

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Telluric profile and location map for the Broadwater
Hot Springs Area, Montana

by

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This report is preliminary and has not been
edited or reviewed for conformity with U.S.
Geological Survey standards and nomenclature.

A telluric profile (E-field ratio telluric method) was made in the vicinity of the Broadwater Hot Springs, Montana to help assess the geothermal potential of the area. The method and equipment used is similar to that described by Beyer (1977). For this survey the recording bandwidth was 0.025 Hz centered at 0.033 Hz (30 sec period) and a dipole length of 500 meters was used.

The traverse was made in a northeasterly direction approximately normal to the known geological trends (fig. 1). It began on the preCambrian Helena dolomite, crossed a Tertiary stock of quartz monzonite, back onto the preCambrian argillite and dolomite and then onto Quaternary alluvium covering the downdropped Helena valley. Geological work (Knopf, 1963) has placed the quartz monzonite approximately between station 1 through 5 of the traverse. A major fault, the Bald Butte Fault, has been inferred trending northwest at about the position of the Union Pacific tracks. There is however no surface evidence for this.

The profile of relative voltage (which reflects variations in apparent resistivity along the profile) is shown in figure 2. A low is shown between stations 1 to 2 and another between stations 4 to 5. The first low occurs within the stock near the location of the Broadwater Hot Springs and might be the result of fracturing and alteration in the stock combined with the presence of thermal waters. The second of these probably correlates with the contact of the Tertiary intrusive with preCambrian crystalline rocks. As both types of rock would normally have high resistivities, the low observed at the contact is inferred to be due to alteration and possible faulting or fractures at the contact. The data also suggest that thermal waters may be present at the northeasterly

contact of the intrusive between stations 4 to 5 where no surface evidence exists.

A broad low is present between stations 6 and 10. This supports the inference of a graben filled with lower resistivity alluvium in the area. One of the major boundary faults for the graben would be approximately at station 6. The Bald Butte Fault would be identified with the inferred fault near station 10.

Beyer, J. H., 1977, Telluric and D.C. resistivity techniques applied to the geophysical investigation of basin and range geothermal systems, Part I -- The E-field ratio telluric method: Lawrence Berkeley Laboratory report LBL-6325 1/3.

Knopf, Adolph, 1963, "Geology of the Northern Part of the Boulder Batholith and Adjacent Area, Montana": USGS Misc. Geol. Invest. Map I-381.

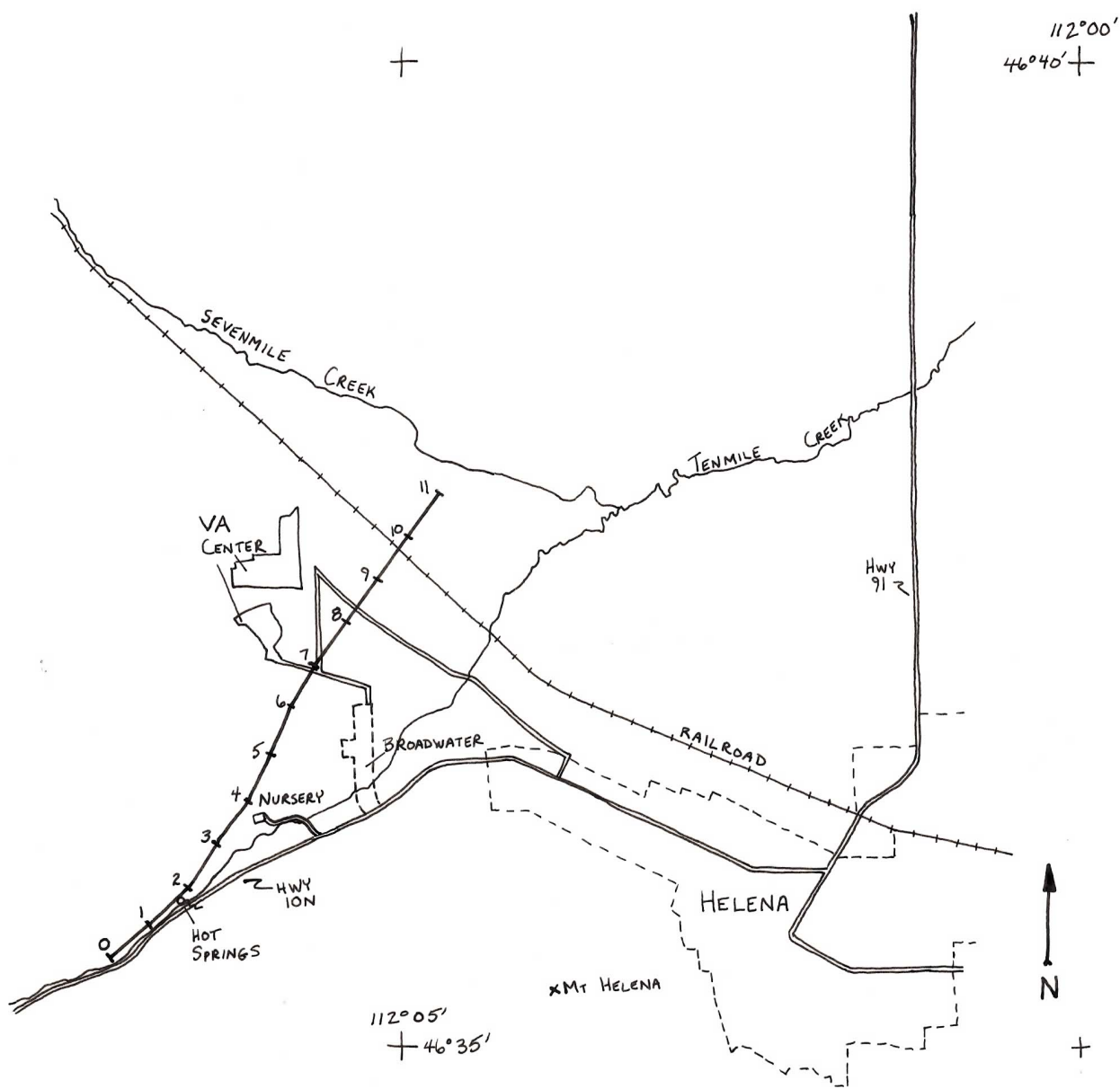
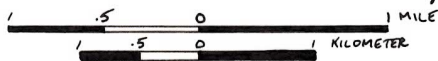


FIG. 1 - TELLURIC TRAVERSE LOCATION MAP
BROADWATER HOT SPRINGS, MT



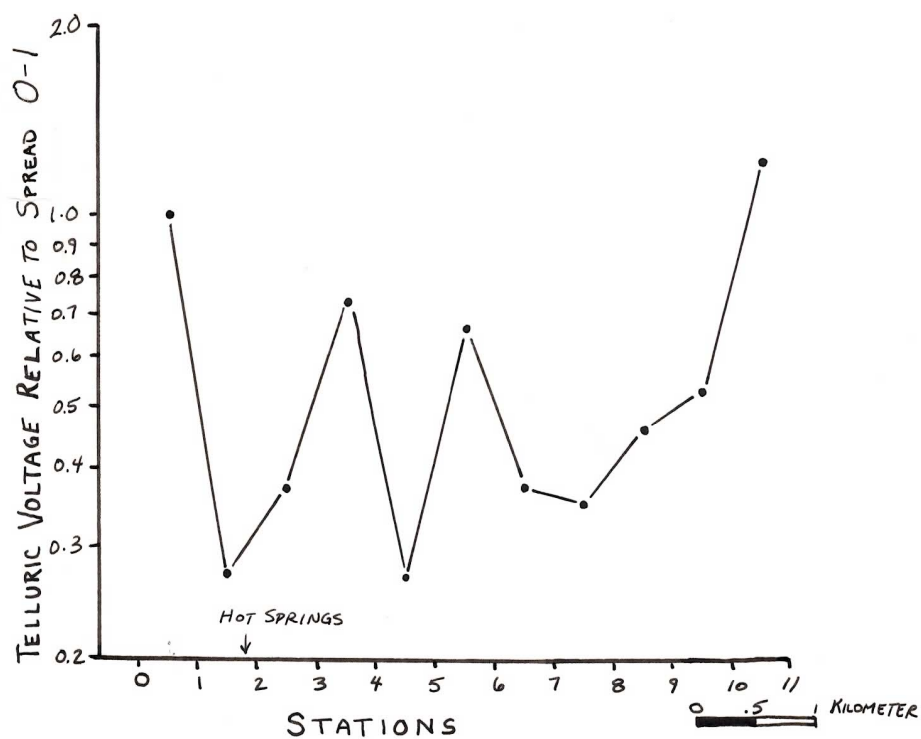


FIG. 2-TELLURIC PROFILE -
BROADWATER HOT SPRINGS, MT