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Preliminary Report on  
Alhambra Hot Springs, Jefferson  
County, Montana

Introduction

Geologic Setting. The Alhambra Hot Springs system consists of several springs and artesian wells located 10 miles south of Helena, Montana. All the springs and wells emanate from fractures in granitic rocks of the Boulder batholith. The warm springs and wells appear to be controlled by the Alhambra fault. This N15<sup>0</sup>-10<sup>0</sup>E lineament is located approximately 1/4 mile east of the town of Alhambra. It crosses Warm Springs Creek in the southwest quarter of the northeast quarter of Section 16, T.8N, R.3W. The locations of the hot springs and several cold wells are shown on the accompanying Figure 1. The rough northwest alignment of the cold wells and the northwest trend of Warm Springs Creek suggests that another fault may run in that direction. If so, the Alhambra Hot Springs may be a localized resource, confined to a zone where the two faults intersect one another.

Chemistry. A number of chemical analyses have been published on the Alhambra system. These are given on the enclosures labeled Table 1 and Table 2. Particular note should be made of the anomalously high radioactivity of the water. Gross alpha and beta activities and the concentration of radium-228 exceed maximum levels for drinking water as set by the Environmental Protection Agency. This aspect of the Alhambra Hot Springs system is discussed in some detail by Leonard and Janzer, Natural Radioactivity in Geothermal Water, Alhambra Hot Springs and Nearby Areas, Jefferson County, Montana. U.S. Geological Survey Open File Report 77-624, August, 1977.

Geothermometry. Chemical analyses of thermal waters can be used to estimate a maximum subsurface temperature of a geothermal system. For Alhambra, the following geothermometers have been calculated:

Chalcedony - 86°C

Quartz - 115°C

Na-K-Ca - 111°C

The geologists who have worked at Alhambra feel that the chalcedony and Na-K-Ca geothermometers are probably the most accurate. I should emphasize, that geothermometers do not predict the depth to a given water temperature. In otherwords, 85° to 111°C temperature water may exist only at great depth, beyond the practical limits of a drill hole.

A more detailed, scientific account of Alhambra Hot Springs is given in the enclosed article by Michael Galloway.