductive gradients characteristic of deep (6000-9000 ft.) gradients can be expected below a depth of about 500-1800 ft, depending on elevation and local groundwater conditions. Examples include the Pucci Chairlift hole on Mount Hood (elevation 5351 ft., conductive below 984 ft. depth), the Clackamas Thermal Gradient Hole near Austin Hot Springs (elevation 3800 ft., conductive below 722 ft.depth), and the Geo Operator N-1 hole at Newberry Volcano (elevation 5850 ft., conductive below 1800 ft. depth). At least 300-500 ft of linear temperature gradient is necessary to obtain a meaningful heat flow measurement, so a minimum drilling depth of about 2100-2300 ft. is generally necessary in young (<6 Ma) volcanic rock. Our experience has shown that the chances of obtaining useful temperature data at these drilled depths is vastly increased at lower-elevation sites. At high-elevation sites like Santiam Pass it is generally better to drill deeper than these minimum depths.

Penetration of pre-5.4-Ma rock will be necessary to estimate the amount of subsidence of the volcanic arc in the Santiam Pass area. Estimates of the amount of post-5.4-Ma subsidence in the High Cascades vary, but a case can be made that the amount could be thousands of feet (e.g. research of E.M. Taylor, Oregon State University). I have constructed speculative cross sections based on available geologic data that suggest that a drilled depth of at least 3000 ft will be necessary to reach pre-5.4-Ma rock at Santiam Pass.

I conclude from the above arguments that the minimum depth for a hole at the drainage divide at Santiam Pass is about 3100 ft. A drilled depth of about 4000 ft. would probably ensure that the objectives of the hole would be met.

ESTIMATE OF COST

We estimate that at least $250,000 of <u>additional</u> drilling support will be needed to reach 4000 ft. About $140,000 of additional support would be needed to provide drill-site geologists, well logging, core curation, and minimal analysis of the core and logs. Therefore about $390,000 of additional support is required to make the higher elevation site a viable project. Combined with the USDOE-GTD support, the total budget would be about $590,000.

It must be emphasized that this budget does not include support for detailed geochemical analysis of the core or for many important scientific experiments that could be done (e.g. in situ stress tests and vertical seismic profiling). We hope that these projects could be funded separately through agencies like the National Science Foundation.

Copied from paper by Priest (1988 USGS Redbook Conference)

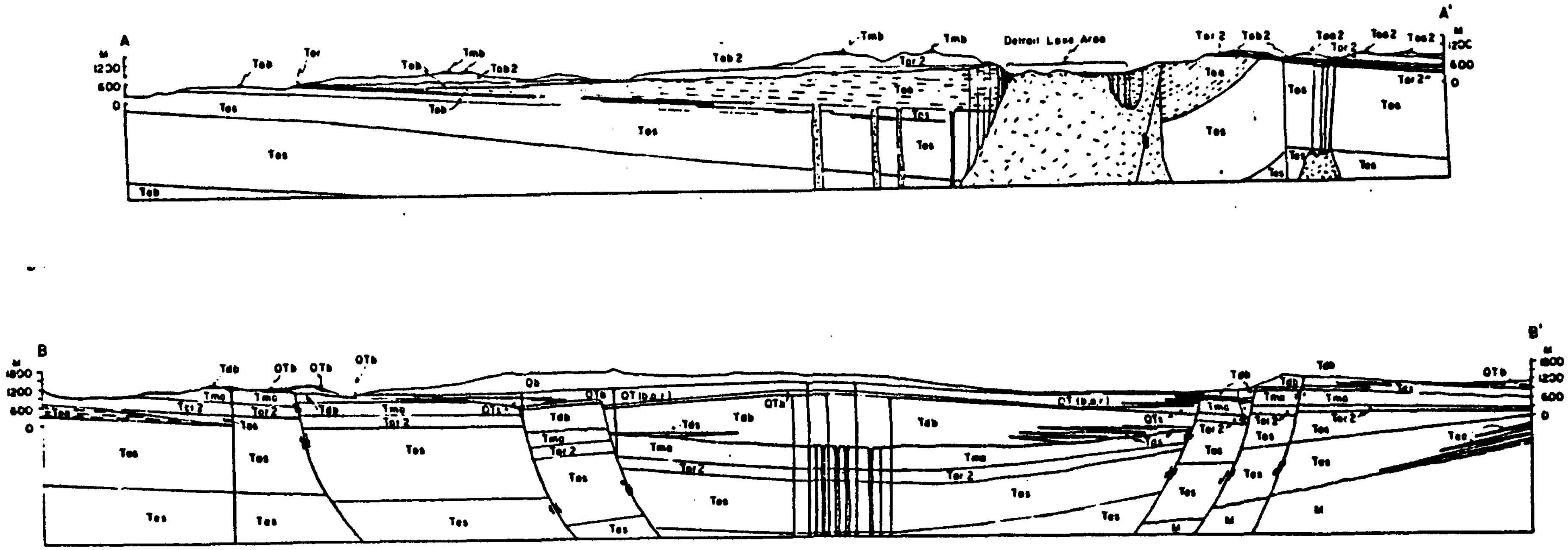
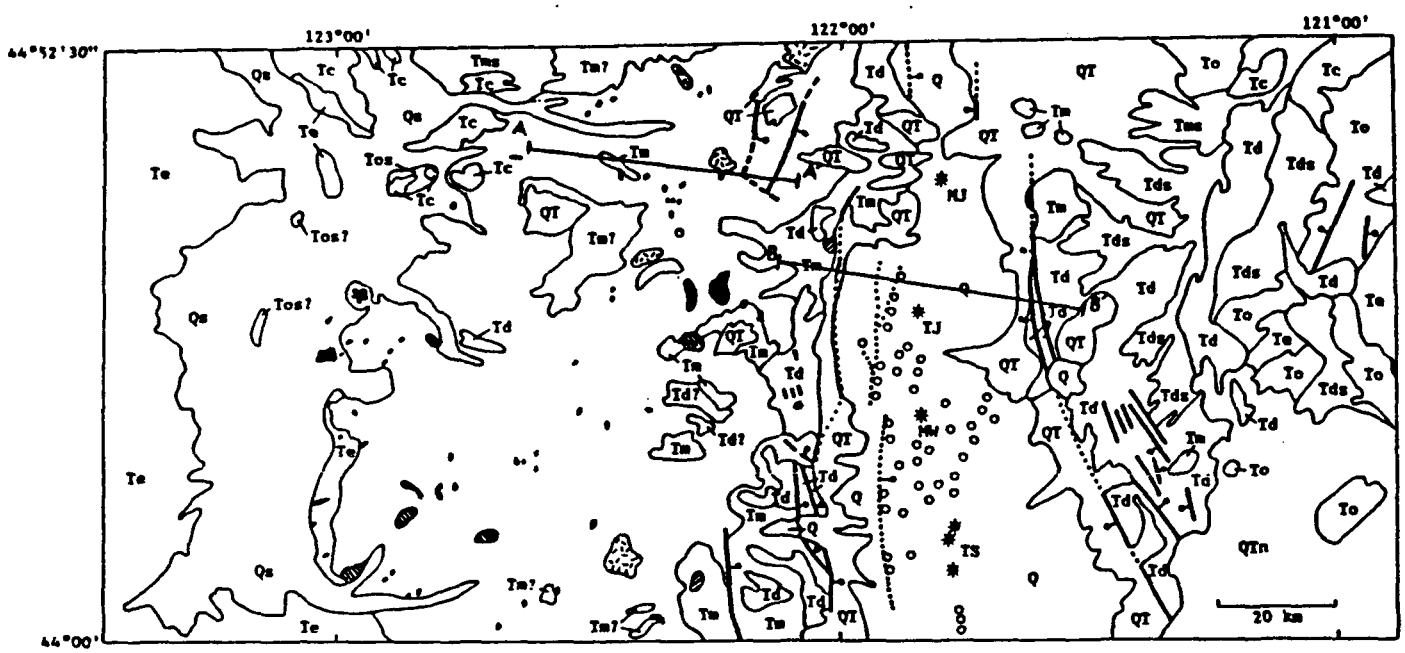


Fig. 5. Cross sections A-A' and B-B' of the geologic map (Figure 4). Note that time-rock units of Figure 4 are broken into more units on the cross sections to show geologic relationships. Unit To is broken into two units: Unit and unit . Units are defined by age (Q = 0.730-0 Ma, QT = 3.9-0.731 Ma, Td = 7.42-4.0 Ma, Tm = 16.9-7.5 Ma, To = 43.2-17 Ma, To_1 = 43.2-25.1 Ma, To_2 = 25.0-17.0 Ma, Te = pre-43.2-Ma Eocene units, and M = Mesozoic rocks), and lithology (b = mafic lava flows, a = andesite, r = dacite and rhyodacite, s = continental volcaniclastic rocks). For example, Tdb is a unit composed mainly of 7.4-4.0-Ma mafic lava flows.

Copied from paper by Priest (1988 USGS Redbook Conference)

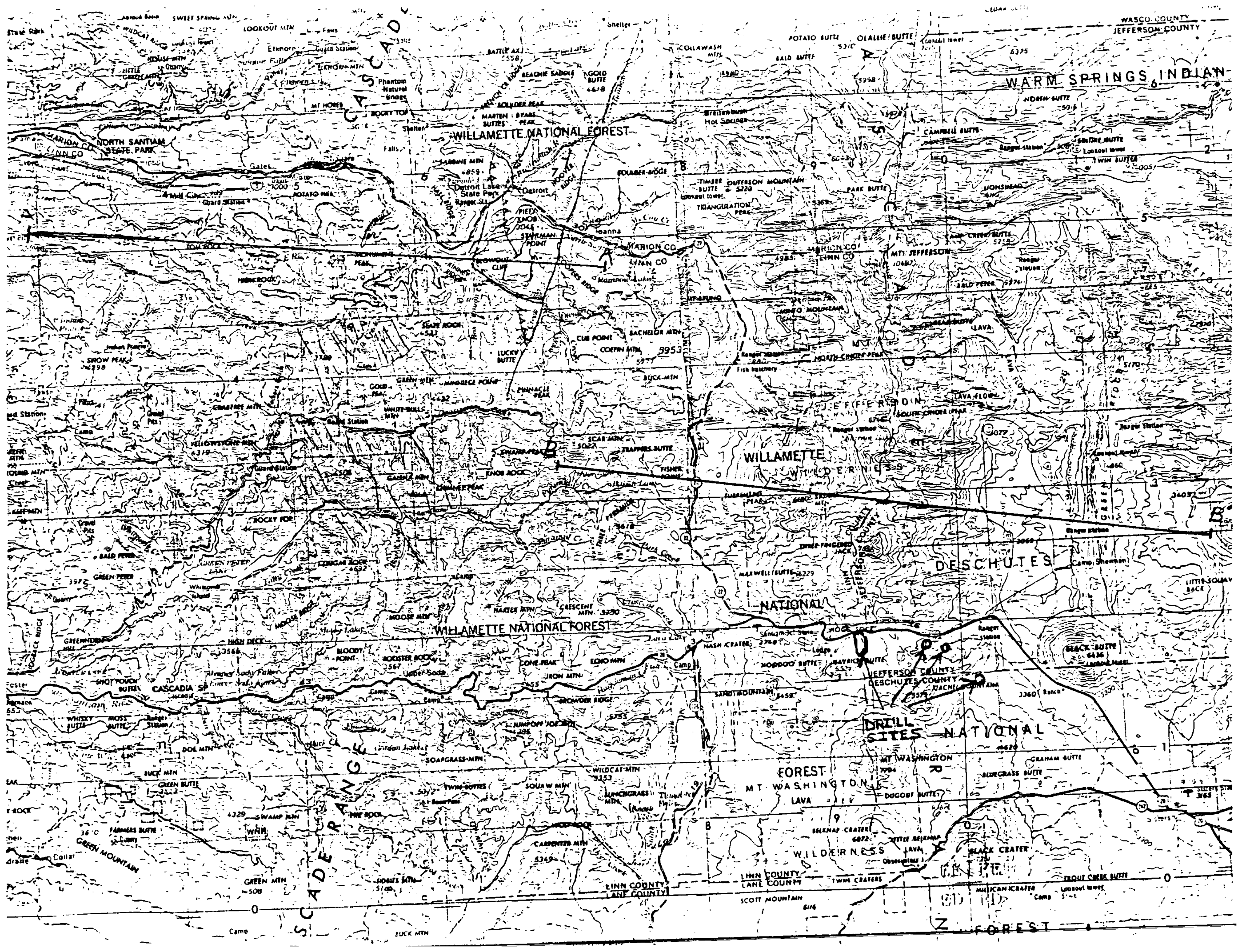


EXPLANATION

- Q 0.730 to 0 Ma volcanic rocks
- Qs 0.730 to 0 Ma sediments
- QT 3.9 to 0.731 Ma volcanic rocks
- QTn Volcanic rocks of Newberry Crater
- Td 7.4 to 4.0 Ma volcanic rocks
- Tds 7.4 to 4.0 Ma sedimentary rocks
- Tm 16.9 to 7.5 Ma volcanic rocks
- Tms 16.9 to 7.5 Ma sedimentary rocks
- Tc Columbia River Basalt Group
- To 43.2 to 17.0 Ma volcanic rocks
- Tos 43.2 to 17.0 Ma sedimentary rocks
- Te Eocene rocks (pre-Cascade and fore-arc rocks)

- Diorite to granodiorite intrusive
- Basaltic intrusive
- Andesitic intrusive
- Dacitic intrusive
- Contact
- Fault--Dashed where inferred; dotted where concealed; bar and ball on downthrown side
- 0.730 to 0 Ma monogenetic vent
- 0.730 to 0 Ma composite cone
  - MJ Mt. Jefferson
  - TJ Three Fingered Jack
  - MW Mt. Washington
  - TS Three Sisters

Fig. 4. Generalized geologic map of the study area modified from Walker and Duncan (1989) and Sherrod and Smith (1989).


WARM SPRINGS INDIAN
WASCO COUNTY
JEFFERSON COUNTY
CASCADE RANGE
WILLAMETTE NATIONAL FOREST
NORTH SANTIAM STATE PARK
MARION CO
LINN CO
Detroit Lake State Park
Detroit
MT. JEFFERSON
MT JEFFERSON
WILLAMETTE WILDERNESS
DESCHUTES NATIONAL FOREST
WILLAMETTE NATIONAL FOREST
CASCADIA SP
JEFFERSON COUNTY
DESCHUTES COUNTY
DRILL SITES
MT WASHINGTON
MT WASHINGTON LAVA
WILDERNESS
BLACK BUTTE
BLACK CRATER
LINN COUNTY
LANE COUNTY
SCOTT MOUNTAIN
GREEN MOUNTAIN
SNOW PEAK
HOODOO BUTTE
NASH CRATER
SAND MOUNTAIN
THREE FINGERED JACK
COFFIN MTN
5953
BACHELOR MTN
LUCKY BUTTE
SCAR MTN
TRAPPERS BUTTE
MAXWELL BUTTE
CRESCENT MTN
COUGAR ROCK
ROOSTER ROCK
IRON MTN
CONE PEAK
ECHO MTN
CROWDER RIDGE
BELKNAP CRATER
TWIN CRATERS
A
B

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 26, 1989

Isamu Aoki
DOE/ID
785 DOE Place
Idaho Falls ID 83402

Dear Sami:

Enclosed is a hard copy Statement of Work for the unsolicited Oregon-DOGAMI proposal which incorporates Ben Lunis' revisions regarding environmental requirements. Also enclosed is a disk with the same document in WP5.0 in the event minor changes are required by DOE/ID purchasing.

Let's hope that this will get the project Phase I funded and on the way. If you require other changes to this SOW please call me.

I would be glad to call George Priest to discuss the impossibility of a 15 day DOE review and other items, when the grant has been mailed out to him.

Sincerely,

Howard

Howard P. Ross
Project Manager

HPR:kr

encls.

State of Oregon, Department of Geology and Mineral Industries
Grant No. DE-FG07-89ID_____

STATEMENT OF WORK

1.0 INTRODUCTION

The goal of this grant is to support research in resource assessment in the Cascade Range of Oregon. The U. S. Geological Survey and the geothermal industry have identified the Cascade volcanic province as a region of high geothermal resource potential. The Oregon Department of Geology and Mineral Industries (DOGAMI) has been funded by DOE since 1979 for geothermal resource assessment activities, and a recent DOE initiative supported cost shared drilling with industry.

The principal objective of this grant is to obtain temperature gradient, heat flow, and hydrologic information along the axis of Cascade volcanism. This is in contrast with earlier deep drilling which tested local known or perceived hot spots, generally associated with major volcanic complexes. Favorable results from the drilling program to be conducted in this grant would likely stimulate and guide industry in additional resource exploration and development.

This project will be completed in two phases. Phase I will include all site selection, site identification, permitting and pre-drilling environmental studies to satisfy NEPA requirements. Phase II will include drilling, data acquisition, interpretation, core curation and final reporting as described in 4.0, Technical Tasks.

Phase I will be funded at a level of approximately 10 percent of the total project amount. Phase II funding will be contingent on the satisfactory completion of Phase I activities, and the availability of funds when a final report of Phase I activities has been submitted to, and accepted by, DOE.

2.0 SCOPE

The technical objectives of this grant are to conduct resource assessment along the axis of Cascade volcanism away from major volcanic centers. The proposed drilling will also provide the first drilling in a proposed deep continental drilling transect across the Santiam Pass area. Following a review of geologic, geophysical, and geochemical data, a site will be selected and a 600 m to 650 m temperature gradient hole will be drilled. Temperature and other geophysical logs will be completed; and the temperature gradient and heat flow will be determined.

Hydrologic and lithologic information will also be determined. All data will be interpreted and the results presented in a final report. All project work will be completed and a final report submitted within 24 months.

3.0 APPLICABLE DOCUMENTS

The research described herein is abstracted from an unsolicited proposal titled "Investigation of the Thermal Regime of the Volcanic Axis of the High Cascades, Oregon", dated May 28, 1988 and revised January 10, 1989, and submitted by the Oregon Department of Geology and Mineral Industries. Previous studies and recommendations for scientific drilling in the Santiam Pass area were submitted to DOE in DOGAMI Open File Report 0-86-3, titled "Investigation of the Thermal Regime and Geologic History of the Cascade Volcanic Arc: First Phase of a Program for Scientific Drilling in the Cascade Range". This report was a deliverable under DOE Grant No. DE-FG07-84ID12526.

4.0 TECHNICAL TASKS

The following tasks will be accomplished in two Phases under this Grant. Phase II tasks will be completed subject to the satisfactory completion of Phase I tasks, DOE-ID approval of the preliminary Environmental Analysis or Action Description Memorandum, whichever is required, and the availability of funding.

Phase I

4.1 Site Selection. Compile a geologic map at a scale of 1:62,500 which covers the area from Santiam Junction on the west to Green Ridge on the east, and from Three Fingered Jack volcano on the north to Mount Washington on the south. Compile all geophysical and geochemical data for this area, and relevant data for adjacent areas. Interpret geoscience data and evaluate environmental factors, and select the optimum feasible drill site in conjunction with relevant county, state, and federal regulatory personnel. Identify the drill site in writing and on a detailed topographic map.

4.2 Permitting and Environmental Studies. Prepare a detailed plan of operations, and obtain all necessary permits for drilling. Perform necessary environmental assessments to conform with DOE-ID/NEPA environmental requirements.

4.3 Complete a technical report summarizing Tasks 4.1 and 4.2 and submit as a Phase I Final Report to DOE. Include the draft geologic map (Task 4.1) as part of this deliverable.

Phase II

4.4 Solicit bids for drilling and select a qualified drilling contractor.

4.5 Drilling and Data Acquisition. Complete a diamond cored drill hole to 600 m to 650 m. Log the hole using accepted geophysical logging procedures. Airlift at any deep aquifers and take down-hole fluid samples from these aquifers. Set a string of 6.4 cm diameter pipe to final depth and surround with heavy mud. Demobilize rig. Monitor temperatures for a period of one year, recording not less than three complete temperature logs. Plug hole and abandon site in accordance with existing regulations following completion of temperature monitoring.

4.6 Interpret geophysical logs and drill cuttings, and prepare a lithologic log for the drill hole. Prepare temperature gradient profiles, measure thermal conductivities for all major lithologic units, and determine heat flow. Correlate subsurface rock units with surface lithologies using petrologic, mineralogic, and geochemical analyses. Prepare an east-west cross section passing through the drill site and the area of the geologic map. Complete geochemical analyses for any fluids recovered as down hole samples. Interpret water-rock interaction and the location of and importance of fluid pathways.

4.7 Core Curation. Curate drill core using accepted methods established by the DOE. Complete core photography and initial sample dissemination from a temporary facility near the drill site. Drill core will be transmitted to permanent storage upon completion of the technical studies, but not later than the delivery date of the final report. Permanent storage will be either at DOGAMI or the UURI Geothermal Sample Library, with core abstracts at the other facility.

4.8 Reporting. Complete an integrated interpretation of all data obtained during the project, and prepare a final technical report describing the methodologies used, the data obtained, the interpretation developed, and the significance of the results. Document all new data in appendices, and submit drill logs to Petroleum Information Service, Denver, Colorado for distribution to the public. The technical results may be presented at appropriate public forums.

5.0 REPORTS, DATA, AND OTHER DELIVERABLES

5.1 Management Records

Reports will be due as indicated on the Federal Assistance Reporting Checklist and the Report Distribution List.

5.2 A Phase I Final Report shall be completed which summarizes all Phase I activities. This report will include a detailed discussion of the site selection data, the draft geologic map, environmental actions and approvals and copies of appropriate drilling and land use permits.

5.3 Final Report

A detailed final technical report will be prepared which will describe the drilling history and the methodologies of all technical studies employed during the project. All new data will be presented in the report together with interpretations and significance of the results. Deliverables will include a final geologic map and appropriate representations of the compiled geochemical and geophysical data maps, lithologic and temperature logs for the drill hole, and a geologic cross section across the area of the drill hole. A draft final report will be submitted for review and comment not less than 45 days prior to the scheduled delivery of the final report.

6.0 SCHEDULE

Phase I. To be completed within five months of receipt of grant.

Phase II. To be completed within 24 months of receipt of grant. Drilling will begin not later than August 1, 1989.

7.0 SPECIAL CONDITIONS

DOGAMI may wish to reenter the subject hole and extend the drilling at some later date with non-DOE funds. If this should be the case, DOGAMI will accept all legal responsibility for the future conduct of the drilling and for later plugging and abandonment of the drill hole. DOGAMI will provide the necessary legal documents, fully executed, to DOE to show that this transfer of responsibility has been accomplished.

GEORGE R. PRIEST
Rt. 3, Box 299-C,
Kruger Road
Sherwood, OR 97140
(503) 625-7915

EDUCATION

Academic:

B.S., Geology, Oregon State University, Corvallis, Oregon, 1971

M.S., Geology, University of Nevada, Reno, Nevada, 1974

Ph.D., Geology, Oregon State University, Corvallis, Oregon, 1980

Professional:

Technical Training Course No. 7, Introduction to Geothermal Log Interpretation, April 1981. Sponsor - GRC.

Short Course, Geothermal Potential of the Cascade Mountain Range, May 1981. Sponsor - GRC. WSEO, ODOE.

Short Course, High Temperature Geothermal Wells: (300°F or 150°C), Planning Drilling and Completion, August, 1985. Sponsor - GRC.

PROFESSIONAL EXPERIENCE

Geologist 4, Regional Geologist, Oregon Department of Geology and Mineral Industries, 4-1-86 to present (Dr. John Beaulieu, supervisor).

Geologist 4, Geothermal Specialist, Oregon Department of Geology and Mineral Industries, 11-1-80 to 3-31-86 (Dr. John Beaulieu, supervisor).

Geologist 3, Oregon Department of Geology and Mineral Industries, 1005 State Office Building, Portland, Oregon 97201, 9-3-79 to 10-31-80 (Dr. Joseph Riccio, supervisor).

Geothermal Exploration Geologist, Chevron Resources Company, P.O. Box 3722, San Francisco, California 94119, 6-20-79 to 9-15-79 (Jim Salveson, supervisor).

Consulting Geologist, to Hanna Mining Company, Coastal Mining Division, 388 W. 2550 S., Salt Lake City, Utah 84115, 3-20-78 to 3-23-78 (Wade Hodges, supervisor).

Geochemist, Lawrence Livermore Laboratory, P.O. Box 808, Livermore, California 94550, 7-5-77 to 9-7-77 (Dr. Kevin K. Knauss and Dr. Terry L. Steinborn, supervisors).

Exploration Geologist, Cyprus Mines Corporation, S. 400 Jefferson Street, Suite 161, Spokane, Washington 99204, 7-25-74 to 9-15-75 (Dr. E.A. Schmidt, supervisor).

Consulting Exploration Geologist to Mr. Bruce Miller, consulting exploration geologist, Geology Department, University of Nevada, Reno, Nevada 89502, 7-1-74 to 7-6-74.

Consulting Active Fault Analyst, Project Manager, for Dr. D.B. Slemmons, Geology Department, University of Nevada, Reno, Nevada 89502, 11-73 to 3-74.

Engineering Geologist, Woodward-Clyde and Associates, Berkeley, California; 5 days 1-74 (Alfred Ringa, supervisor).

Exploration Geologist, Phelps Dodge Corporation, Reno, Nevada 89502, 6-15-72 to 9-15-72 (Robert Ludden, supervisor).

PROFESSIONAL ACTIVITIES

Vice-Chairman, Steering Committee for the Program for Scientific Drilling in the Cascades, 1986-present.

Chairman, Cascade Task Force (ad hoc committee aimed at planning scientific drilling in the Cascade Range), 1984-1986.

Technical Reviewer, United States Department of Energy Cascade Deep Geothermal Gradient Drilling Program, 1985.

Advisor, Pacific Northwest Utilities Conservation Commission, 1983.

Member, American Geophysical Union, 1985-present.

Member, Geological Society of America, 1972-present.

Reviewer, Geological Society of America, Cordilleran Section Meeting, 1984.

Member, Geothermal Resources Council (GRC), 1979-present.

Member, Technical Review Committee for 1983 Annual Meeting, GRC, 1983.

Member, Oregon Academy of Science, 1978-present.

PUBLICATIONS

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Priest, G.R., and Blackwell, D.D., 1984, Understanding thermal energy and dynamic processes in subduction-related volcanic arcs: Proposed studies in the Cascades: Oregon Department of Geology and Mineral Industries, Oregon Geology, v. 46, no. 10, p. 122-123.

Priest, G.R., and Blackwell, 1984, Understanding thermal energy and dynamic processes in subduction-related volcanic arcs: Proposed studies in the Cascades: EOS (American Geophysical Union Transactions), v. 65, p. 722.

Priest, G.R., 1983, A field trip guide to the central Oregon Cascades: Second Day: Santiam Pass-Belknap Hot Springs-Breitenbush Hot Springs: Oregon Department of Geology and Mineral Industries, Oregon Geology, no. 12, p. 133-138.

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Priest, G.R., 1983, Geothermal exploration in the central Oregon Cascade Range, in Priest, G.R., and Vogt, B.F., eds., Geology and geothermal resources of the central Oregon Cascade Range: Oregon Department of Geology and Mineral Industries Special Paper 15, p. 77-87.

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Priest, G.R., Beeson, M.H., Gannett, M.W., and Berri, D.A., 1982, Geology, geochemistry, and geothermal resources of the Old Maid Flat area, Oregon, in Priest, G.R., and Vogt, B.F., Geology and geothermal resources of the Mount Hood area, Oregon: Oregon Department of Geology and Mineral Industries Special Paper 14, p. 16-30.

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DOGAMI.UNS

DETERMINATION OF NONCOMPETITIVE FINANCIAL ASSISSTANCE (DNCFA)

Sponsoring Program Office: Department of Energy, Division of Geothermal and Hydropower Technologies

Awarding Office: Department of Energy, Idaho Operations Office

Type of Award Proposed: Grant

Proposed Recipient: State of Oregon, Department of Geology and Mineral Industries (DOGAMI)

Nature of Assistance: Research Grant

Amount: $211,928

Statutory Authority: I recommend that negotiations be conducted only with the Department of Geology and Mineral Industries, State of Oregon, for the assistance described herein in accordance with DOE Assistance Regulations, 10 CFR Chapter 11, Subpart 600.14

1. Assistance to be Furnished

To investigate the thermal regime in the most active part of the High Cascades at the volcanic axis and to measure the amplitude of the heat-flow anomaly. This will be accomplished by drilling a 650 m temperture-gradient test hole in the Santiam Pass area, Oregon. The Cascade Range has been identified as one of the more promising geothermal provinces in the Unites States, but most drilling to date has either been too shallow, or localized around major volcanic centers, and hence not representative of the High Cascades as a province. The proposed drill hole would be situated along the axis of the High Cascades and between major volcanic centers, and should therefore provide considerable information on the overall geothermal potential of the Cascade Range.

This is an unsolicited proposal to conduct resource assessment. Interest in the study topic was developed in the course of an existing Grant to DOGAMI, Grant No. DE-FG07-84ID12526. The proposed drill hole is a portion of the recommendations for further research presented in a technical report "Investigation of the Thermal Regime and Geologic History of the Cascade Volcanic Arc: First Phase of a Program for Scientific Drilling in the Cascade Range", DOGAMI Open File Report O-86-3, which is a deliverable for the existing grant.

2. Review and Evaluation

The U. S. geothermal industry and academic researchers alike have identified the Cascade volcanic province as a region of

high geothermal resource potential. Much of the research and resource assessment has been completed by the U. S. Geological Survey, and by DOGAMI through DOE funding. DOE also issued Solicitation No. DE-SC07-85ID12580 for cost shared drilling with industry, which has resulted in deep temperature gradient and hydrologic data near Newberry Caldera and in the Clackamas area. This proposal is therefore relevant to and consistant with the DOE mission in evaluating the geothermal resource potential of the Cascade Range.

The principal objective of the proposal is to obtain temperature gradient, heat flow, and hydrologic information along the axis of volcanism. This is in contrast with earlier deep drilling which tested local known or perceived hot spots. This objective should be achieved unless unexpected and unusually difficult drilling problems force a termination of the drill hole, or unless hydrologic disturbances preclude a meaningful temperature gradient determination within the depth range that can be drilled with the committed funds. The probability of a successful hole is judged to be greater than 50%, and some useful data will result even in the event of a hydrologically disturbed temperature profile.

DOGAMI will undertake geological, geophysical, geochemical, and evironmental studies to determine the best drilling site to achieve the project objectives. An experienced professional drilling contractor will be employed and will be supervised by DOGAMI personnel experienced in the drilling of similar boreholes to assure the best effort in completing the borehole to the desired depth and within budget. DOGAMI has pursued geothermal resource assessment for 17 years and is very experienced in volcanic terrains. The Principal Investigator, Dr. George Priest, has extensive experience in drilling programs of this type. The senior geologist and drill site geologist are not specified by name and resume in the proposal. They will be selected from individauls qualified by the necessary experience and academic background for their project tasks. Drilling and geophysical subcontractors will be selected only if they fulfill experience and training requirements.

The proposal includes little explanation of, or justification for the $100,000 drilling subcontract. We note a 1987 proposal by the Washington- Department of Natural Resources to drill two holes to depths of 1,000 feet each at a cost of $28/ft in similar Cascades volcanic rocks. Hence the proposed (net, inclusive of moblization) cost of $46.90/ft of the DOGAMI proposal should be adequate, even for a hole capability of 1200 m. DOE should be aware of the uncertainty of drilling conditions and drilling costs, and should define in advance a contingency fund or a definite dollar cutoff to the drilling venture. DOE-ID has

acknowledged that adequate funds are available for funding of this proposal at the $211,928 level requested.

3. Relevance to Accomplishment of a Public Purpose

The proposed grant, if successful, will contribute significant new information to the geothermal energy resource potential of the Cascades. If the information is considered favorable by industry, the results may stimulate and guide industry to further efforts in exploration and/or resource development.

This project is unique in testing a model for high heat flow along the volcanic axis of the Cascades as opposed to earlier drilling efforts which focused on known hot spots or volcanic complexes. It will also produce deep drilling information above a subduction zone within the Cascades, basic geologic information of much interest to the earth science community.

4. Criteria for Justifying Noncompetitive Financial Assistance

The activity to be funded is a continuation of geothermal resource assessment being conducted by the State of Oregon, Department of Geology and Mineral Industries, since 1979. Competition for support of this effort would have a significant adverse effect on the continuity of these studies.

The applicant, DOGAMI, is the authorized agency within the State of Oregon responsible for statewide geological studies and geothermal resource evaluation. DOE is thereby precluded from providing support for this study, within the State of Oregon, to another entity.

5. Determination

This proposal is not eligible for financial assistance under a recent, current, or planned DOE solicitation. DOGAMI has been determined to be the appropriate agency within the State of Oregon to conduct this resource assessment and therefore a competitive solicitation would not be appropriate.

In light of these facts, I consider the proposed soure as the only acceptable one for the planned assistance and recommend authorization of negotiations without further competition.

Recommendation: _____

Project Manager

Concurrence: _____

General Council (if over $100,000)

Concurrence: _____
Cognizant Contracting Specialist/Officer

Approved: _____
Contracting Officer*

Concurrence: _____
Director, Contracts Management Division

Approved: _____
Competition Advocate

*Contracting Officer higher than the Cognizant Officer

State of Oregon, Department of Geology and Mineral Industries
Grant No. DE-FG07-88ID_____

STATEMENT OF WORK

1.0 INTRODUCTION

The goal of this grant is to support research in resource assessment in the Cascade Range of Oregon. The U. S. Geological Survey and the geothermal industry have identified the Cascade volcanic province as a region of high geothermal resource potential. The Oregon Department of Geology and Geophysics (DOGAMI) has been funded by DOE since 1979 for geothermal resource assessment activities, and a recent DOE initiative supported cost shared drilling with industry.

The principal objective of this grant is to obtain temperature gradient, heat flow, and hydrologic information along the axis of Cascade volcanism. This is in contrast with earlier deep drilling which tested local known or perceived hot spots, generally associated with major volcanic complexes. Favorable results from the drilling program to be conducted in this grant would likely stimulate and guide industry in additional resource exploration and development.

2.0 SCOPE

The technical objectives of this grant are to conduct resource assessment along the axis of Cascade volcanism away from major volcanic centers. The proposed drilling will also provide the first drilling in a proposed deep continental drilling transect across the Santiam Pass area. Following a review of geologic, geophysical, and geochemical data, a site will be selected and a 650 m temperature gradient hole will be drilled. Temperature and other geophysical logs will be completed, and the temperature gradient and heat flow will be determined. Hydrologic and lithologic information will also be determined. All data will be interpreted and the results presented in a final report. All project work will be completed and a final report submitted within 24 months.

3.0 APPLICABLE DOCUMENTS

The research described herein is abstracted from an unsolicited proposal titled "Investigation of the Thermal Regime of the Volanic Axis of the High Cascades, Oregon", dated May 28, 1988 and submitted by the Oregon Department of Geology and Mineral Industries. Previous studies and recommendations for scientific drilling in the Santiam Pass area were submitted to DOE in DOGAMI Open File Report O-86-3, titled "Investigation of the Thermal Regime and Geologic

History of the Cascade Volcanic Arc: First Phase of a Program for Scientific Drilling in the Cascade Range". This report was a deliverable under DOE Grant No. DE-FG07-84ID12526.

4.0 TECHNICAL TASKS

The following tasks will be acomplished under this Grant.

4.1 Site Selection. Compile a geologic map at a scale of 1:62,500 which covers the area from Santiam Junction on the west to Green Ridge on the east, and from Three Fingered Jack volcano on the north to Mount Washington on the south. Compile all geophysical and geochemical data for this area, and relavent data for adjacent areas. Interpret geoscience data and evaluate environmental factors, and select the optimum feasible drill site in conjunction with relevant county, state, and federal regulatory personnel.

4.2 Permitting and Contracting. Prepare a detailed plan of operations, and obtain all necessary permits for drilling. Solicit bids for drilling and select a qualified drilling contractor.

4.3 Drilling and Data Acquisition. Complete a diamond cored drill hole to about 650 m. Log the hole using accepted geophysical logging procedures. Airlift at any deep aquifers and take down-hole fluid samples from these aquifers. Set a string of 6.4 cm diameter pipe to final depth and surround with heavy mud. Demobilize rig. Monitor temperatures for a period of one year, recording not less than three complete temperature logs. Plug hole and abandon site in accordance with existing regulations following completion of temperature monitoring.

4.4 Interpret geophysical logs and drill cuttings, and prepare a lithologic log for the drill hole. Prepare temperature gradient profiles, measure thermal conductivities for all major lithologic units, and determine heat flow. Correlate subsurface rock units with surface lithologies using petrologic, mineralogic, and geochemical analyses. Prepare an east-west cross section passing through the drill site and the area of the geologic map. Complete geochemical analyses for any fluids recovered as down hole samples. Interpret water-rock interaction and the location of and importance of fluid pathways.

4.5 Core Curation. Curate drill core using accepted methods established by the DOE. Complete core photography and initial sample dissemination from a

temporary facility near the drill site. Drill core will be transmitted to permanent storage upon completion of the technical studies, but not later than the delivery date of the final report. Permanent storage will be either at DOGAMI or the UURI Geothermal Sample Library, with core abstracts at the other facility.

4.6 Reporting. Complete an integrated interpretation of all data obtained during the project, and prepare a final technical report describing the methodologies used, the data obtained, the interpretation developed, and the significance of the results. Document all new data in appendicies, and submit drill logs to Petroleum Information Service, Denver, Colorado for distribution to the public. The technical results may be presented at appropriate public forums.

5.0 REPORTS, DATA, AND OTHER DELIVEPABLES

5.1 Management Records

Reports will be due as indicated on the Federal Assistance Reporting Checklist and the Report Distribution List.

5.2 Final Report

A detailed final technical report will be prepared which will describe the drilling history and the methodologies of all technical studies employed during the project. All new data will be presented in the report together with interpretations and significance of the results. Deliverables will include appropriate representations of the compiled geologic, geochemical, and geophysical data maps, lithologic and temperature logs for the drill hole, and a geologic cross section across the area of the drill hole. A draft final report will be submitted for review and comment not less than 45 days prior to the scheduled delivery of the final report.

EARTH SCIENCE LABORATORY
UNIVERSITY OF UTAH RESEARCH INSTITUTE
391 Chipeta Way, Suite C
Salt Lake City, Utah 84108
(801) 524-3422

Marshall's revised SOW — 9/1/88
DATE

Joel Renner	EG&G	
TO	ORG./LOCATION	TELEPHONE NUMBER

Howard Ross	UURI	
FROM	ORG./LOCATION	TELEPHONE NUMBER

THIS TRANSMITTAL CONSISTS OF _____ PAGES.
(excluding cover sheet)

VERIFICATION TELEPHONE NO. (801) 524-3437

SAMPLE OF B

DETERMINATION OF NONCOMPETITIVE FINANCIAL ASSISTANCE (DNCFA)

Sponsoring Program Office:

Awarding Office:

Type of Award Proposed: (Grant or Cooperative Agreement)

Proposed Recipient:

Nature of Assistance:
(e.g.; Research Grant, Conference Grant, etc.)

Amount: (including any cost sharing proposed or required)

Statutory Authority:

I recommend that negotiations be conducted only with the (source) for the assistance described herein in accordance with DOE Assistance Regulations Subpart 600.14.

1. Assistance to be Furnished

   - Non-technical description of the proposed assistance and its applications and significance.

   - A statement of whether the application was solicited or unsolicited and the nature of any significant preapplication contact between the applicant and DOE.

2. Review and Evaluation

   To the extent relevant discuss the programmatic evaluation conducted and the results of that evaluation including:

   - The overall merit and relevance to the DOE mission.

   - The anticipated objectives to be achieved and the probability of achieving the stated objectives.

   - The facilities or techniques which the applicant proposes to make available to achieve the proposed project's objectives.

   - The qualifications of the proposed project director or key personnel who are considered to be critical to the achievement of the proposed project's objectives.

- The adequacy of the proposed budget. Include a statement that adequate funding for the project exists.

Relevance to Accomplishment of a Public Purpose

- Give a brief description of the public purpose of support or stimulation to be served by the proposed award.

- In nontechnical terms, identify any particular significant or specialized character of the activity proposed to be funded.

Criteria for Justifying Noncompetitive Financial Assistance

Include a statement of which one(s) of the following criteria is (are) being relied upon to justify the action and an explanation in general, nontechnical detail why each such criterion applies.

- The activity to be funded is necessary to the satisfactory completion of, or is a continuation or renewal of, an activity presently being funded by DOE or another Federal agency, and for which competition for support would have a significant adverse effect on continuity or completion of the activity.

- The activity is being or would be conducted by the applicant using its own resources or those donated or provided by third parties; however, DOE support of that activity would enhance the public benefits to be derived and DOE knows of no other entity which is conducting or is planning to conduct such an activity.

- The applicant is a unit of government and the activity to be supported is related to performance of a governmental function within the subject jurisdiction, thereby precluding DOE provision of support to another entity.

- The applicant has exclusive domestic capability to perform the activity successfully, based upon unique equipment, proprietary data, technical expertise, or other such unique qualifications.

- The applicant implements an agreement between the United States Government and a foreign government to fund a foreign government to fund a foreign applicant.

- Time constraints associated with a public health, safety, or welfare or national security requirement preclude competition.

- The responsible Assistant Secretary, with the approval of the Director, determines that a noncompetitive award is in the public interest. This authority may not be delegated.

Determination

Include a statement that:

- The proposals are not eligible for financial assistance under a recent, current, or planned DOE solicitation; and,

- A competitive solicitation would not be appropriate.

In light of these facts, I consider the proposed source(s) as the only acceptable one(s) for the planned assistance and recommend authorization of negotiations without further competition.

Recommendation: _____
Project Manager

Concurrence: _____
General Counsel (if over $100,000)

Concurrence: _____
Cognizant Contracting Specialist/Officer

Approved: _____
Contracting Officer*

Concurrence: _____
Director, Contracts Management Division

Approved: _____
Competition Advocate

*Contracting Officer higher than the Cognizant Officer

clude, b e not limited to, the requirements of this part, Federal statutes, the OMB Circulars and other governmentwide guidance implemented by this part, Executive Orders, and the requirements identified in Appendix A of this part.

(b) Except as expressly exempted by Federal statute or program rule, recipients and subrecipients of DOE financial assistance shall comply with all generally applicable requirements to which, by the terms of such requirements, they are subject. DOE may require the submission of preaward assurances of compliance with one or more generally applicable requirements and may conduct preaward and postaward compliance reviews only to the extent such actions are authorized by this part, Federal statute or rule, Executive Order, or OMB directive.

§ 600.13 Application deadlines.

(a) Each solicitation shall include a deadline date for submission of applications. The established deadline shall also apply to any amendment to an application initiated by an applicant. An application or amendment shall be timely if it is:

(1) Received at the location specified in the solicitation on or before the established deadline date and time; or

(2) Received after the deadline date, and the application or amendment was sent by first class mail, was postmarked on or before the deadline date, and is received by DOE before technical evaluation of all acceptable applications submitted in response to the solicitation begins. Applicants should obtain a legibly dated mailing receipt from the U.S. Postal Service or use certified or registered mail to enable them to substantiate the date of mailing. Private metered postmarks shall not be acceptable proof of the date of mailing; and

(3) Complete (see § 600.10(d) and § 600.11(c)).

(b) DOE shall not consider and shall return any application that does not meet the requirements of paragraphs (a)(1) or (a)(2) and (a)(3) of this section.

(c) If necessary, DOE may extend an established application deadline by publishing a timely notice of the extension in the same manner as the solicitation was publicized. The extension of time shall apply to all applicants.

§ 600.14 Unsolicited applications.

(a) *General.* An unsolicited application is an application for DOE financial assistance which is not submitted in response to a solicitation or which is submitted in response to a Notice of Program Interest (see § 600.15). DOE may award financial assistance to an applicant who submits an unsolicited application for support of a project that involves an innovative idea, method or approach. DOE shall determine whether the application would result in a procurement contract or in a grant or cooperative agreement. An unsolicited application may be considered for DOE financial assistance only if the application is relevant to a public purpose of support or stimulation authorized by Federal statute.

(b) *Preapplication contact.* Anyone who is contemplating submitting an unsolicited application is encouraged, before expending extensive effort in preparing a detailed application or submitting any proprietary information to DOE, to make preliminary inquiries of DOE program staff as to DOE interest in the type of project contemplated. The potential applicant should not construe any such discussion as either encouragement to submit an unsolicited application or a promise of an award.

(c) *Preparation and submission of application.* A guide for preparing unsolicited applications/proposals is available from the Unsolicited Proposals Management Section, Reports and Analysis Branch (MA-942), Procurement and Assistance Management Directorate, Department of Energy, 1000 Independence Avenue, S.W., Washington, D.C. 20585.

(1) Unsolicited applications shall be in the format set forth in "The Guide for Submission of Unsolicited Proposals," except that a State government, local government, or Indian tribal government shall use one of the application forms prescribed by OMB Circular A-102, Attachment M, as appropriate.

(2) An unsolicited application must be submitted to the Unsolicited Proposals Management Section at the address specified in paragraph (c) of this section. If there have been prior discussions with a particular DOE program office, and the applicant wants the application to be considered by that office, the applicant should indicate "For consideration by (*Name of appropriate program*)" on the face of the application.

(d) *General evaluation.* DOE shall make a general evaluation of an unsolicited application based on the following types of factors:

(1) The overall merit of the proposed project or activity.

(2) The anticipated objectives to be achieved and the probability of achieving the stated objectives.

(3) The facilities or techniques which the applicant proposes to make available to achieve the proposed project's objectives.

(4) The qualifications of the proposed project director or key personnel who are considered to be critical to the achievement of the proposed project's objectives.

(e) *Criteria for selection of an unsolicited application.* (1) DOE may select an unsolicited application only if:

(i) The application is meritorious based on the general evaluation as in paragraph (d) of this section; and

(ii) The proposed project represents a unique or innovative idea, method, or approach which would not be eligible for financial assistance under a recent, current, or planned solicitation, or if, as determined by DOE, a competitive solicitation would be appropriate.

(2) Any request for continuation, renewal, or supplemental funding of a project which was originally funded as the result of an unsolicited application shall be evaluated in the same manner as any other request for such funding and shall not be subject to the selection criterion of paragraph (e)(1)(ii) of this section. (See § 600.106 for requirements concerning funding of grants.)

(f) *Funding.* An award based on an unsolicited application may be made only if sufficient appropriated funds are available.

(g) *Unsuccessful cations.* DOE shall promptly notify in writing each applicant whose application which does not satisfy the requirements of this section. DOE will return unsuccessful unsolicited applications only if requested by the applicant. This request may be made at the time of application or up to 30 days after the date of the written notification required by this paragraph.

(The information collection requirements contained in paragraph (c)(1) have been approved by the Office of Management and Budget under control numbers 0348-0005—0348-0009)

§ 600.15 Notice of program interest.

(a) *General.* (1) DOE may publish a periodic Notice of Program Interest in the FEDERAL REGISTER and other media, as appropriate, which describes broad, general, technical problems and areas of investigation for which DOE may award grants or cooperative agreements.

(2) DOE shall evaluate any application submitted under a Notice of Program Interest as an unsolicited application (see § 600.14).

(b) *Contents.* In addition to the information required under § 600.9(c), the notice shall include the following:

(1) A brief description of the areas of interest for which DOE may provide financial assistance.

(2) A statement about how resulting applications will be evaluated and the criteria for selection and funding as specified in § 600.14.

(3) An expiration date with an explanation that such a date does not represent a common deadline for applications but rather that applications may be submitted at any time before the notice expires.

(4) The location for application submission, which shall be the Unsolicited Proposals Management Section, Reports and Analysis Branch (MA-942), Procurement and Assistance Management Directorate, Department of Energy, Forrestal Building, 1000 Independence Avenue, S.W., Washington, D.C. 20585, unless the notice specifies otherwise.