

#14

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

DATA FROM GEOTHERMAL TEST WELLS NEAR MOUNT HOOD, OREGON

By J. H. Robison, L. S. Forcella, and M. W. Gannett

---

OPEN-FILE REPORT 81-1002

Menlo Park, California  
1981

CONTENTS

|                          | Page |
|--------------------------|------|
| Explanation of data----- | 1    |

ILLUSTRATIONS

|   |    |
|---|----|
| <u>FIGURE 1</u> Map of Mt. Hood area showing locations of geothermal wells----- | 2  |
| <u>FIGURE 2</u> Diagram of well-numbering system-----                           | 3  |
| <u>FIGURES 3-9</u> Graphs of temperature measurements in wells-----             | 18 |

TABLES

|  |   |
|--|---|
| <u>TABLE 1</u> Specifications and drillers' logs of wells----- | 4 |
|--|---|

# DATA FROM GEOTHERMAL TEST WELLS NEAR MOUNT HOOD, OREGON

by

J. H. Robison, L. S. Forcella, and M. W. Gannett

## EXPLANATION OF DATA

This report includes well specifications, drillers' logs, and temperature logs of geothermal test wells drilled at 7 sites near Mt. Hood Oregon. The wells were drilled in 1979 and 1980 under contract to the U.S. Geological Survey. The project, funded by the U.S. Department of Energy, was part of an interagency effort to determine the geothermal potential of Mt. Hood. The Agencies involved were U.S. Department of Energy, U.S. Forest Service, U.S. Geological Survey, and Oregon Department of Geology and Mineral Industries.

Locations of the Geological Survey wells are shown in figure 1. Also shown are locations of two deep geothermal test wells in the Old Maid Flat area that were drilled by other agencies. The numbering system for well identification is shown on figure 2.

Descriptions of lithology are based on examination of drill cuttings with the aid of a binocular microscope. Many of the surveys listed in table 1 were made by the authors, using wireline-logging equipment mounted in a small van; most of the surveys listed for the Pucci chairlift site were made by an oilfield service company. Temperature surveys shown in figures 3-9 were made with portable and van-mounted equipment employing thermistor probes that have an accuracy and precision of 0.01°C or better.

Twenty samples of drill cuttings from the Pucci chairlift well were submitted to the Geothermal Laboratory at Southern Methodist University, Dallas, Texas. Bulk or solid-component thermal conductivities were determined under the direction of Dr. David D. Blackwell; the values range from 3.90 to 5.21 mcal/cm. sec. °C.

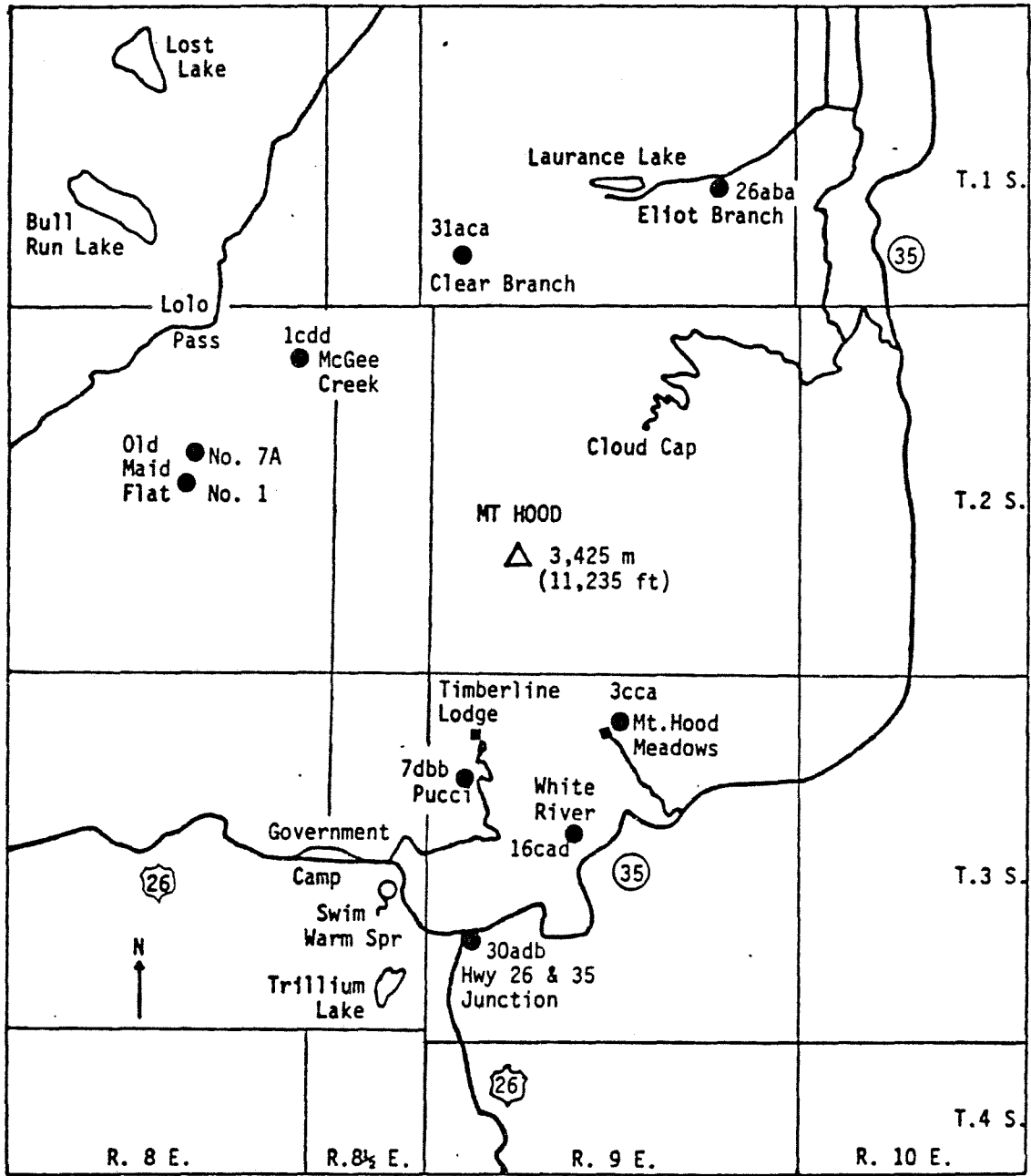


FIGURE 1.-- Map of Mt. Hood area showing locations of geothermal wells.

TABLE 1 -- Specifications and drillers' logs of wells.

1S/9E-26aba. Eliot Branch site. Cathedral Ridge quadrangle (7.5'). Hood River County, Oregon. 45°27'35" N. 121°37'58" W. Alt. 860 m (2,820 ft). Drilled in 1980 to 220 m (720 ft) by American Deep Drilling & Exploration, Oregon City, Oregon, using air-rotary method (including air hammer to install casing).

Construction: 26-cm (10 1/4-in) inside diameter welded casing, surface to 78 m (256 ft). 20.6-cm (8 1/8-in) id welded casing, surface to 92 m (301 ft). 5-cm (2-in) inside diameter tubing, surface to 218 m (715 ft), with 2-m (6-ft) well screen on end. 20.0-cm (7 7/8-in) hole from 92 m (301 ft) to 220 m (720 ft).

Water level in tubing: 34.8 m (114 ft), Oct. 1980.

| Logs and surveys:                           | Depth (m) |
|---|-----------|
| Lithology (see generalized lithology below) | 0 - 220   |
| Temperature, Nov. 22, 1980 (max 10.3°C)     | 0 - 217   |
| Gamma                                       | 1 - 220   |
| Caliper                                     | 69 - 220  |

TABLE 1 -- Specifications and drillers' logs of wells (continued).

| Generalized Lithology   | Thick-<br>ness<br>(meters) | Depth<br>(meters) |
|---|----------------------------|-------------------|
| Clastic debris; angular to subrounded volcanoclastic particles; degree of alteration variable | 84                         | 84                |
| Mudflow deposits; about 50 percent crystals, with plagioclase, hypersthene, and hornblende    | 17                         | 101               |
| Lithic mudflow; subrounded to angular volcanic clasts   | 6                          | 107               |
| Lithic mudflow; subrounded to angular volcanic clasts; hematite alteration                    | 18                         | 125               |
| Porphyritic hypersthene andesite  | 2                          | 127               |
| Mudflow or clastic debris   | 16                         | 143               |
| Porphyritic hypersthene andesite  | 3                          | 146               |
| Mudflow or clastic debris; 75 percent crystals of plagioclase, hypersthene                    | 3                          | 149               |
| Porphyritic hypersthene andesite  | 10                         | 159               |
| Mudflow or clastic debris; subangular volcanic clasts, and crystals                           | 3                          | 162               |
| Clastic debris; subrounded volcanic clasts  | 3                          | 165               |
| Mudflow or clastic debris; subangular volcanic clasts, and crystals                           | 15                         | 180               |
| Mudflow or clastic debris, some hematite-stained, includes clasts of hypocrySTALLINE basalt   | 19                         | 199               |
| Porphyritic hypersthene andesite  | 2                          | 201               |
| Mudflow or clastic debris; hematite-stained, altered  | 9                          | 210               |
| Mudflow or clastic debris; more rounded and altered than above                                | 10                         | 220               |

TABLE 1 -- Specifications and drillers' logs of wells (continued).

1S/9E-31aca. Clear Branch site. Cathedral Ridge quadrangle (7.5'). Hood River County, Oregon. 45°26'30" N. 121°42'57" W. Alt. approx. 1,280 m (4,200 ft). Drilled in 1980 to 311 m (1,020 ft) by American Deep Drilling & Exploration, Oregon City, Oregon, using air-rotary and mud-rotary methods.

Construction: 20.6-cm (8 1/8-in) inside diameter welded casing, surface to 69 m (226 ft). 5-cm (2-in) inside diameter tubing, surface to 311 m (1,020 ft), with sealed end. 20.0-cm (7 7/8-in) hole 69 m (226 ft) to 311 m (1,020 ft).

Water level in casing: Above land surface.

| Logs and surveys:                                | Depth (m)          |
|--|--------------------|
| Litology (see generalized lithology below)       | 0 - 311            |
| Temperature, Nov. 19, 1980 (max. 10.86°C)        | 0 - 311            |
| Caliper  | 0 - 69<br>69 - 306 |
| Gamma  | 3 - 311            |
| Spontaneous potential/resistivity (single point) | 69 - 300           |

TABLE 1 -- Specifications and drillers' logs of wells (continued).

| Generalized Lithology   | Thick-<br>ness<br>(meters) | Depth<br>(meters) |
|---|----------------------------|-------------------|
| Colluvial deposits; angular clasts of hornblende andesite, pyroxene andesite  | 5                          | 5                 |
| Epiclastic debris; assortment of clasts of andesite, basalt, and crystals of plagioclase, and hypersthene; some hematite staining and hydrothermal alteration | 74                         | 79                |
| Hypersthene andesite flows; partly fractured and permeable  | 26                         | 105               |
| Fluvial (?) debris; rounded clasts of andesite, basalt, and crystals; hydrothermally altered; partly silty  | 12                         | 117               |
| Cemented epiclastic debris; matrix of small crystals and orange and green clay; abundant hydrothermal alteration  | 40                         | 157               |
| Epiclastic debris; angular to rounded volcanic lithic and crystal debris  | 16                         | 173               |
| Hypersthene andesite, fractured; clay matrix  | 4                          | 177               |
| Cemented epiclastic debris of andesite and basalt; some clay matrix, alteration of fragments  | 55                         | 232               |
| Hypersthene andesite flow   | 3                          | 235               |
| Cemented, altered, andesite debris  | 6                          | 241               |
| Hypersthene andesite flow   | 5                          | 246               |
| Cemented epiclastic debris of andesite, some basalt; varying degrees of oxidation   | 65                         | 311               |



TABLE 1 -- Specifications and drillers' logs of wells (continued).

2S/8E-1cdd. McGee Creek site. Bull Run Lake quadrangle (7.5'). Hood River County. 45°25'08" N. 121°46'06" W. Alt. 915 m (3,000 ft). In 1979 drilled to 235 m (770 ft) by Skyles Well Drilling, Oregon City, Oregon. In 1980 deepened to 610 m (2,000 ft) using mud-rotary method by Orvail Buckner Well Drilling, Redmond, Oregon.

Construction: 20.6-cm (8 1/8-in) inside diameter welded casing, surface to 45 m (147 ft), cemented to surface. 5-cm (2-in) inside diameter tubing, surface to 608 m (1,994 ft), with 2-m (6-ft) well screen on end. 20.0-cm (7 7/8-in) hole from 46 m (150 ft) to 610 m (2,000 ft).

Water Level in tubing: Approximately 10 m (30 ft) below land surface.

| Logs and surveys:                           | Depth (m) |
|---|-----------|
| Lithology (see generalized lithology below) | 0 - 610   |
| Temperature, Aug. 12, 1980 (max 60.0°C)     | 0 - 608   |
| Gamma                                       | 2 - 603   |
| Caliper                                     | 45 - 608  |
| Resistivity, single point                   | 45 - 323  |

| Generalized Lithology   | Thick-<br>ness<br>(meters) | Depth<br>(meters) |
|---|----------------------------|-------------------|
| Volcanic and glacial debris, including mudflows, block and ash deposits; fragments of andesite and dacite | 47                         | 47                |
| Pyroxene andesite, with hematite alteration   | 20                         | 67                |
| Mudflow or flow breccia, altered  | 9                          | 76                |
| Porphyritic pyroxene andesite, highly altered   | 52                         | 128               |

TABLE 1 -- Specifications and drillers' logs of wells (continued).

| Generalized Lithology  | Thick-<br>ness<br>(meters) | Depth<br>(meters) |
|--|----------------------------|-------------------|
| Mudflow deposits   | 3                          | 131               |
| Pyroxene andesite, highly altered  | 6                          | 137               |
| Mudflow deposits, highly altered   | 6                          | 143               |
| Pyroxene andesite, altered   | 12                         | 155               |
| Hornblende andesite, altered   | 34                         | 189               |
| Pyroxene andesite  | 11                         | 200               |
| Epiclastic volcanic deposits   | 4                          | 204               |
| Hornblende andesite, fresh   | 16                         | 220               |
| Pyroxene andesite  | 15                         | 235               |
| Hornblende andesite  | 39                         | 274               |
| Reddish-gray clay  | 37                         | 311               |
| Dark-gray pyroxene andesite  | 24                         | 335               |
| Mudflow deposits; altered lithic clasts                                    | 6                          | 341               |
| Pyroxene andesite  | 16                         | 357               |
| Mudflow deposits; mostly plagioclase crystals                              | 15                         | 372               |
| Pyroxene andesite  | 6                          | 378               |
| Mudflow deposits; mostly plagioclase crystals                              | 20                         | 398               |
| Hornblende andesite flows  | 29                         | 427               |
| Mudflow deposits; about 25 percent crystals                                | 46                         | 473               |
| Andesitic lavas, hydrothermally altered, with<br>interbedded flow breccias | 39                         | 512               |
| Pyroxene andesite  | 8                          | 520               |
| Mudflow deposits; altered lithic clasts                                    | 23                         | 543               |

TABLE 1 -- Specifications and drillers' logs of wells (continued).

| Generalized Lithology                                  | Thick-<br>ness<br>(meters) | Depth<br>(meters) |
|--|----------------------------|-------------------|
| Pyroxene andesite, altered                             | 7                          | 550               |
| Mudflow deposits: 60 percent lithic clasts,<br>altered | 23                         | 573               |
| Hornblende andesite                                    | 15                         | 588               |
| Mudflow deposits; lithic clasts, altered               | 13                         | 601               |
| Hornblende andesite, slightly altered                  | 9                          | 610               |

3S/9E-3cca. Mt Hood Meadows site. Mount Hood South quadrangle (7.5'). Hood River County, Oregon. 45°20'00" N. 121°39'36" W. Alt. approx. 1,665 m (5,460 ft). Drilled in 1980 to 355 m (1,165 ft) by American Deep Drilling & Exploration, Oregon City, Oregon, using mud-rotary method.

Construction: 20.6-cm (8 1/8-in) inside diameter welded casing, surface to 50 m (165 ft) 5-cm (2-in) inside diameter tubing, surface to 352 m (1,155 ft), with sealed end. 20.0-cm (7 7/8-in) hole from 50 m (165 ft) to 355 m (1,165 ft).

Water level: Not determined; hole filled with drilling mud.

| Logs and surveys:                       | Depth (m) |
|---|-----------|
| Lithology (see generalized below)       | 0 - 355   |
| Temperature, Nov. 18, 1980 (max 11.6°C) | 5 - 350   |
| Gamma                                   | 3 - 355   |

TABLE 1 -- Specifications and drillers' logs of wells (continued).

| Generalized Lithology   | Thick-<br>ness<br>(meters) | Depth<br>(meters) |
|---|----------------------------|-------------------|
| Colluvium; andesite, rare basalt  | 4                          | 4                 |
| Epiclastic debris; andesite, basalt; subangular to rounded; soft clay matrix                        | 13                         | 17                |
| Porphyritic hypersthene andesite  | 7                          | 24                |
| Epiclastic debris; andesite, basalt, clay matrix; hematite stained                                  | 6                          | 30                |
| Porphyritic hypersthene andesite, partly fractured and oxidized                                     | 15                         | 45                |
| Interflow of andesitic debris; oxidized   | 3                          | 48                |
| Porphyritic hypersthene andesite  | 3                          | 51                |
| Epiclastic debris; andesite, some basalt  | 2                          | 53                |
| Porphyritic hypersthene andesite  | 11                         | 64                |
| Epiclastic debris of basalt, andesite   | 8                          | 72                |
| Porphyritic hypersthene andesite  | 10                         | 82                |
| Basalt flow; brownish black, porphyritic  | 6                          | 88                |
| Epiclastic debris; subround to subangular andesite and basalt fragments, with some pale orange clay | 107                        | 195               |
| Basalt flow; black, porphyritic   | 9                          | 204               |
| Epiclastic debris; andesite and basalt  | 30                         | 234               |
| Porphyritic hypersthene andesite  | 15                         | 249               |
| Epiclastic debris; hematite weathering  | 7                          | 256               |
| Basalt flow; dark gray, porphyritic   | 7                          | 263               |
| Epiclastic debris; basalt and andesite  | 6                          | 269               |
| Porphyritic hypersthene andesite  | 10                         | 279               |
| Interflow zone of debris; hematite-stained  | 3                          | 282               |

TABLE 1 -- Specifications and drillers' logs of wells (continued).

| Generalized Lithology                             | Thick-<br>ness<br>(meters) | Depth<br>(meters) |
|---|----------------------------|-------------------|
| Basalt flow; grayish black, porphyritic, oxidized | 8                          | 290               |
| Porphyritic hypersthene andesite; oxidized        | 11                         | 301               |
| Epiclastic debris; andesitic                      | 32                         | 333               |
| Epiclastic debris; basaltic                       | 12                         | 345               |
| Basalt flow; dark gray, porphyritic               | 3                          | 348               |
| Epiclastic debris; basalt, with some andesite     | 7                          | 355               |

3S/9E-7dbb. Pucci chairlift site. Mount Hood South quadrangle (7.5').

Clackamas County, Oregon. 45°19' 18" N. 121°42'46" W. Alt. 1,628 m (5,340 ft). In 1979 drilled to 274 m (900 ft) using air-rotary method and to 610 m (2,002 ft) using mud-rotary method by Orvail Buckner Well Drilling, Redmond, Oregon. In 1980 deepened to 1,220 m (4,003 ft) using mud-rotary method by Holman Drilling Corp., Spokane, Washington; completed Oct. 1980.

Construction: 26-cm (10 1/4-in) inside diameter welded casing, surface to 61 m (200 ft); cemented to surface. 20.6-cm (8 1/8-in) inside diameter welded casing, surface to 189 m (620 ft). 15.6-cm (6 1/8-in) welded casing, surface to 438 m (1,437 ft); suspended inside 15.6-cm casing with casing hanger; packers in annulus between casing and hole at 948 m (3,110 ft), 1,030 m (3,380 ft), and 1,095 m (3,590 ft); slot perforation 1,098 m (3,600 ft). 15.2-cm (6-in) open hole from 1,107 m (3,630 ft) to 1,220 m (4,003 ft).

Water Level in casing: 573 m (1,880 ft) below land surface, Nov. 26, 1980. During drilling, water level as shallow as 80 m (260 ft), as on Sept.

TABLE 1 -- Specifications and drillers' logs of wells (continued).

20, 1979, when depth of well was 190 m (622 ft). On Dec. 3, 1979 water level approx. 215 m (700 ft), inside tubing then installed to 604 m (1,980 ft).

| Logs and surveys:                                 | Depth (m)   |
|---|-------------|
| Lithology (see generalized lithology, following). | 0 - 1,220   |
| Temperature - Dec. 3, 1979                        | 0 - 580     |
| - Dec. 25, 1980; not stabilized                   | 0 - 1,052   |
| Television survey (videocassette), 15.6-cm casing | 0 - 366     |
| Gyroscopic directional survey                     | 0 - 438     |
| Casing profile caliper, in 15.6-cm casing         | 0 - 471     |
| Open-hole caliper                                 | 438 - 1,220 |
| Spontaneous potential                             | 438 - 1,220 |
| Dual induction (resistivity)                      | 438 - 1,220 |
| Natural gamma                                     | 438 - 1,220 |
| Density   | 438 - 1,220 |
| Neutron - porosity                                | 438 - 1,220 |
| Acoustic velocity                                 | 438 - 1,220 |
| Microseismogram (fracture finder)                 | 438 - 1,220 |

| Generalized Lithology        | Thick-<br>ness<br>(meters) | Depth<br>(meters) |
|------------------------------|----------------------------|-------------------|
| Volcanic debris              | 67                         | 67                |
| Pyroxene andesite flow       | 30                         | 97                |
| Epiclastic volcanic deposits | 6                          | 103               |

TABLE 1 -- Specifications and drillers' logs of wells (continued).

| Generalized Lithology  | Thick-<br>ness<br>(meters) | Depth<br>(meters) |
|--|----------------------------|-------------------|
| Andesite flows   | 31                         | 134               |
| Epiclastic volcanic deposits                                       | 6                          | 140               |
| Reddish-gray and gray pyroxene andesite flows                      | 76                         | 216               |
| Epiclastic volcanic deposits, with some<br>hydrothermal alteration | 59                         | 275               |
| Pyroxene andesite  | 18                         | 293               |
| Epiclastic volcanic deposits, with some<br>hydrothermal alteration | 220                        | 513               |
| Pyroxene andesite  | 8                          | 521               |
| Epiclastic volcanic deposits                                       | 23                         | 554               |
| Reddish-gray to gray pyroxene andesite                             | 9                          | 563               |
| Black, diktytaxitic olivine basalt                                 | 9                          | 572               |
| Epiclastic volcanic deposits                                       | 12                         | 584               |
| Pyroxene andesite  | 12                         | 596               |
| Epiclastic volcanic deposits                                       | 5                          | 601               |
| Hypersthene andesite   | 9                          | 610               |
| Epiclastic volcanic deposits                                       | 20                         | 630               |
| Hypersthene andesite   | 9                          | 639               |
| Epiclastic volcanic deposits                                       | 6                          | 645               |
| Pyroxene andesite  | 8                          | 653               |
| Volcanic deposits, with hematite alteration                        | 38                         | 691               |
| Hypersthene andesite   | 6                          | 697               |
| Epiclastic volcanic deposits                                       | 15                         | 712               |
| Vesicular pyroxene andesite, partly oxidized                       | 19                         | 731               |
| Epiclastic volcanic deposits                                       | 6                          | 737               |

TABLE 1 -- Specifications and drillers' logs of wells (continued).

| Generalized Lithology  | Thick-<br>ness<br>(meters) | Depth<br>(meters) |
|--|----------------------------|-------------------|
| Orange and brownish-gray altered andesite  | 43                         | 780               |
| Epiclastic volcanic deposits, highly altered,<br>with chlorite, hematite, and limonite | 22                         | 802               |
| Pyroxene andesite flows, hydrothermally altered  | 49                         | 851               |
| Clastic andesite deposits, altered   | 11                         | 862               |
| Reddish-brown pyroxene andesite  | 22                         | 884               |
| Andesitic deposits, hydrothermally altered   | 9                          | 893               |
| Dark, altered pyroxene andesite  | 19                         | 912               |
| Epiclastic volcanic deposits, altered  | 7                          | 919               |
| Reddish-brown andesite, with hematite<br>alteration                                    | 12                         | 931               |
| Epiclastic volcanic deposits, altered  | 9                          | 940               |
| Dark, porphyritic pyroxene andesite flows,<br>with chlorite alteration                 | 98                         | 1038              |
| Epiclastic volcanic deposits, with<br>secondary mineralization                         | 52                         | 1090              |
| Pyroxene andesite, with gray to black chlorite<br>alteration                           | 9                          | 1099              |
| Epiclastic volcanic deposits; intensely<br>altered lava fragments                      | 43                         | 1142              |
| Grayish-brown pyroxene andesite, varying<br>from fresh to altered                      | 78                         | 1220              |

3D/9E-16cad. White River pit site. Mount Hood South quadrangle (7.5').  
Hood River County, Oregon. 45°18'22" N. 121°40'34" W. Alt. approx.  
1,330 m (4,360 ft). Drilled to 305 m (1,002 ft) in 1979 by Harness



TABLE 1 -- Specifications and drillers' logs of wells (continued).

Drilling Co., Tucson, Arizona, using mud-rotary method.

Construction: 17.8-cm (7-in) inside diameter welded casing surface to 71 m (232 ft). 5-cm (2-in) id tubing, surface to 288 m (945 ft), with 2-m (6-ft) well screen on end. 15.9-cm (6 1/4-in) hole from 71 m (1,002 ft).

Water level in tubing 44 m (144 ft), Aug. 13, 1980.

| Logs and surveys:                       | Depth (m) |
|---|-----------|
| Temperature, Nov. 21, 1980 (max 15.8°C) | 0 - 290   |
| Gamma                                   | 2 - 290   |

Lithology - Preliminary examination shows that to total depth of 305 m (1,002 ft), formation consists of volcaniclastic debris, dominated by fragments derived from Mount Hood andesite flows.

3S/9E-30adb. Highway 26 & 35 junction site. Mount Hood South quadrangle (7.5'). Clackamas County, Oregon. 45°16'56" N. 121°42'35" W. Alt. 1,107 m (6,630 ft). Drilled to 35 m (114 ft) by Orvail Buckner Well Drilling, Redmond, Oregon, using air-rotary method, and to 294 m (965 ft) by Harness Drilling Co., Tucson, Arizona, using mud-rotary method; completed Sept. 1980.

Construction: 31-cm (12-in) id welded casing, surface to 35 m (114 ft). 20.6-cm (8 1/8-in) welded casing, surface to 66 m (216 ft). 5-cm (2-in) id tubing, surface to 291 m (955 ft), with 2-m (6-ft) well screen on end. 25-cm (9 7/8-in) hole, 68 m (223 ft) to 107 m (350 ft); 20.0-cm (7 7/8-in) hole to 294 m (965 ft).

TABLE 1 -- Specifications and drillers' logs of wells (continued).

Water level in tubing: Approx. 25 m (82 ft) below land surface, Nov. 1980.

| Logs and surveys:   | Depth (m)                  |                   |
|---|----------------------------|-------------------|
| Lithology (see preliminary description below)                             | 0 - 294                    |                   |
| Temperature, Nov. 20, 1980 (max 15.5°C)                                   | 5 - 288                    |                   |
| Caliper   | 68 - 293                   |                   |
| Gamma   | 3 - 293                    |                   |
| Spontaneous potential-resistivity (single point)                          | 66 - 293                   |                   |
| Preliminary description of lithology                                      | Thick-<br>ness<br>(meters) | Depth<br>(meters) |
| Alluvial deposits of andesitic volcanic debris                            | 69                         | 69                |
| Volcanic debris; dark andesitic fragments, basaltic fragments, ash        | 73                         | 142               |
| Vesicular basalt  | 3                          | 145               |
| Olivine basalt  | 35                         | 180               |
| Volcanic debris; dark andesitic fragments, basaltic fragments, ash, clays | 114                        | 294               |

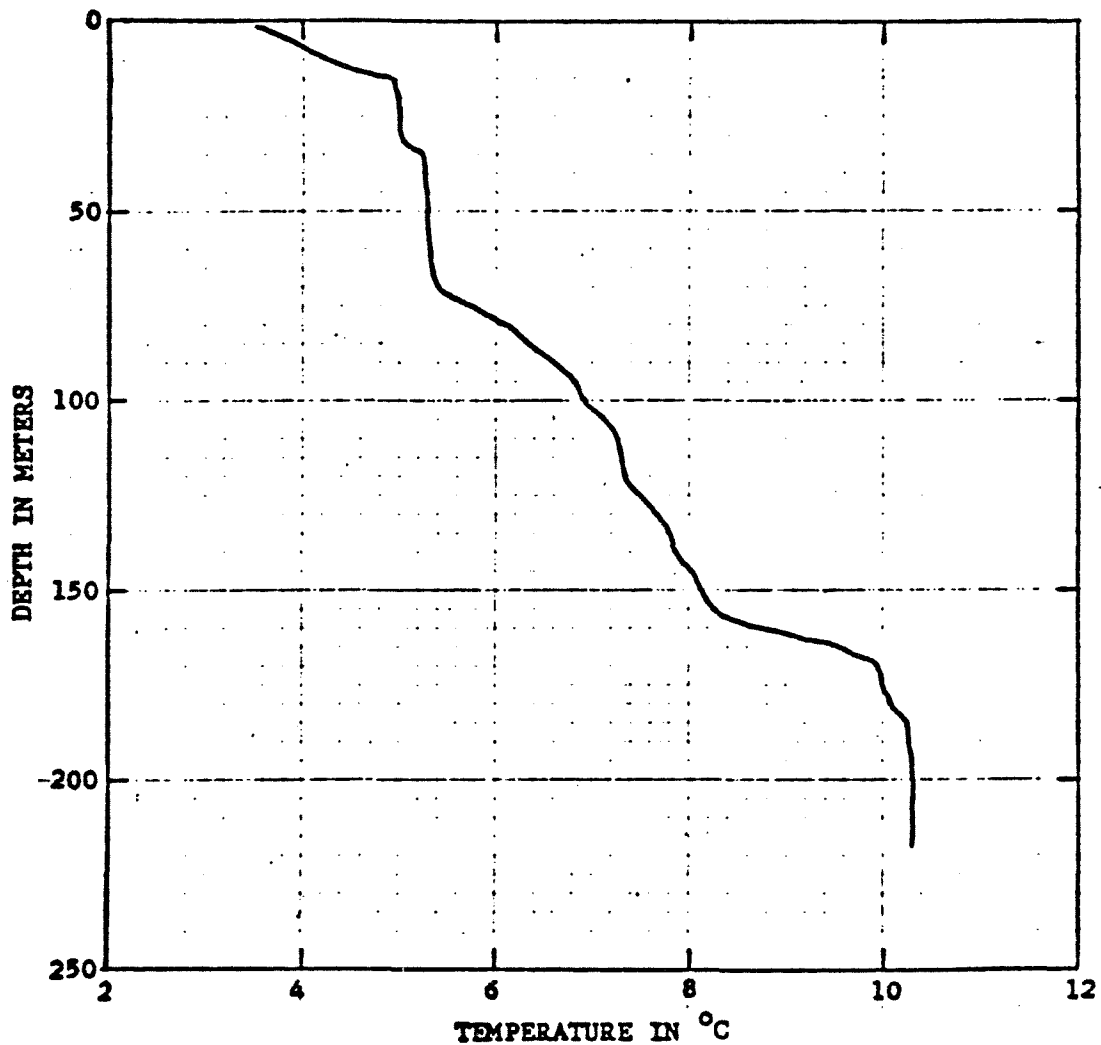


FIGURE 3 -- Graph of temperature measurements in well 1S/9E-26aba.

Ellet Branch site, Mt. Hood area, Oregon.  $45^{\circ}27'35''$  N.  $121^{\circ}37'58''$  W.  
 Altitude 860 meters (2,820 feet). Temperature measurements  
 November 22, 1980 by J. Robison & J. Blevins.

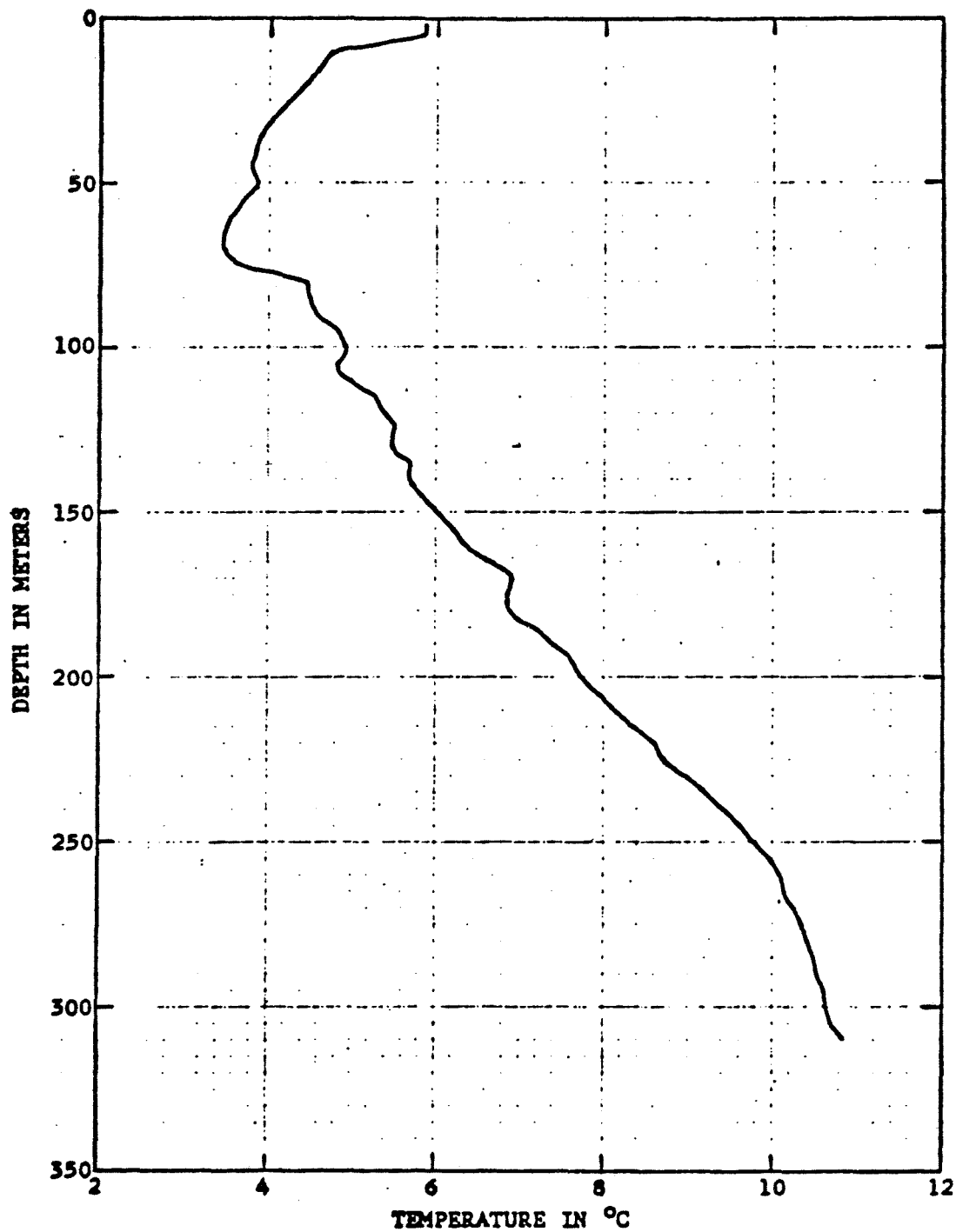


FIGURE 4 -- Graph of temperature measurements in well 15/9E-31aca.

Clear Branch site, Mt. Hood area, Oregon.  $45^{\circ}26'30''$  N.  $121^{\circ}42'57''$  W.  
 Altitude approximately 1,250 meters (4,100 feet). Temperature  
 measurements November 19, 1980 by J. Robison & J. Blevins.

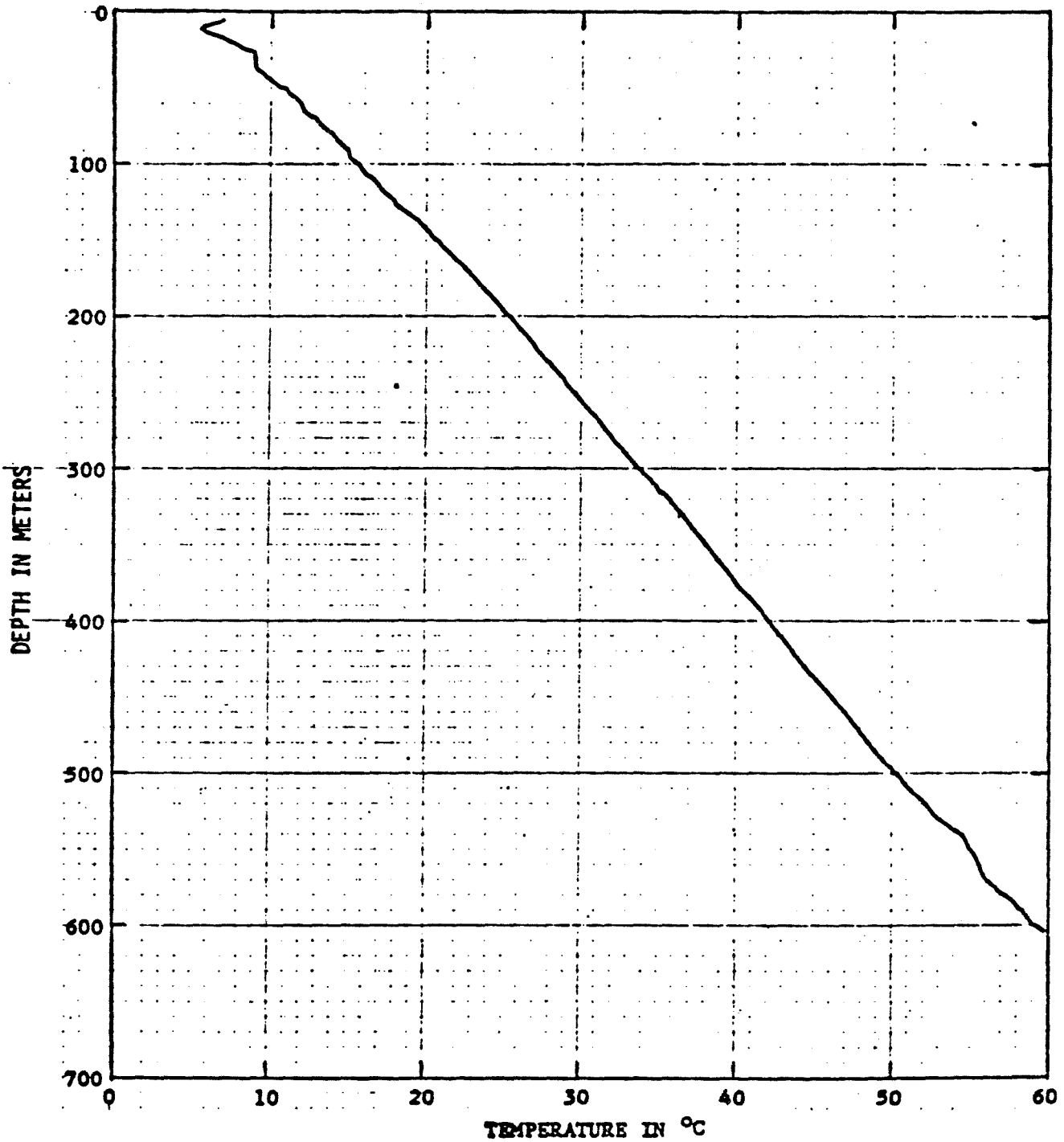


FIGURE 5 -- Graph of temperature measurements in well 2S/8E-1cdd.

$\frac{45}{500} \cdot 1000 = 90^{\circ}\text{C}/\text{km}$

McGee Creek site, Mt. Hood area, Oregon. 45°28'08" N. 121°46'08" W.  
 Altitude 915 meters (3,000 feet). Temperature measurements August 12,  
 1980 by R. Spafford, Southern Methodist University.

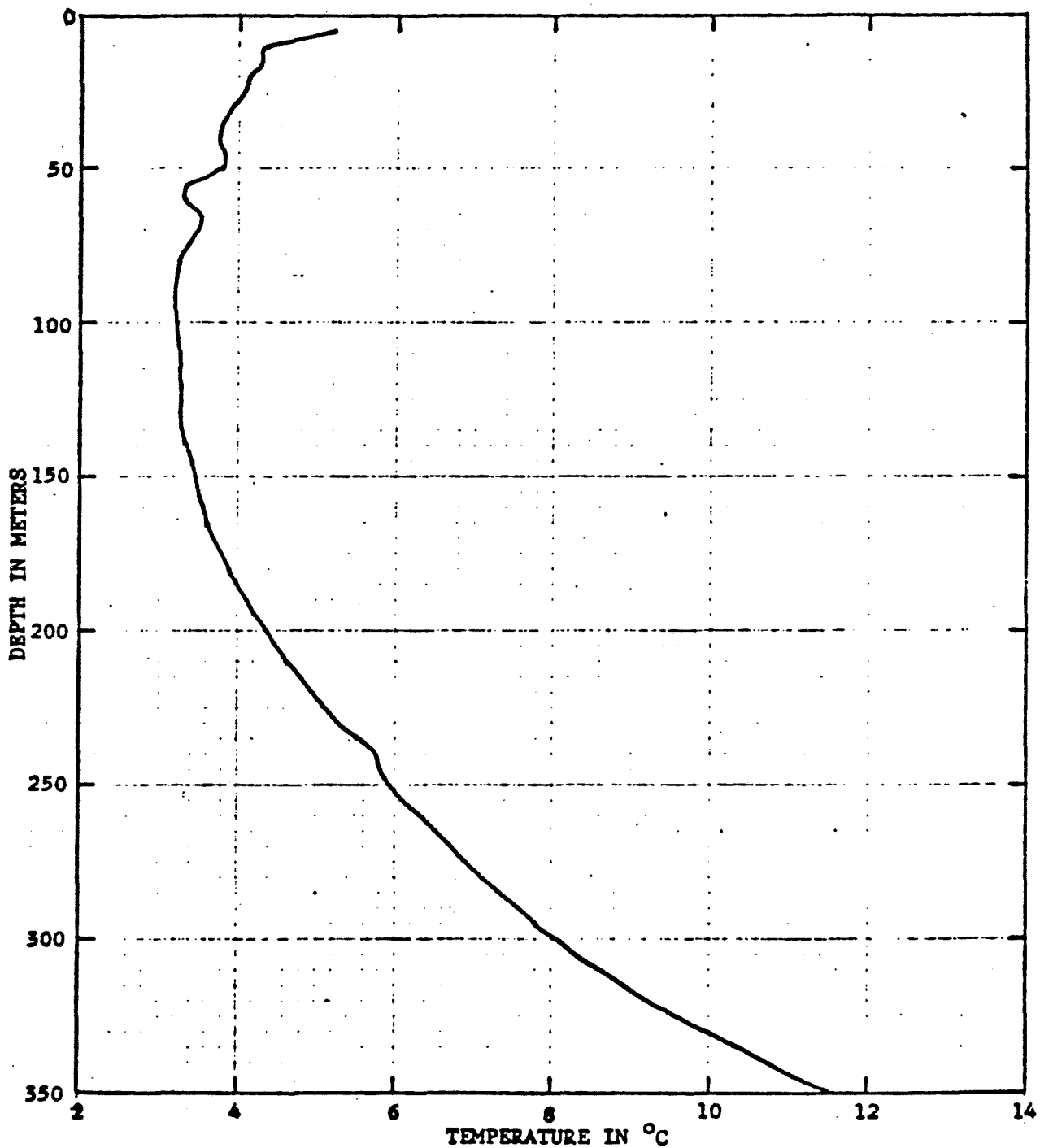


FIGURE 6 -- Graph of temperature measurements in well 3S/9E-3cca.

Mt. Hood Meadows site, Mt. Hood area, Oregon. 45°20'00" N.  
 121°39'36" W. Altitude approximately 1,665 meters (5,460 feet).  
 Temperature measurements November 18, 1980 by J. Robison & J. Blevins.

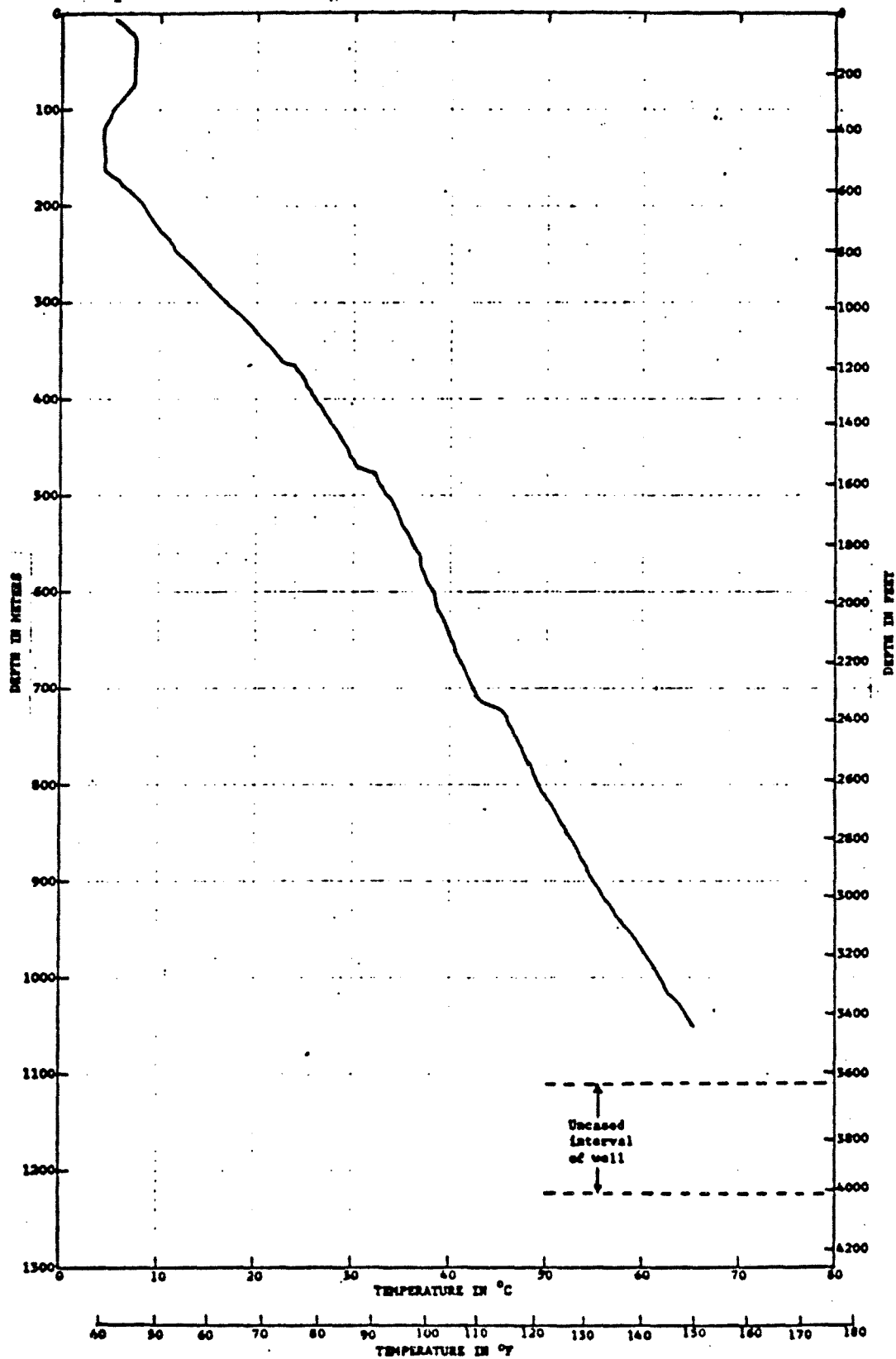


FIGURE 7 -- Graph of temperature measurements in well 35/9E-7dbb.

Pucci chairlift site, Mt. Hood area, Oregon.  $45^{\circ}19'18''$  N.  $121^{\circ}42'46''$  W.  
 Altitude 1,628 meters (5,340 feet). Temperature measurements October 25, 1960  
 by G. Black, Oregon Department Geology and Mineral Industries.

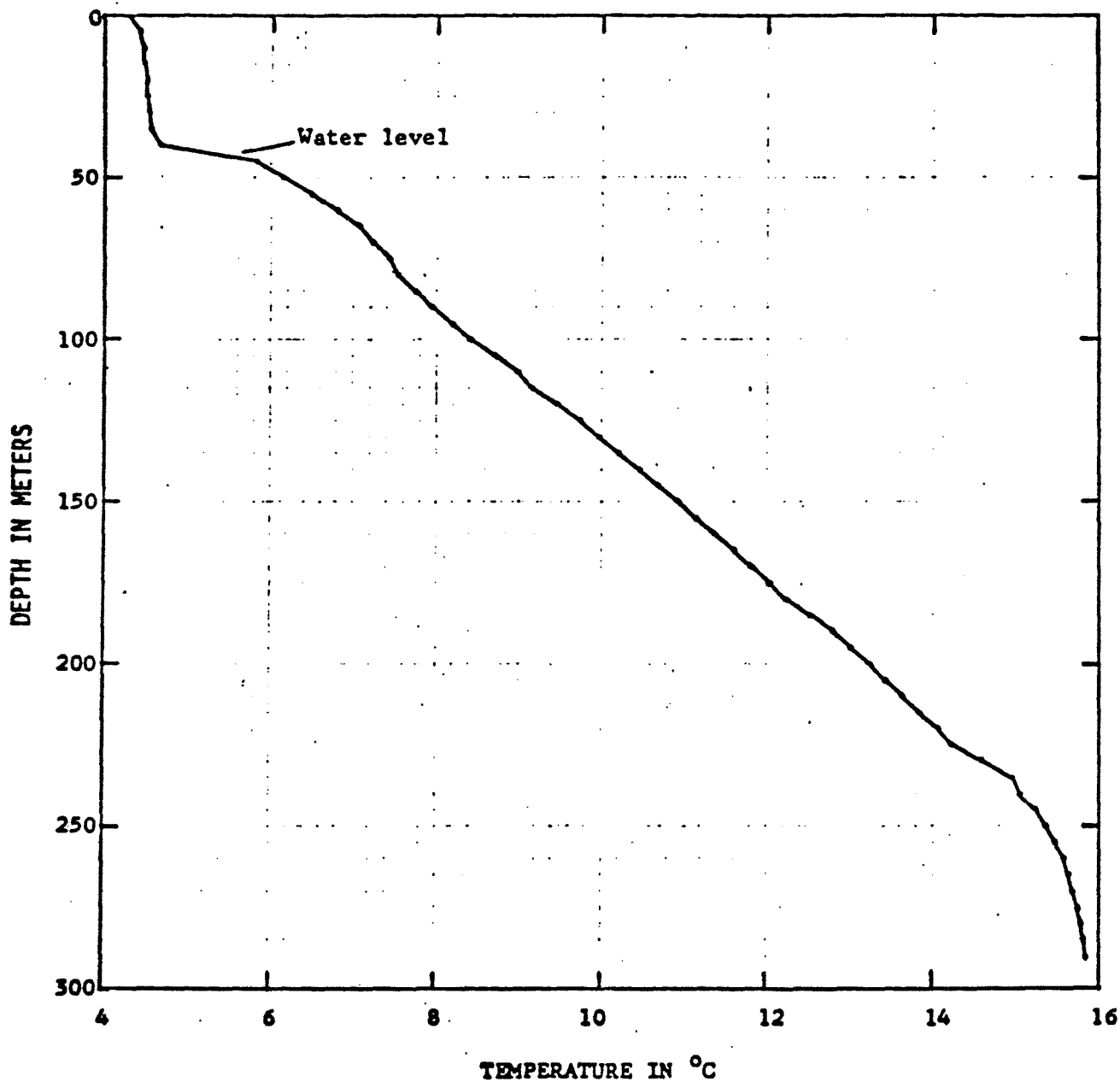


FIGURE 8 -- Graph of temperature measurements in well 3S/9E-16cad.

White River pit site, Mt. Hood area, Oregon.  $45^{\circ}18'22''$  N.  
 $121^{\circ}40'34''$  W. Altitude approximately 1,330 meters (4,360 feet).  
 Temperature measurements November 21, 1980 by J. Robison & J. Blevins.



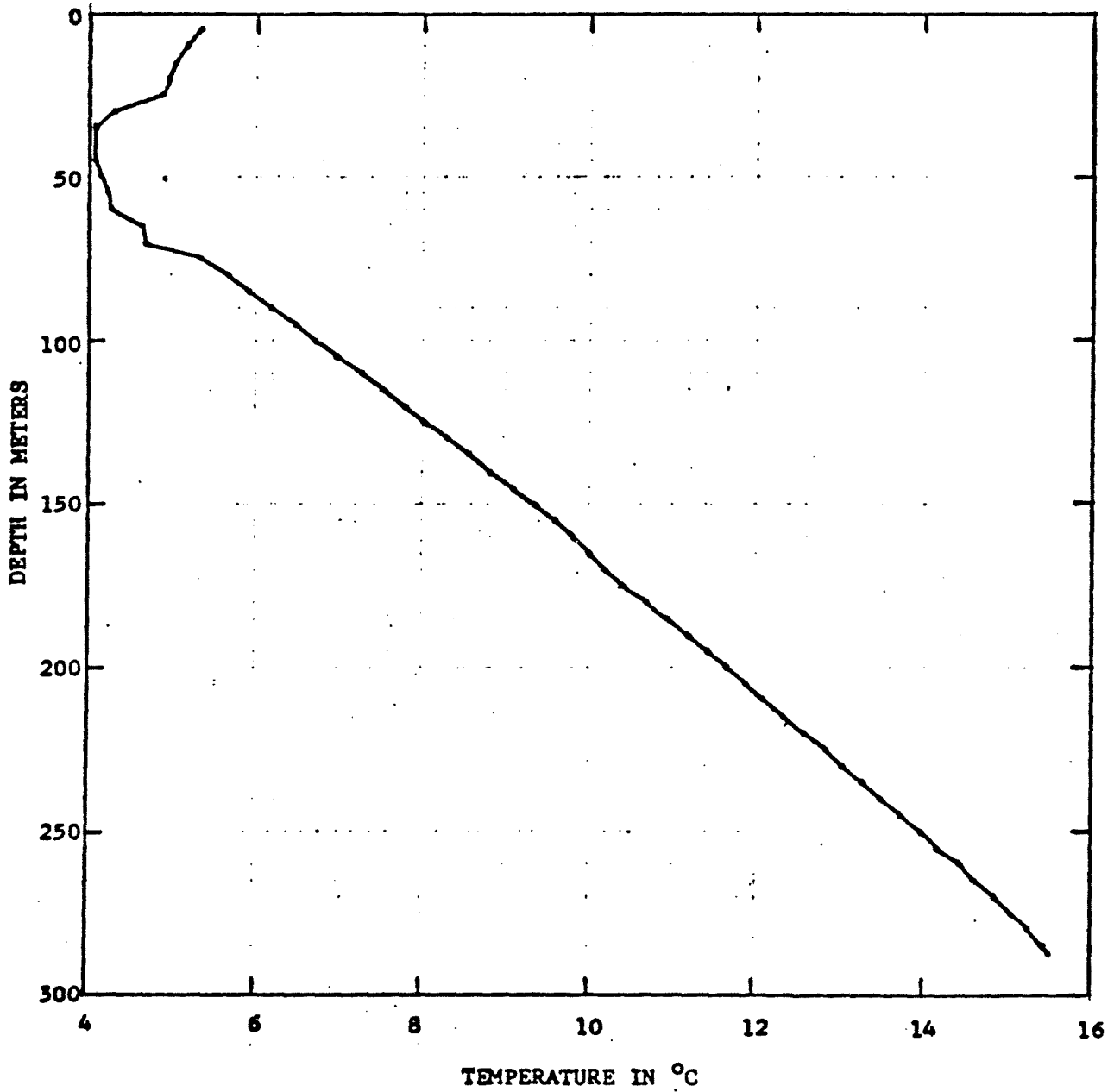


FIGURE 9 -- Graph of temperature measurements in well 3S/9E-30adb.

Highway 26 & 35 junction site, Mt. Hood area, Oregon.

45°16'56" N. 121°42'35" W. Altitude 1,107 meters (3,630 feet).

Temperature measurements November 20, 1980 by J. Robison & J. Blevins.