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CASCADES NEWSLETTER
NO. 3

6 February, 1987

CASCADES GEOTHERMAL PROGRAM
U. S. DEPARTMENT OF ENERGY

ANNOUNCEMENT OF OPEN FILE DATA RELEASE

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The first thermal gradient hole drilled under this program was finished about 1 November, 1985 by GEO-Newberry Crater, Inc. on the south flank of the Newberry Volcano. GEO-Newberry is a wholly-owned subsidiary of GEO Operator Corporation. The hole, Corehole N-1, is located 3500 ft west and 2450 ft north of the southeast corner of Section 25,T22S R12E in Deshutes County, Oregon. It was rotary drilled to a depth of 487 ft, and was then cored at HQ size (3.8 in) to a depth greater than 4000 ft. UURI open-filed the data from N-1 and made available a split of the core for inspection in Salt Lake City on 24 February 1986.

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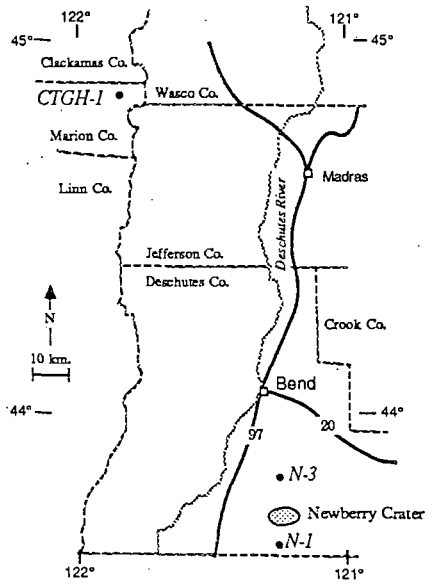

GEO - NEWBERRY N-3

FIGURE 1

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N-3-2	Lithologic Log	--	1	$ 0.30
N-3-3	Drillers Log		74	11.75
N-3-4	Hole Completion Schematic	--	1	0.30
N-3-5	Temperatures During Drilling	--	1	0.30
N-3-6	Standing Fluid Level	--	1	0.30
N-3-7	Temperature Log	Geother. 8-18-86	3	0.60

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1. Temperature, differential temperature (50-4002 ft)
2. Neutron (50-4000 ft)
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CTGH-1-4	Graphic Drilling Log	Lithology, temperature from MRT, penetration rate, water level, lost circulation zones	9	1.80
CTGH-1-5	Drilling and completion history	narrative drilling history	4	1.00
CTGH-1-6	Secondary Minerals from CTGH-1 Drill Core	Analysis by USGS of selected core samples for alteration mineralogy	1	0.30
CTGH-1-7	Report and data for Geophysical well logs 0-515 ft, Colorado Well Logging	Surveys run 13 June 86 (SP, short and long normal resistivity, temperature, density, natural gamma, ground resistivity, duration survey)	75	13.00
CTGH-1-8	Report and data for geophysical well logs to TD (4800 ft), Colorado Well Logging	Surveys run 3-5 Sept. 1986 including density (4200-4800 ft), full wave form sonic (4225-4425 ft), 16"-64" resistivity and SP (4200-4800 ft), natural gamma-neutron, (0-4100 ft) temperature (0-4800 ft) deviation	59	10.00

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13 June 86 Runs

1. Temperature and fluid resistivity (16-514 ft)
2. SP and 16"-64" resistivity (35-515.5 ft)
3. Natural gamma, neutron, guard resistivity (20-516 ft)
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3-5 Sept., 1986 Runs

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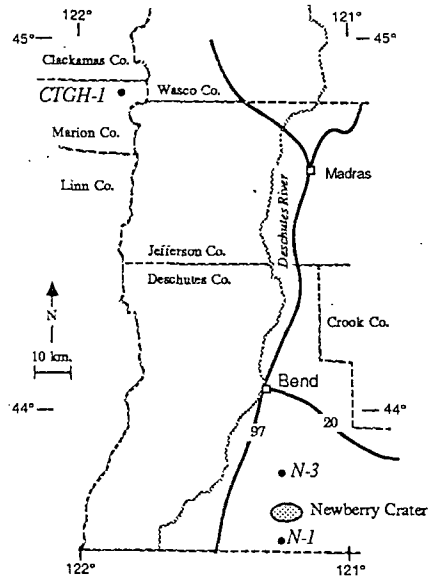

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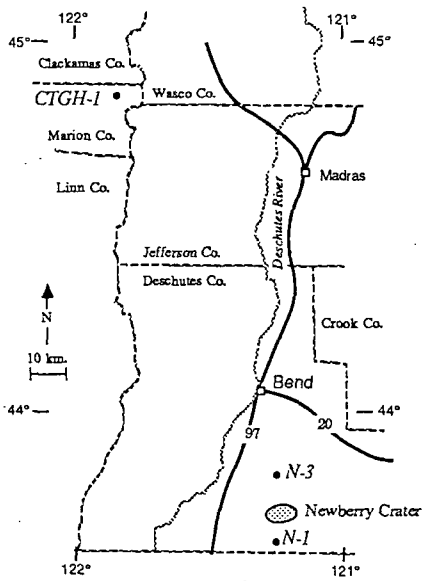

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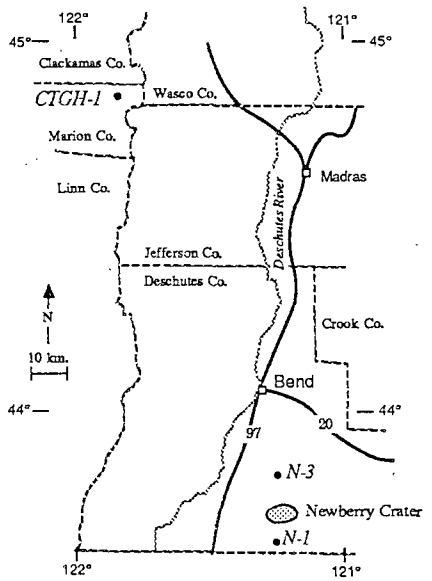

GEO - NEWBERRY N-3

FIGURE 1

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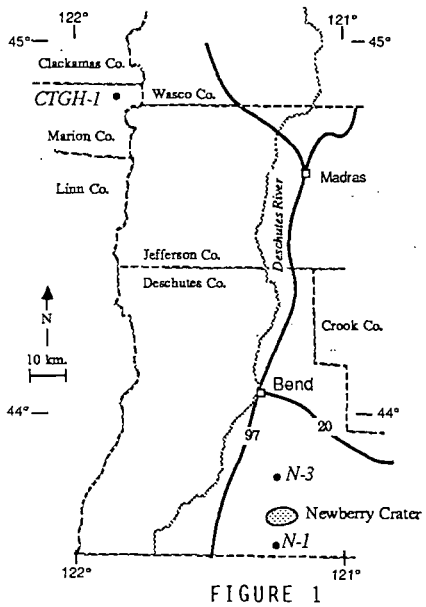

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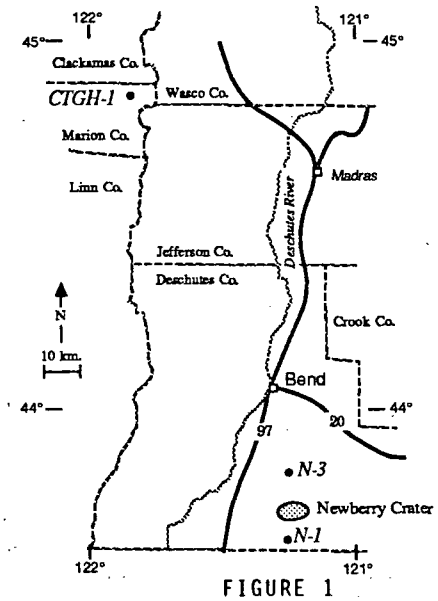

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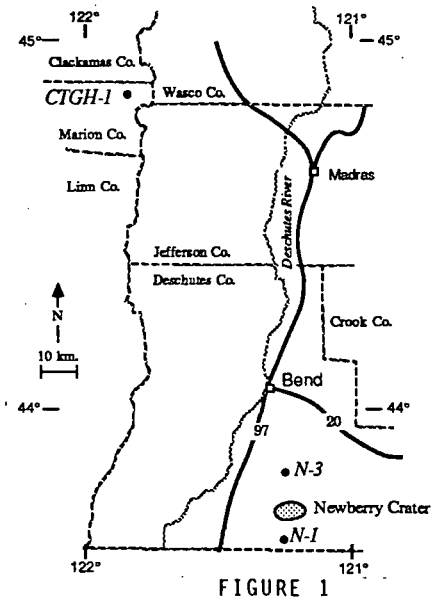

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3-5 Sept., 1986 Runs

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5. SP, 16"-64" resistivity (4200-4799 ft)

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CASCADES NEWSLETTER
NO. 3

6 February, 1987

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U. S. DEPARTMENT OF ENERGY

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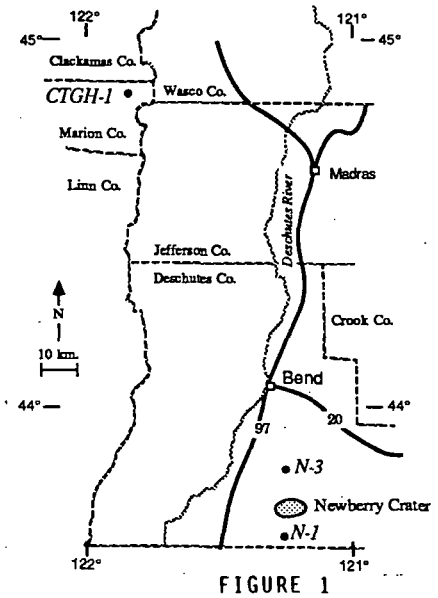

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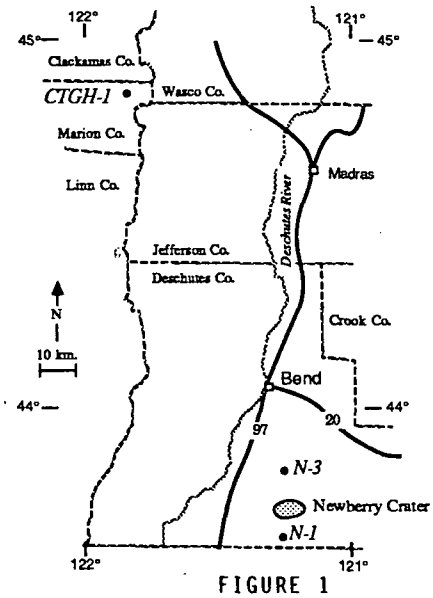

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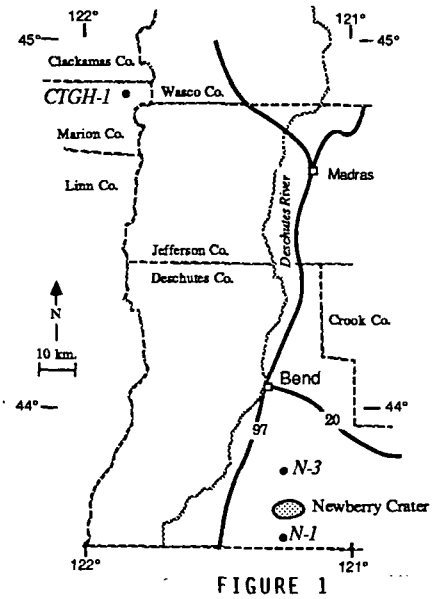

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1. GEO N-1 Well Data to 4,000'
   a) Drillers log
   b) Well summary including casing schematic
   c) Temperatures measured during drilling
   d) Temperature log (detailed), 9 Nov. 85
   e) Table of measured thermal conductivity

2. GEO N-1 Core Hole Lithologic Log

3. GEO N-1 Geophysical Logs (Dresser Atlas) to 4,000', 2 Nov 85
   a) Gamma ray
   b) BHC acoustic fraclog
   c) 4-Arm caliper log
   d) BHC acoustilog
   e) Geothermal temperature log
   f) Induction electrolog

4. Core Hole GEO N-1, Photographs 487' - 4,003'

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Earth Science Laboratory / UURI
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7 February, 1986

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U. S. DEPARTMENT OF ENERGY

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CASCADES NEWSLETTER
NO. 1

20 September, 1985

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U. S. DEPARTMENT OF ENERGY

The U. S. Department of Energy (DOE), Division of Geothermal and Hydropower Technologies (DGHT), is mandated to perform research in support of industry for identification, evaluation, extraction, and utilization of geothermal energy as an alternative energy source. As part of this effort, DGHT has initiated a new program designed to support industry efforts in the Cascades volcanic region of California, Oregon and Washington.

The majority of the world's known high-temperature geothermal resources are closely associated with active volcanism. A relatively small amount of data are in the public domain from volcanic areas in Japan, the Philippines, Mexico, Central America and from Newberry Caldera (Oregon), Lassen (California), and Meager Creek (British Columbia) in the Cascades. The key aspects of exploration in this environment are knowledge of the locations of heat sources (high-level plutons) and of the locations and nature of fracture systems which would allow meteoric fluids to communicate with the hot rock and ascend within reasonable drilling depths. The western andesitic volcanic province of the U.S., the Cascades, remains one of the areas of high geothermal potential which has seen relatively little systematic exploration by the U.S. geothermal industry. One of the reasons has been the paucity of direct surface geothermal manifestations, which, in turn, has been attributed to high rainfall. Downward percolation of cold water may reduce or eliminate surface thermal phenomena and require deep temperature-gradient measurements as well as deep geophysical exploration to see through the near-surface, cold-water aquifers. This hypothesis can be tested only by drilling below the so-called "rain curtain". Resource assessment and exploration research have been conducted by the U.S. Geological Survey and by the states involved--Washington, Oregon and California--as well as by industry. However, there have been few wells drilled in the Cascades to sufficient depth to evaluate the zone of cold water overflow and the temperature and hydrological conditions beneath it.

DOE's objectives are 1) to gather data to characterize the deep thermal regime of the Cascades volcanic region and 2) to transfer these data to the public in order to stimulate further development of hydrothermal resources. The first step in achieving these objectives was taken when the DOE-Idaho Operations Office issued Solicitation Number DE-SC07-85ID12580 to receive and consider for support proposals to enter into Cooperative Agreements for the drilling of gradient holes and for the release of data generated from the drilling project. To qualify for consideration, the proposals had to meet the following criteria:

1. The proposed site was to be located within the Cascades volcanic region of the United States as delineated by Figure 1;
2. The proposal was to include a cost-share plan in which DOE's share would not exceed 50 percent;
3. The proposed hole was to be a minimum of 3000 feet deep; and,
4. The proposer was to agree to complete the hole and allow DOE access to the hole for data acquisition purposes.

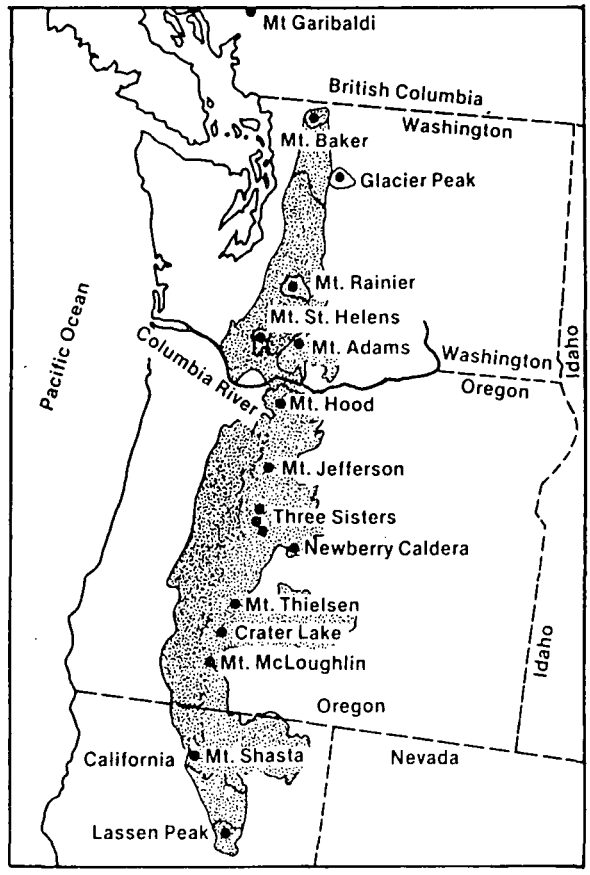

Figure 1. Defined Proposal Area (stippled area)

Three companies submitting proposals were selected to negotiate cooperative agreements. The three firms selected and the proposed drilling projects are: GEO-Newberry Crater, Inc. for drilling two 4000-foot coreholes on the flanks of Newberry volcano; Thermal Power Company for drilling one 5000-foot corehole in the Clackamas area; and, Blue Lake Geothermal Company for drilling one 3000-foot hole (upper 2000 ft rotary, lower 1000 ft core) in the Santiam pass area.

The program will result in the release of such items as rock samples, fluid samples and well logs, as well as data generated from the samples and interpretation of these data.

Splits of rock and fluid samples will be housed at UURI during the active phases of the program, with splits also being retained by the industry participant and the state geological agency as negotiated with DOE. The holes will generally be completed with 2-1/2 in. pipe so that equilibrium temperature gradients can be measured. An access period for entry into the holes up to 1 year after drilling will be allowed for publically funded research. Prior to setting the pipe, the holes will be logged to total depth with a suite of logs that will vary from project to project but will generally include caliper, temperature, resistivity, self potential and gamma ray tools.

The first hole under the program is currently underway in the Newberry Crater area by GEO-Newberry Crater, Inc., a subsidiary of Geothermal Resources International, Inc. Surface casing has been set to 470 feet and coring has begun. At this time the hole is drilling at 1830 feet. Core recovery has been about 90%.

More information on this DOE program can be obtained by calling or writing to one of the following:

Marshall Reed
U.S. Department of Energy
Division of Geothermal Energy
Room 5F-078
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CASCADES NEWSLETTER
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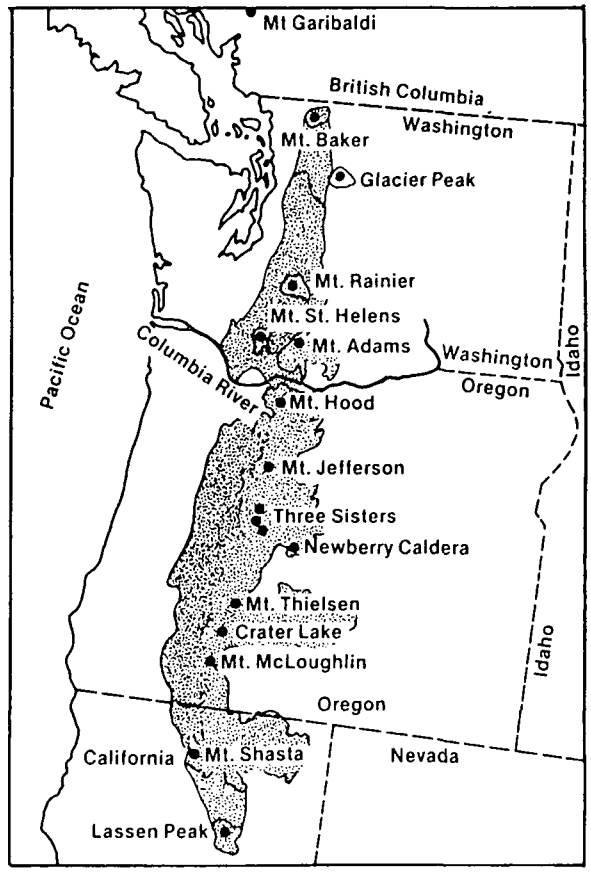

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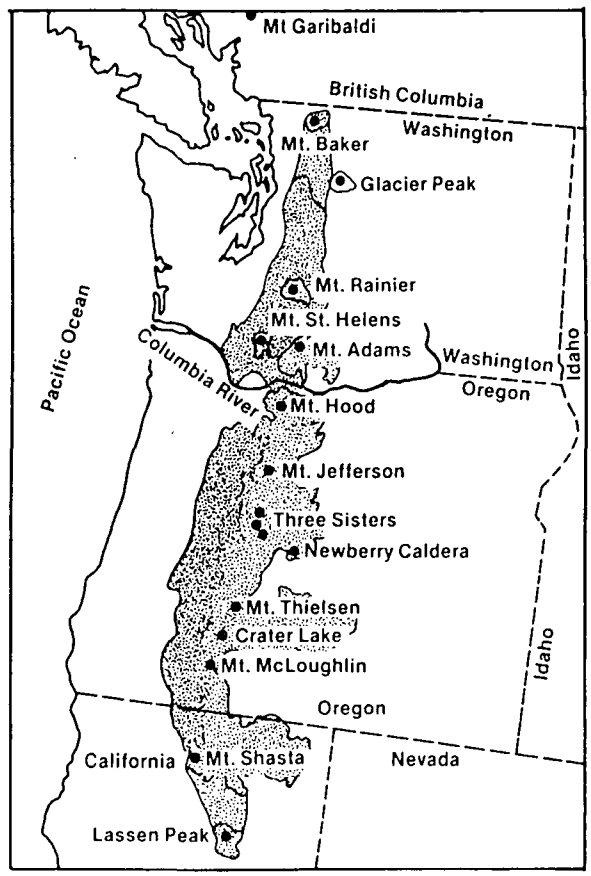

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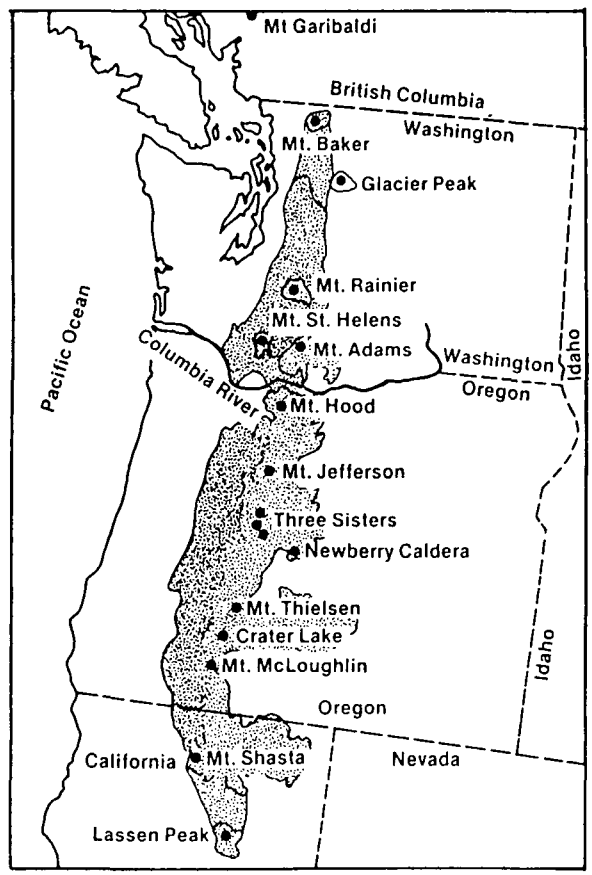

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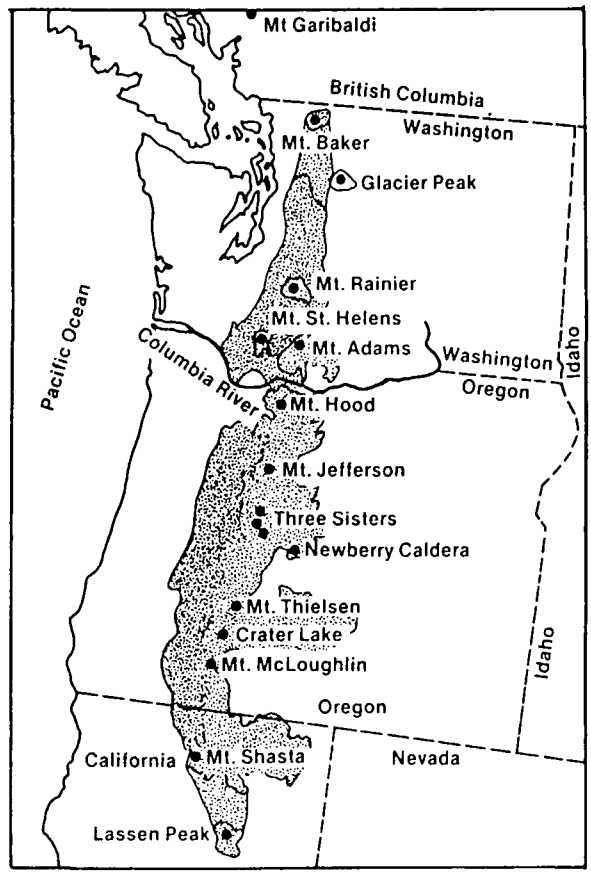

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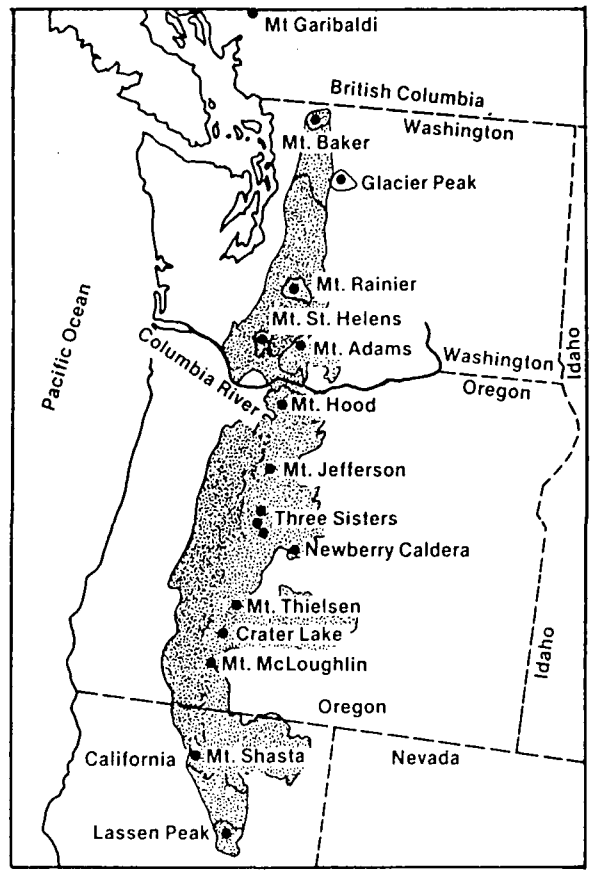

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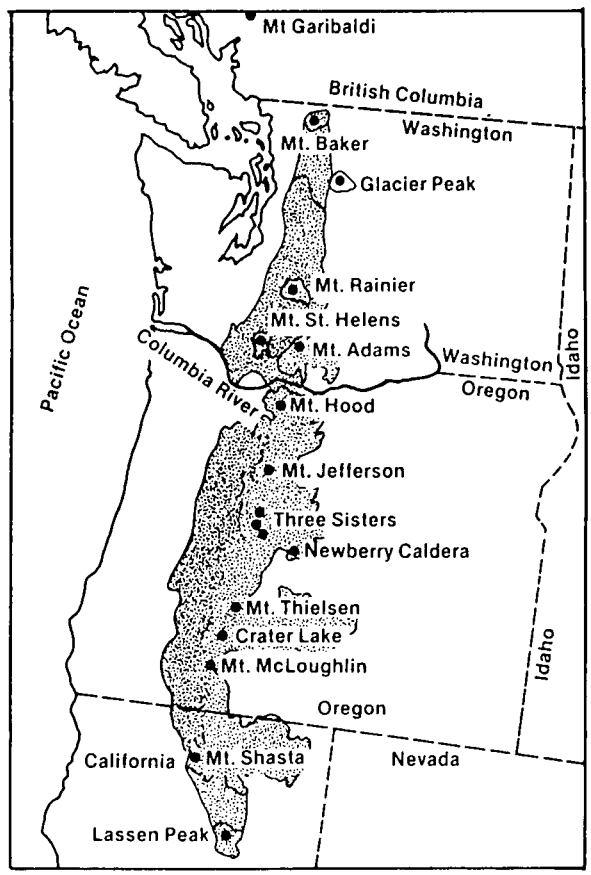

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CASCADES NEWSLETTER
NO. 1

20 September, 1985

CASCADES GEOTHERMAL PROGRAM
U. S. DEPARTMENT OF ENERGY

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1. The proposed site was to be located within the Cascades volcanic region of the United States as delineated by Figure 1;
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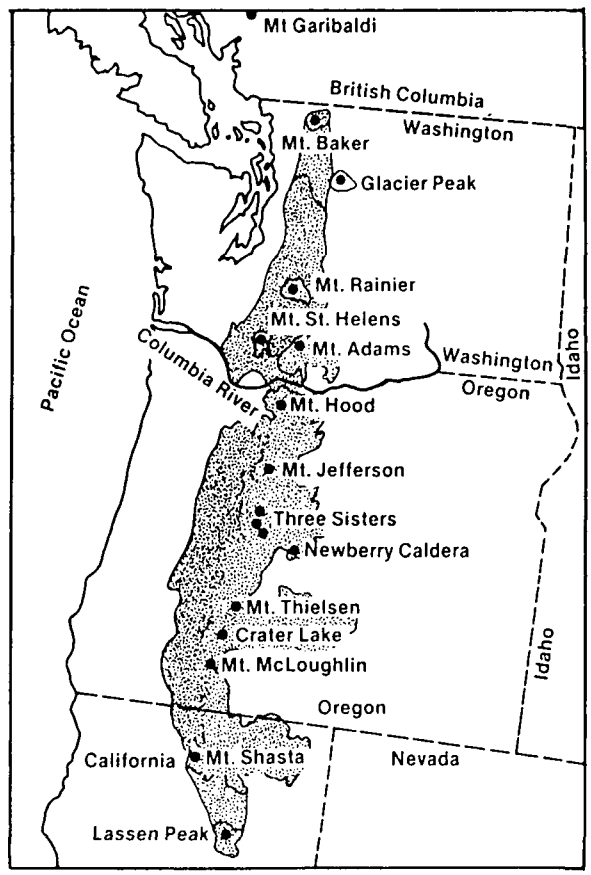

Figure 1. Defined Proposal Area (stippled area)

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The first hole under the program is currently underway in the Newberry Crater area by GEO-Newberry Crater, Inc., a subsidiary of Geothermal Resources International, Inc. Surface casing has been set to 470 feet and coring has begun. At this time the hole is drilling at 1830 feet. Core recovery has been about 90%.

More information on this DOE program can be obtained by calling or writing to one of the following:

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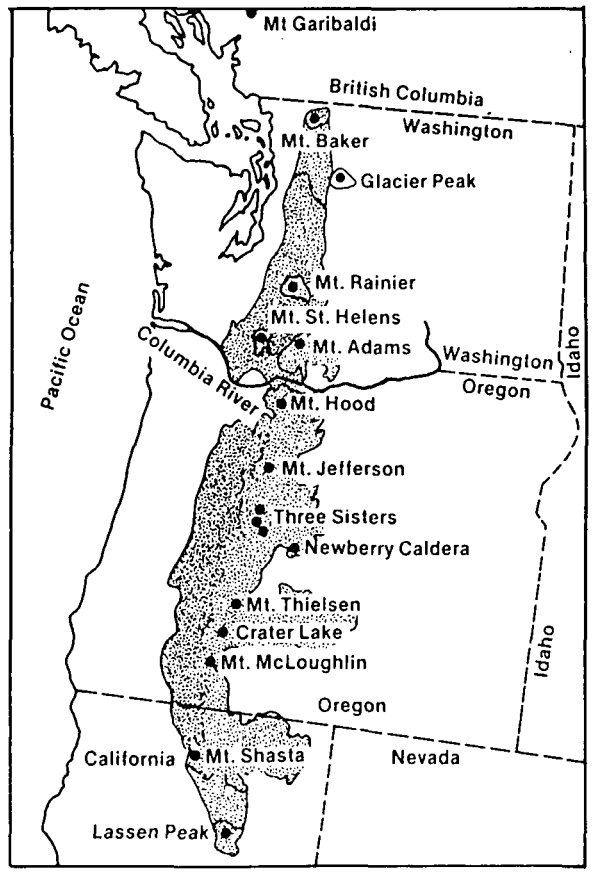

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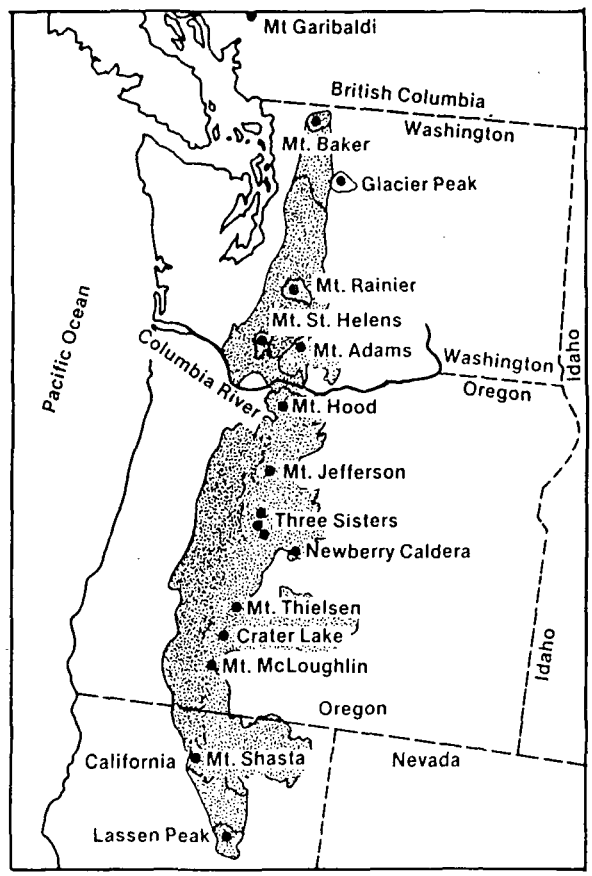

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7 February, 1986

CASCADES GEOTHERMAL PROGRAM
U. S. DEPARTMENT OF ENERGY

ANNOUNCEMENT OF OPEN FILE DATA RELEASE

The U. S. Department of Energy (DOE), Division of Geothermal and Hydropower Technologies (DGHT), as part of their mandate to support research for the identification, evaluation and utilization of geothermal energy, has initiated a program to support industry efforts in the Cascades volcanic region. The Cascade region is an area with high geothermal potential but few surface manifestations and limited subsurface data. To stimulate further development of hydrothermal resources, DOE-Idaho Operations Office issued Solicitation Number DE-SC07-85ID12580. As explained in the first Cascades Newsletter (Sept. 20, 1985), the objective of this solicitation was cost sharing with industry for the drilling of gradient holes which would penetrate the "rain curtain" and obtain deep thermal, lithologic and structural data. The data obtained and studies conducted under this program are to be released to the public for the benefit of the geothermal industry and the scientific community.

The first thermal gradient hole to be drilled under this program was finished about 1 November, 1985 by GEO-Newberry Crater, Inc. on the south flank of the Newberry Volcano. GEO-Newberry is a wholly-owned subsidiary of GEO Operator Corporation. The hole, Corehole N-1, is located 3500 ft west and 2450 ft north of the southeast corner of Section 25,T22S R12E in Deshutes County, Oregon. It was rotary drilled to a depth of 487 ft, and was then cored at HQ size (3.8 in) to a depth greater than 4000 ft. Core recovery was about 95 percent.

UURI will open file data from the drilling and make available a split of the core for inspection in Salt Lake City on 24 February 1986. The data that will be available includes the following:

1. GEO N-1 Well Data to 4,000'
   a) Drillers log
   b) Well summary including casing schematic
   c) Temperatures measured during drilling
   d) Temperature log (detailed), 9 Nov. 85
   e) Table of measured thermal conductivity

2. GEO N-1 Core Hole Lithologic Log

3. GEO N-1 Geophysical Logs (Dresser Atlas) to 4,000', 2 Nov 85
   a) Gamma ray
   b) BHC acoustic fraclog
   c) 4-Arm caliper log
   d) BHC acoustilog
   e) Geothermal temperature log
   f) Induction electrolog

4. Core Hole GEO N-1, Photographs 487' - 4,003'

Additional wells will be drilled under the Cascades Geothermal Drilling Program this spring and the data will be released as it becomes available.

SUMMARY OF LITHOLOGIC LOG

A detailed lithologic log made from observations on the core by Michael Johnson of GEO-Newberry will be available. Rock names are tentative at the present time because no chemical or microscopic work has been done on the core. Basalt and basaltic andesite flows dominate the sections. There are a number of interspersed units of basaltic ash, pyroclastic deposits and basalt dikes. Below about 3100 feet the section apparently becomes somewhat more felsic, as indicated by an increased gamma ray response. Flows or dikes tentatively classified as dacitic occur frequently below 3200 feet. There are a number of clay-altered basaltic ash and latitic tuff units.

SUMMARY OF GEOPHYSICAL WELL LOGS

Caliper Log

The tool was a 4-arm caliper. The hole size is quite uniform at 3.8 in., with only a few minor washouts.

Temperature Logs

The Dresser log shows temperature and differential temperature observed 35 hrs. after circulation stopped. The temperature is a uniform 42°F to 2100 ft., where a positive temperature gradient begins. The gradient between 2500 ft and 3100 ft averages 53°C/km. Temperature at 3260 is 74°F, and at this depth the gradient becomes much higher. At 3400 the temperature is 113°F, but thereafter the gradient decreases again and the observed temperature at 4000 ft is 155°F. The rapid temperature increase at 3260 ft occurs within a dacite flow or dike.

A more detailed temperature log was recorded on 9 Nov 85 by Geotech Data. This profile differs from the Dresser log because the seven days between logs allowed borehole temperatures to move toward equilibrium. The log shows a sharp temperature increase of about 50°F centered at a depth of about 3260 feet and a temperature of 160°F at 4000 feet.

Gamma Ray Log

The gamma ray log shows a great deal of character that can be correlated with lithologic changes. Rocks tentatively classified as basalt

and basaltic andesite show a much lower count than those tentatively classified as dacite or latite. The clay-altered horizons, especially below about 3100 ft, give a high count.

Induction Electrolog

This log is comprised of an induction log, a 16 in short normal resistivity log and a spontaneous potential log. The mud resistivity apparently was not measured at the time of logging. The SP log is off scale for most of the hole. The short normal log is helpful in indicating some lithologic boundaries but would not give true formation resistivity without interpretation. The induction log yields formation resistivity, but the precision is not known. The resistivity above about 2800 feet averages 50-100 ohm-meters. Below about 2800 feet conductors begin to appear, apparently coincident with altered beds of latite(?) tuff and basaltic ash. The frequency and thickness of conductive horizons increases downward to 4000 ft, and the interval 3300 to 3900 ft is comprised 50 percent of material having resistivities lower than 20 ohm-m and as low as about 3 ohm-m.

BHC Acoustilog

This is a borehole-compensated sonic log. Typical seismic velocities in basalt flows is 1800 ft/sec, and velocities in ash units and altered units is appreciably less, with volume as low as 7000 ft/sec being observed. The log shows a great deal of character, and many of the sharp velocity decreases correlate with flow contacts within lithologic units and with the boundaries between units.

BHC Acoustic Fraclog

This is a borehole compensated log of seismic wave amplitude vs. time. It shows much the same information as the Acoustilog discussed above.

Copies of the Dresser Logs can be obtained from Rocky Mountain Well Log Service, P.O. Box 3150, Denver, CO 80201. Copies of all other data can be obtained from UURI by contacting Joan Pingree (UURI; 391 Chipeta Way, Suite C; Salt Lake City, UT 84108). A split of the core can be inspected at the UURI Sample Library by prior appointment arranged through Joan Pingree. Prices for data released from UURI are as follows:

	Cost
1. GEO N-1 Well Data to 4,000'	
a) Drillers log	$ 9.50
b) Well summary including casing schematic	$ 1.00
c) Temperatures measured during drilling	$ .50
d) Temperature log (detailed)	$ 2.50
e) Table of measured thermal conductivity	$ .50
2. GEO N-1 Core Hole Lithologic Log	$ 8.50
3. Core Hole GEO N-1, Photographs 487' - 4,003' @ $.50/print	~$200.00

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