WATER RESOURCES—INFORMATION SERIES

REPORT 25

SCHLUMBERGER RESISTIVITY SOUNDINGS NEAR FALLON, NEVADA

By
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and Patrick A. Glancy

Prepared cooperatively by the
Geological Survey, U.S. Department of the Interior

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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.

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In 1976, the U.S. Geological Survey, in cooperation with the
Nevada Division of Water Resources, made thirty one Schlumberger
resistivity soundings near the city of Fallon, Nevada. The survey was
made to estimate and delineate the volume of fill containing fresh
ground water and to map the lateral extent and thickness of basalt
layers which act as the principle aquifer in the area.

Figure 1 shows the index map for the location, number, and azimuth
of the 31 Schlumberger sounding stations. The maximum symmetric
electrode spacing, AB/2 used for some of the soundings reached 4,877
meters (16,000 feet). For soundings #2 and #3 standard Schlumberger
apparent resistivities at large electrode spacings were calculated from
measurements made with an asymmetric Schlumberger array using a correction
formula (Zohdy and Bisdorf, 1976). For example, with one current
electrode remaining stationary at 1,829 meters (6,000 feet), the second
current electrode was moved to larger spacings of 2,348 meters (8,000
feet) and 3,048 meters (10,000 feet), respectively. All the sounding
curves were automatically processed and interpreted (Zohdy, 1973 and
1975) as shown in the graphs given in the appendix.
Each graph shows the following:

(1) Field data designated by a segmented solid-line curve with diamond symbols for observed data.

(2) A continuous-dashed curve which represents:

(a) The continuous "field" curve which is generally obtained by maintaining the position of the last segment and shifting each of the previous segments, up or down so that the last point on each segment coincides with the corresponding point on the following segment (Zohdy and others, 1973).

(b) The digitized curve at the rate of six points per logarithmic cycle. Although the individual digitized points are not depicted on the dashed curve (to avoid cluttering the graphs) they were computed using a subroutine in a computer program for bicubic spline functions (Anderson, 1971). The digitized data from the continuous dashed curve were then fed into the automatic interpretation program (Zohdy, 1973) to obtain the best fitting theoretical sounding curve for a horizontally layered medium. The automatic interpretation program used here was slightly modified from the one referred to in the above reference. The modifications are identical to those used in another program recently written for inverting Wenner sounding curves (Zohdy and Bisdorf, 1975).

(3) The theoretical best fitting sounding curve plotted as (+) signs.
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SCHLUMBERGER SOUNDINGS
STATION LOCATION, NUMBER,
AND AZIMUTH.

FIGURE 1.
(4) The detailed layering for which the theoretical curve is calculated.

(5) The D.Z. (Dar Zarrouk) curve for the detailed layering. The ordinate values for the D.Z. curves are shifted upward or downward by one logarithmic cycle to avoid cluttering the graphs or they are plotted on a separate sheet of graph paper (as for Fallon 11 and Fallon 21). The D.Z. curves can be used to obtain equivalent and simpler solutions containing fewer number of layers. In addition they can be used to impose certain constraints on the layer thicknesses and resistivities (Zohdy, 1974).

All these graphs were generated on a graphic plotter. The plotter-driving subroutines were developed by G. I. Evenden of the U.S. Geological Survey.
References


Computed from measurements made with an asymmetric array...
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