

UNITED STATES DEPARTMENT OF INTERIOR

GEOLOGICAL SURVEY

SCHLUMBERGER SOUNDINGS IN THE
KITSAP PENINSULA AREA, WASHINGTON

by

Dallas B. Jackson and Robert J. Bisdorf

Open-File Report 77-290
1977

This report is preliminary
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Prepared in cooperation with the Tacoma, Washington Division of Water Resources

In 1976, the U.S. Geological Survey, in cooperation with the Tacoma, Washington, Division of Water Resources, made forty eight Schlumberger resistivity soundings on the Kitsap Peninsula, Washington. The survey was made to locate units in the glacial drift that have high resistivities. In this area there appears to be a correlation between high resistivity units and producing aquifers.

Plate 1 shows the index map for the location, number, and azimuth of the 48 Schlumberger sounding stations. All the sounding curves were automatically processed and interpreted (Zohdy, 1973 and 1975) as shown in the graphs given in the appendix. Of the forty eight sounding curves, thirty eight were of good to excellent quality, seven (8, 12, 16, 21, 36, 40, and 41) were of mediocre quality and three (17, 25, and 27) were of inferior quality. Although the automatic interpretation of these latter soundings should, be considered as ranging from unreliable to meaningless, they were all included for completeness of data presentation.

Each graph shows the following:

- (1) Field data designated by a solid line curve with diamond symbols for observed data.
- (2) A 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.
- (4) The detailed layering for which the theoretical curve is calculated.
- (5) The D.Z. (Dar Zarrouk) curve for the detailed layering. The

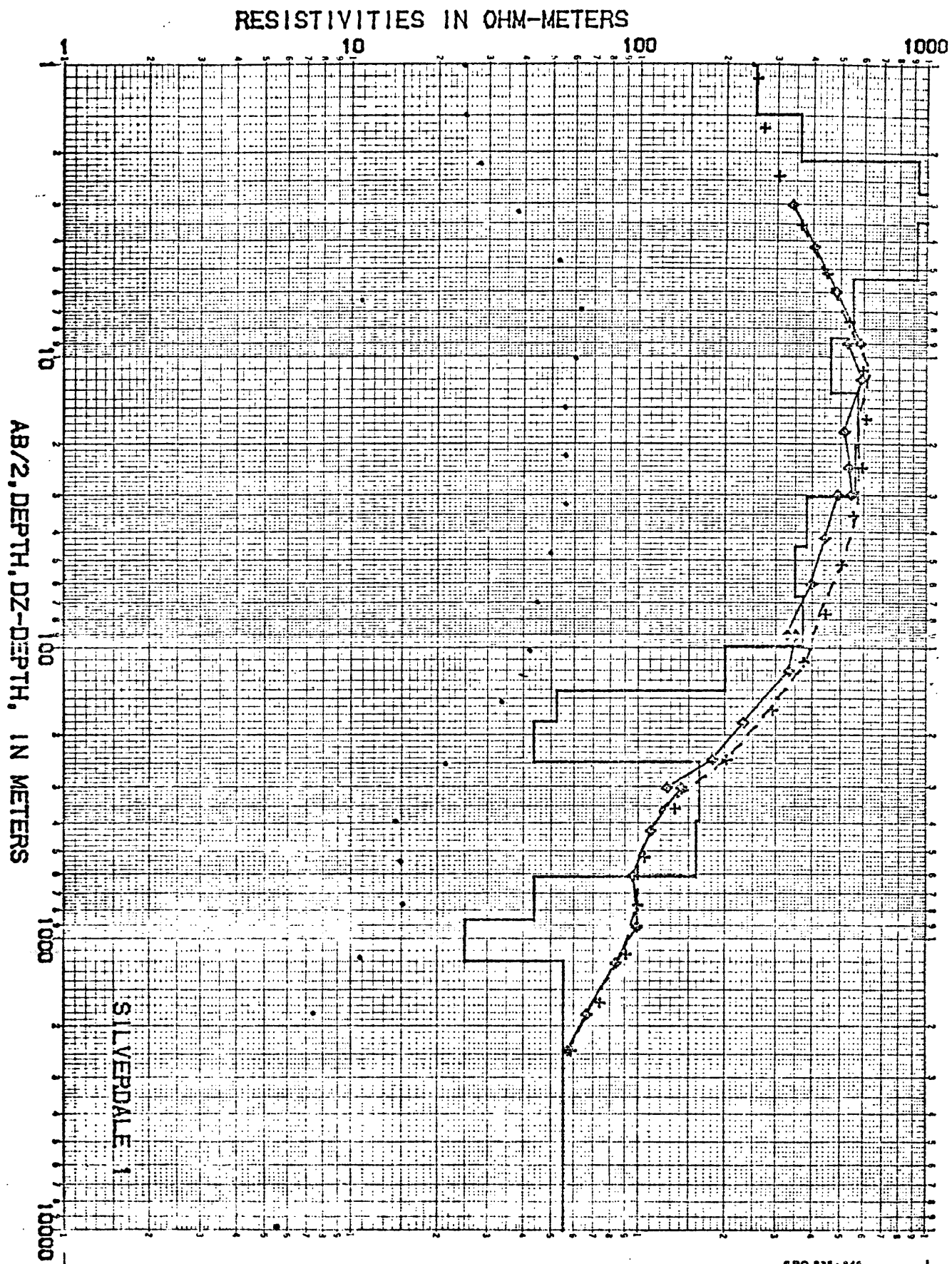
ordinate values for the D.Z. curves are shifted upward or downward by one logarithmic cycle to avoid cluttering the graphs or they are plotted on a separate sheet of graph paper (as for Silverdale 3, 4, and others). The D.Z. curves can be used to obtain equivalent and simpler solutions containing fewer 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 Evenden (1975).

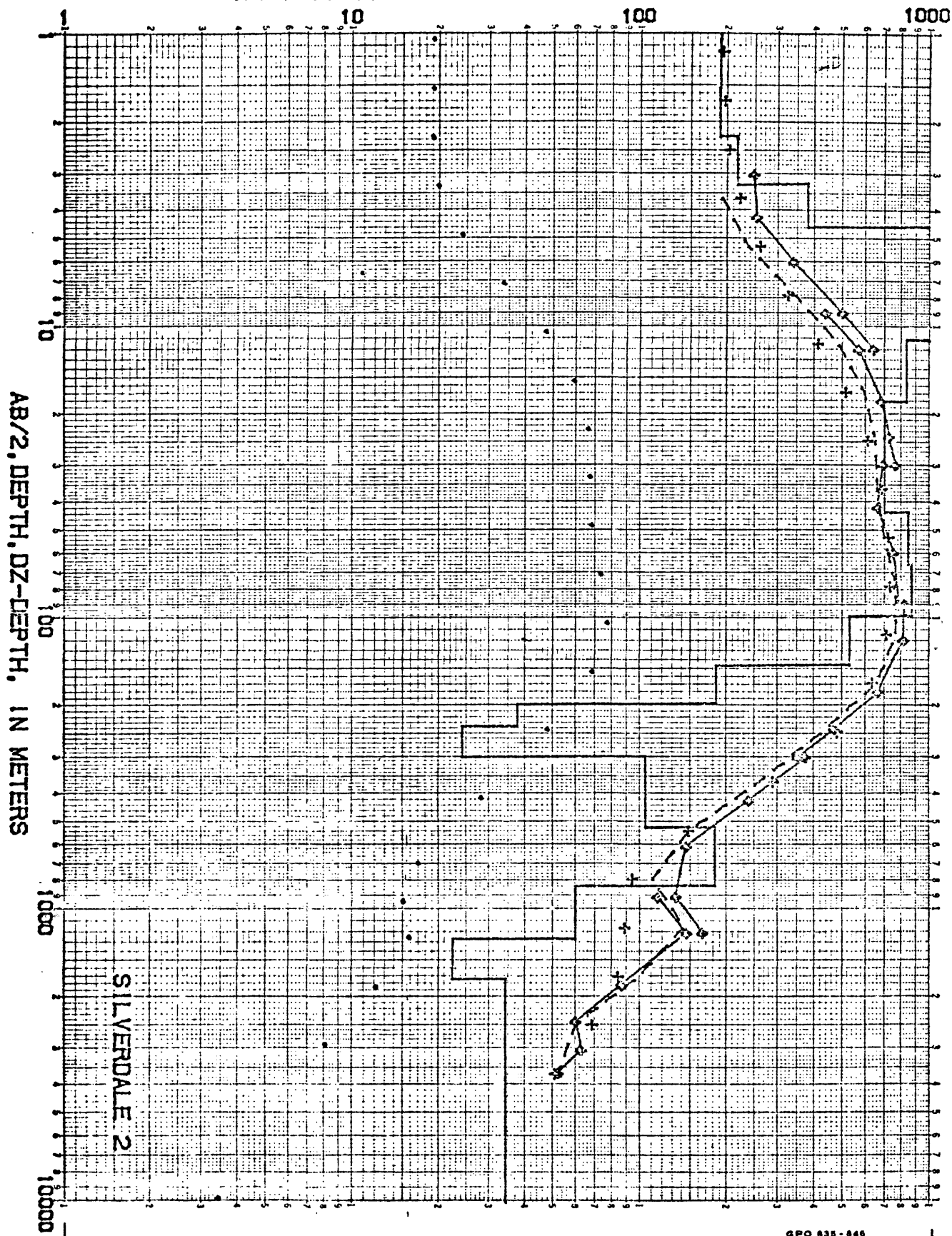
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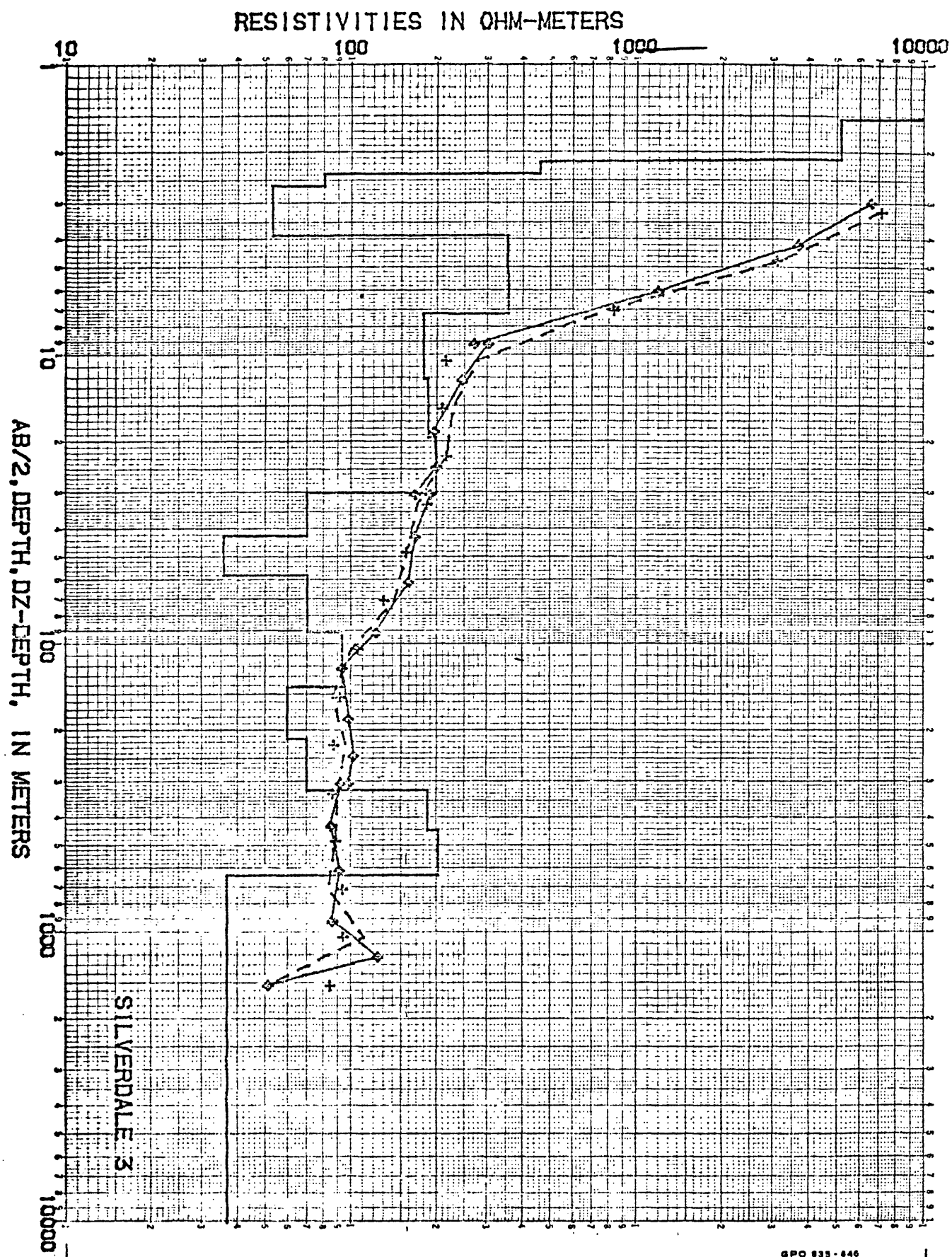
- Anderson, W. L., 1971, Application of bicubic spline functions to two dimensional gridded data: NTIS (National Technical Information Service), No. PB-203579, Springfield, Virginia.
- Evenden, G. I., 1975, A general purpose contouring system: U.S. Geol. Survey open-file report #75-317, 108 p.
- Zohdy, Adel A. R., 1973, A computer program for the automatic interpretation of Schlumberger sounding curves over horizontally stratified media: NTIS (Natl. Tech. Inf. Service) PB-232703/AS, 25 p. Springfield, Virginia.
- Zohdy, Adel A. R., 1974, The use of Dar-Zarrouk curves in the interpretation of VES data: U.S. Geol. Survey Bull. 1313-D, 41 p.
- Zohdy, A. A. R., 1975, Automatic interpretation of Schlumberger sounding curves using modified Dar-Zarrouk functions: U.S. Geol. Survey Bull. 1313-E, 39 p.
- Zohdy, A. A. R., Anderson, L. A., and Muffler, L. J. P., 1973, Resistivity self potential, and induced polarization surveys of vapor-dominated geothermal system: Geophysics, v. 38, p. 1130-1144.
- Zohdy, A. A. R., and Bisdorf, R. J., 1975, Computer programs for the forward calculation and automatic inversion of Wenner sounding curves: NTIS (Natl. Tech. Inf. Service) PB-247265/AS, Springfield, Virginia.

APPENDIX I

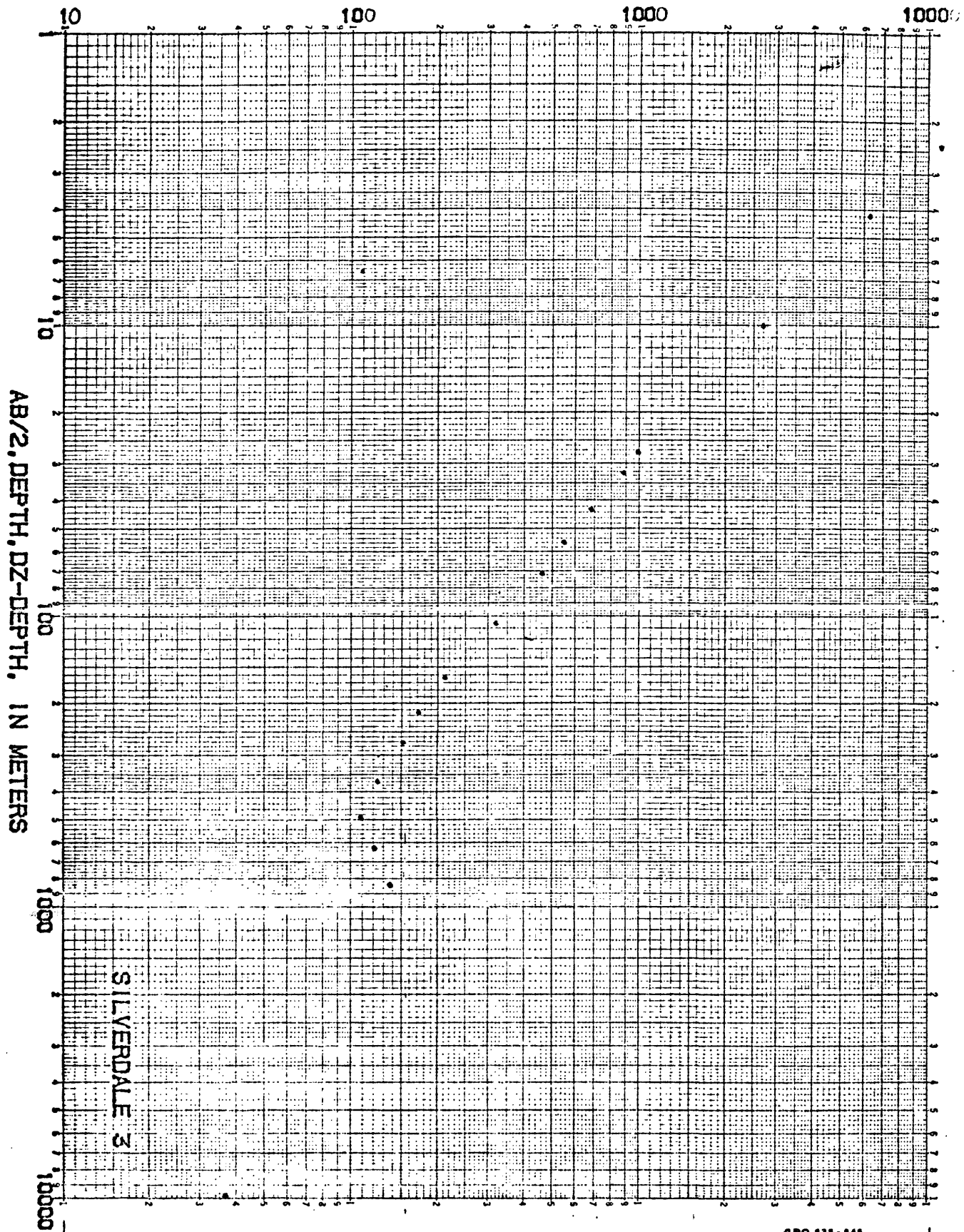


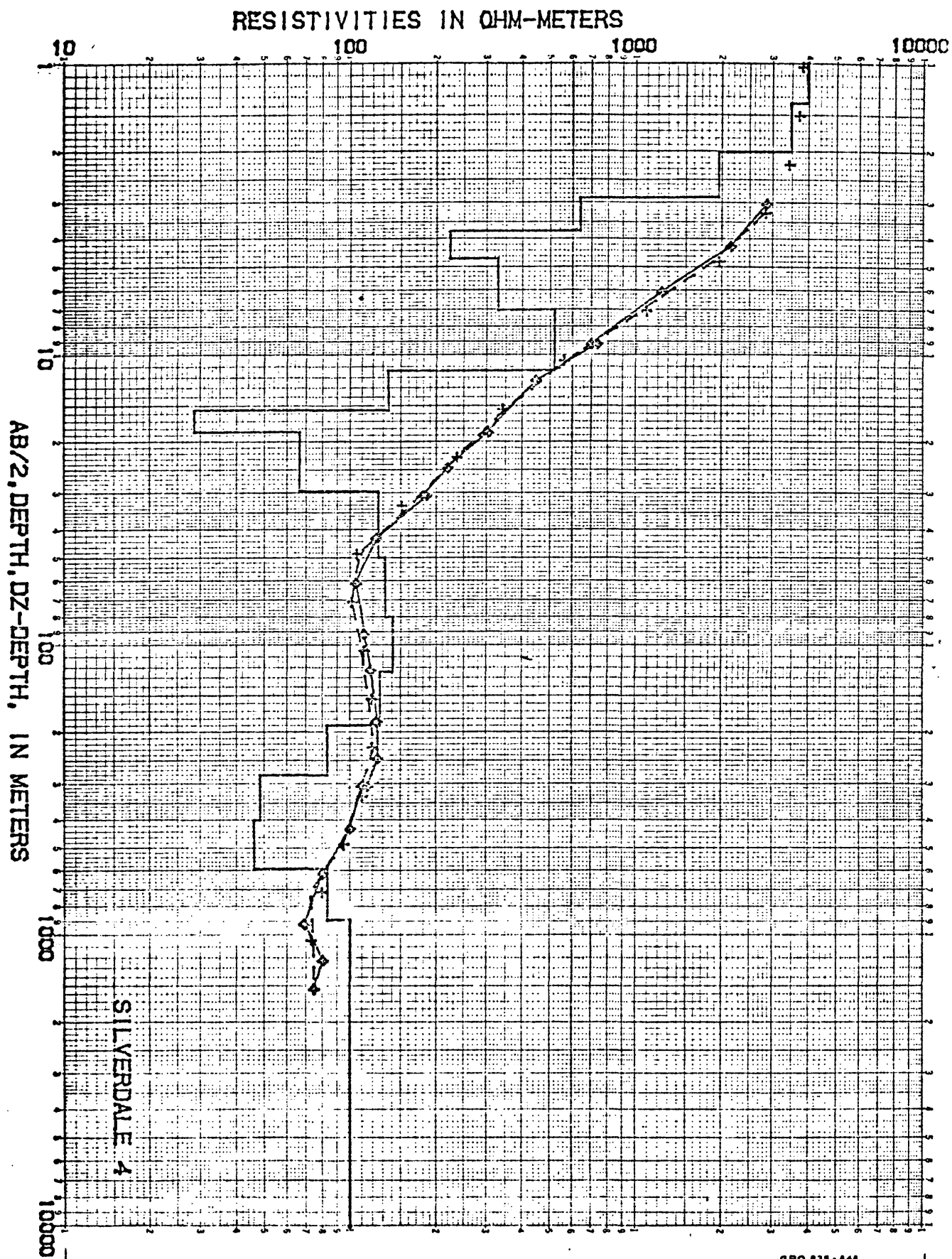
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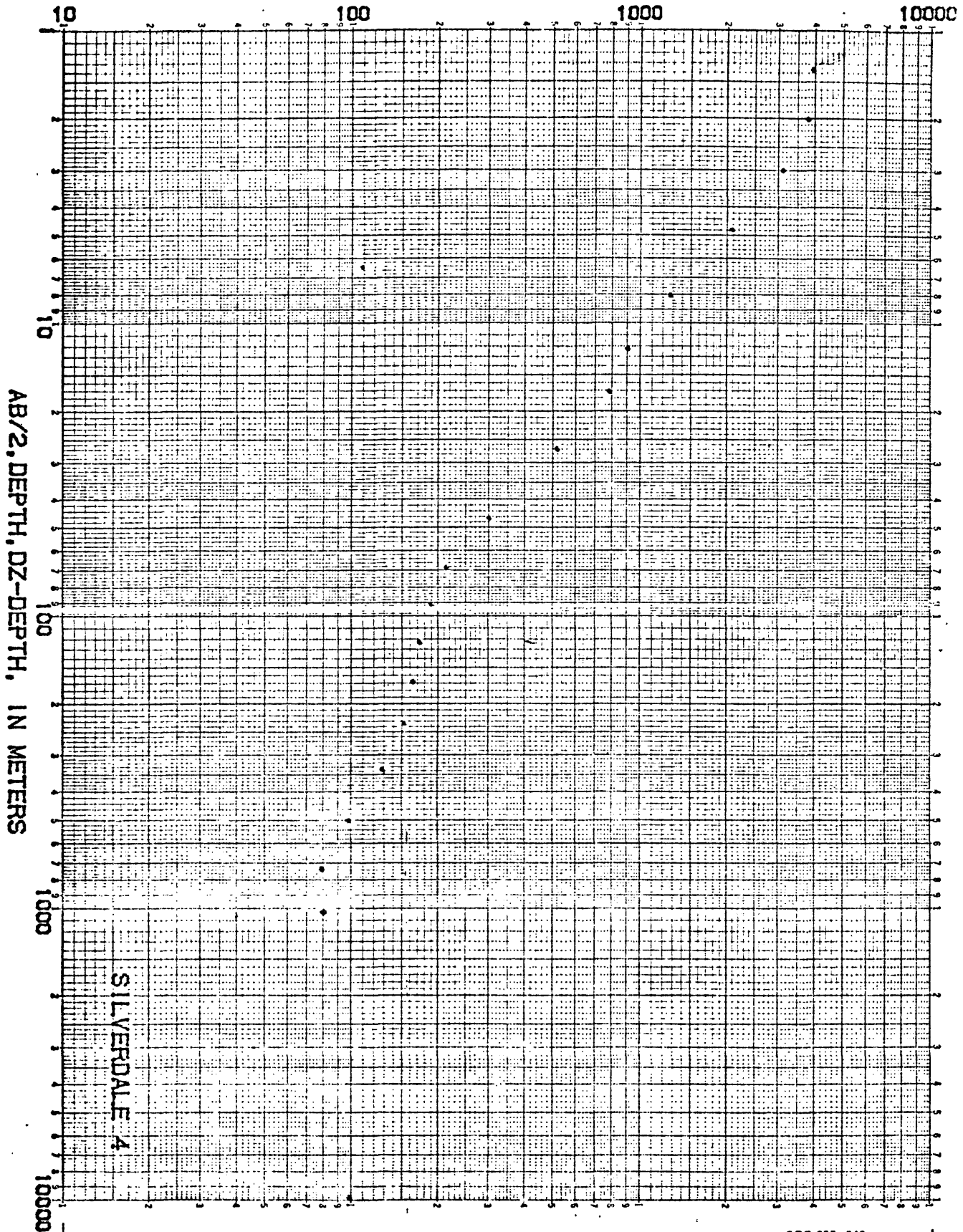


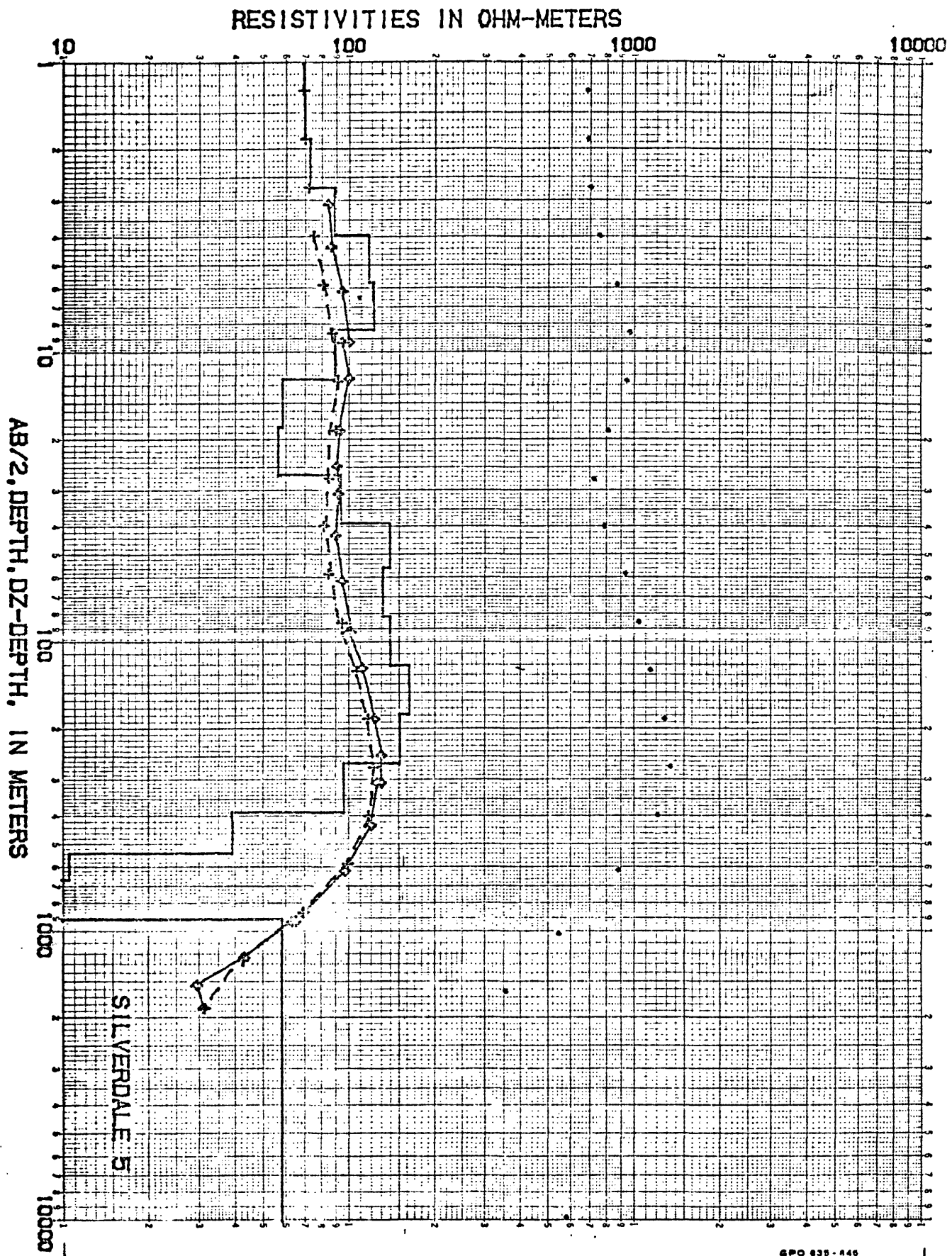
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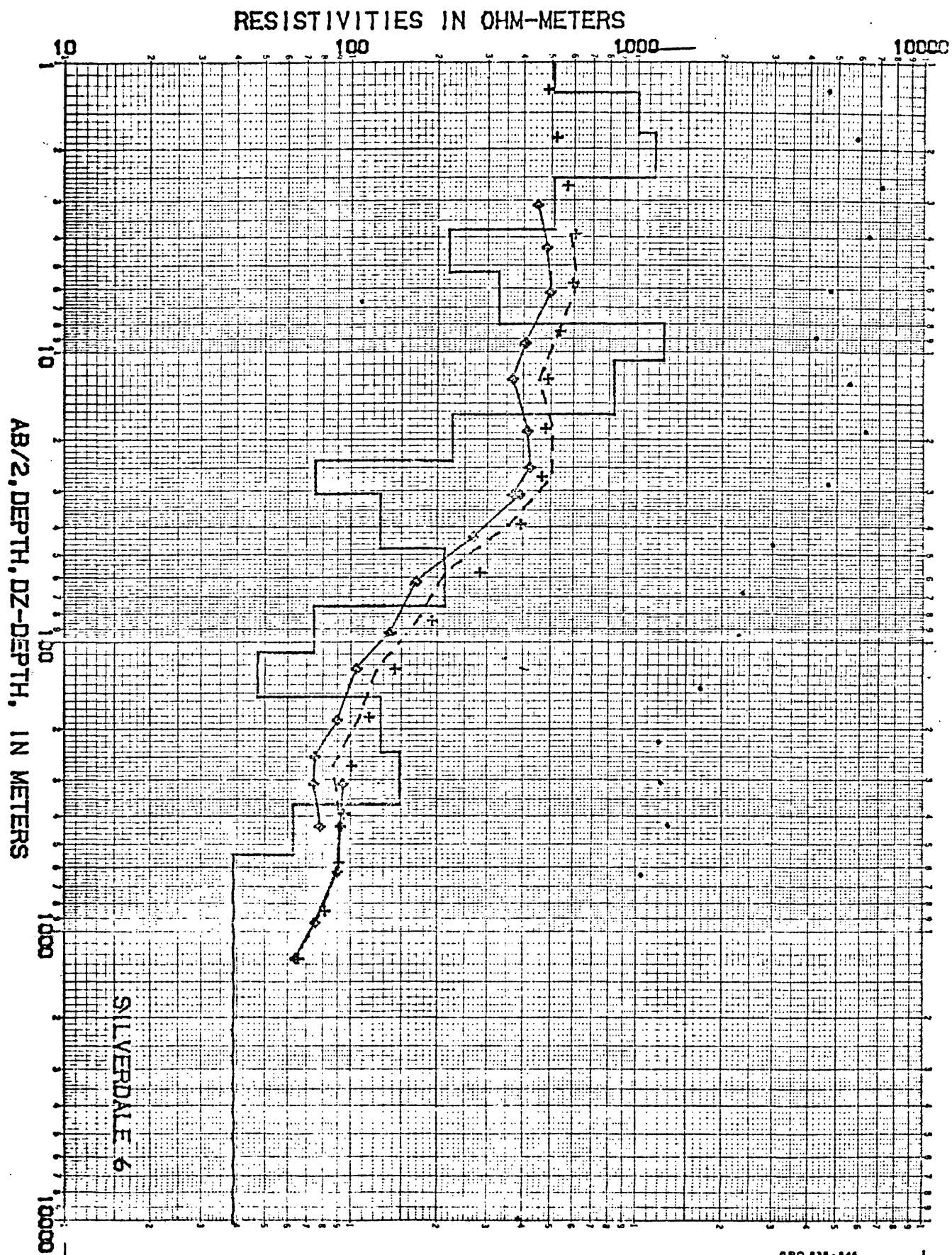




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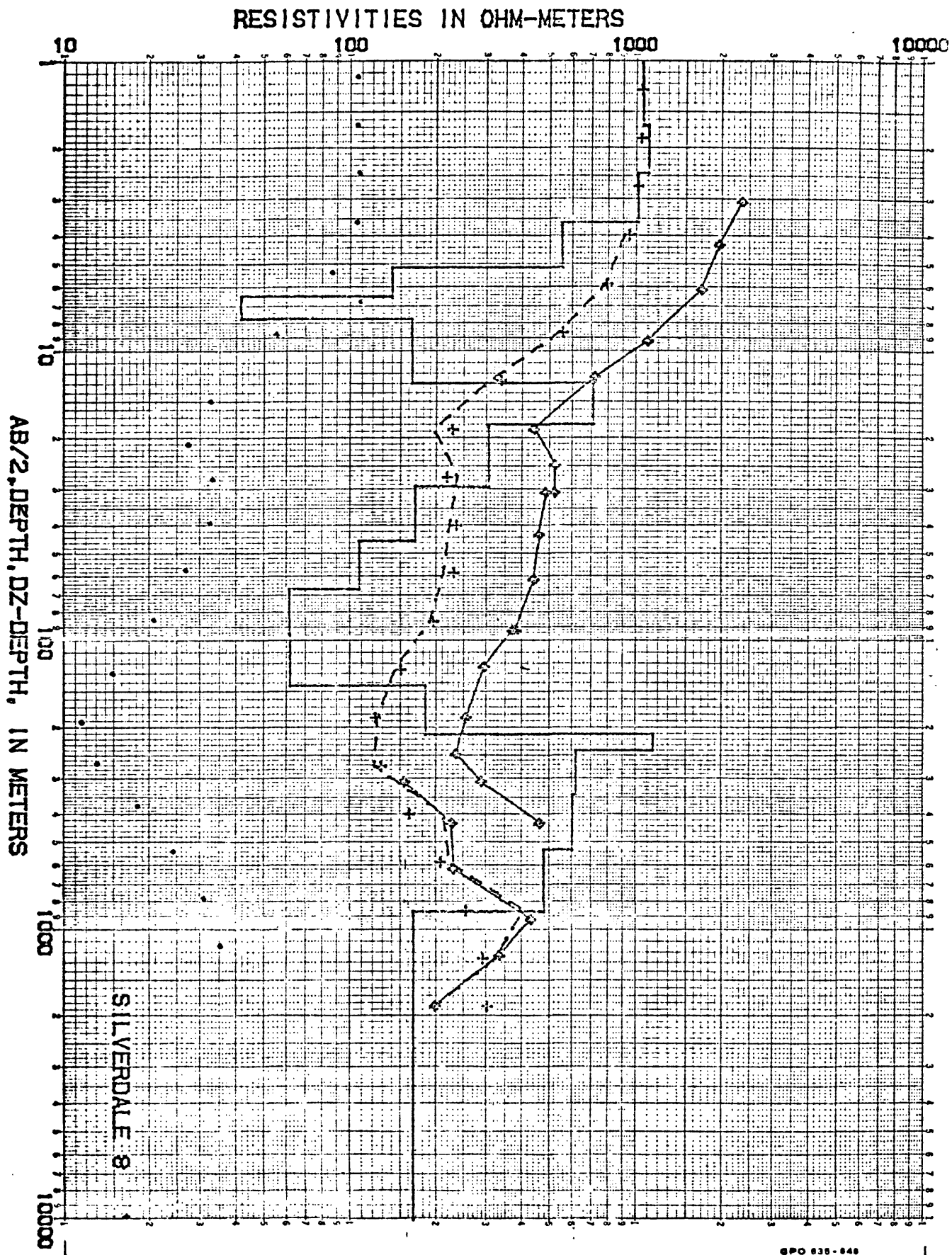


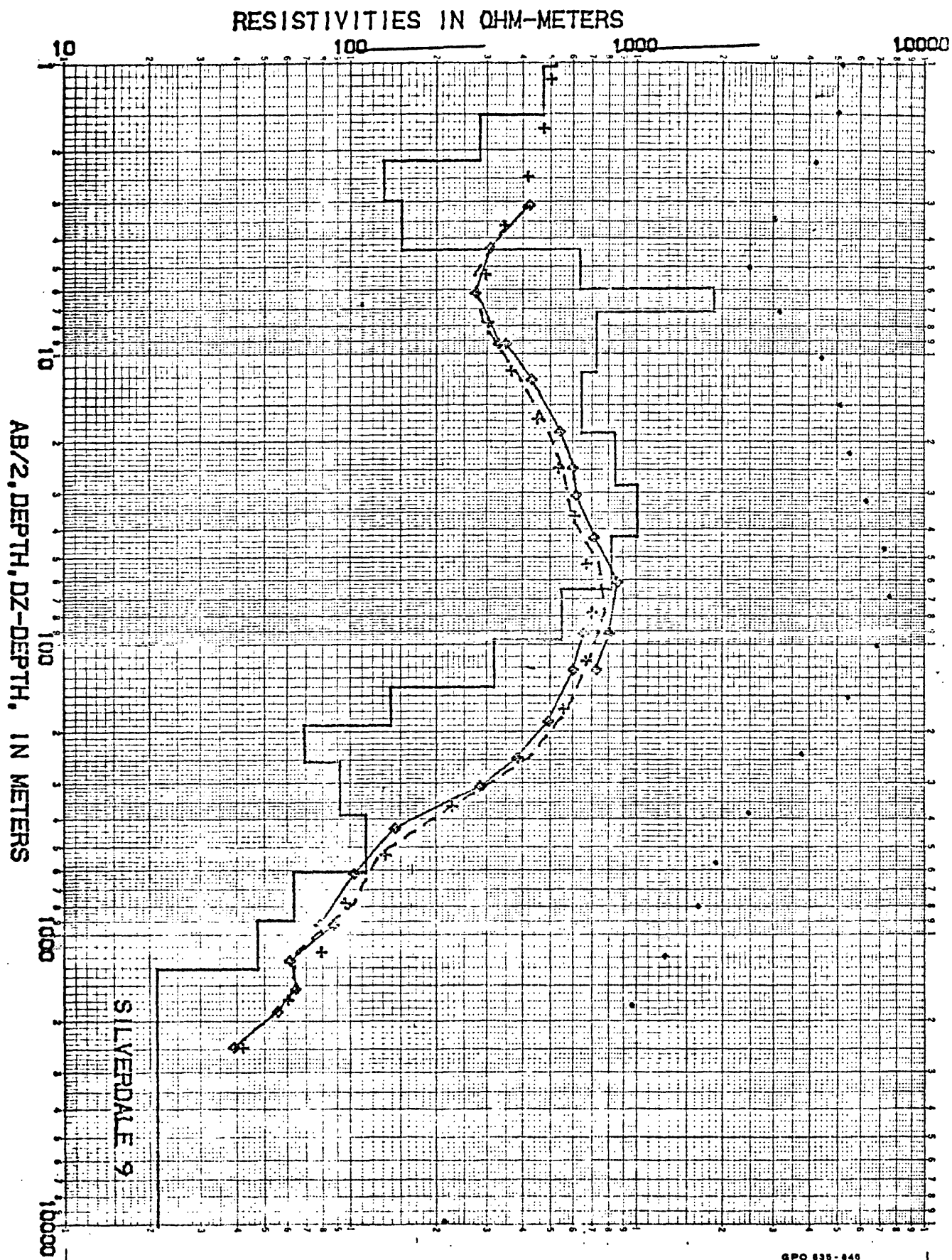
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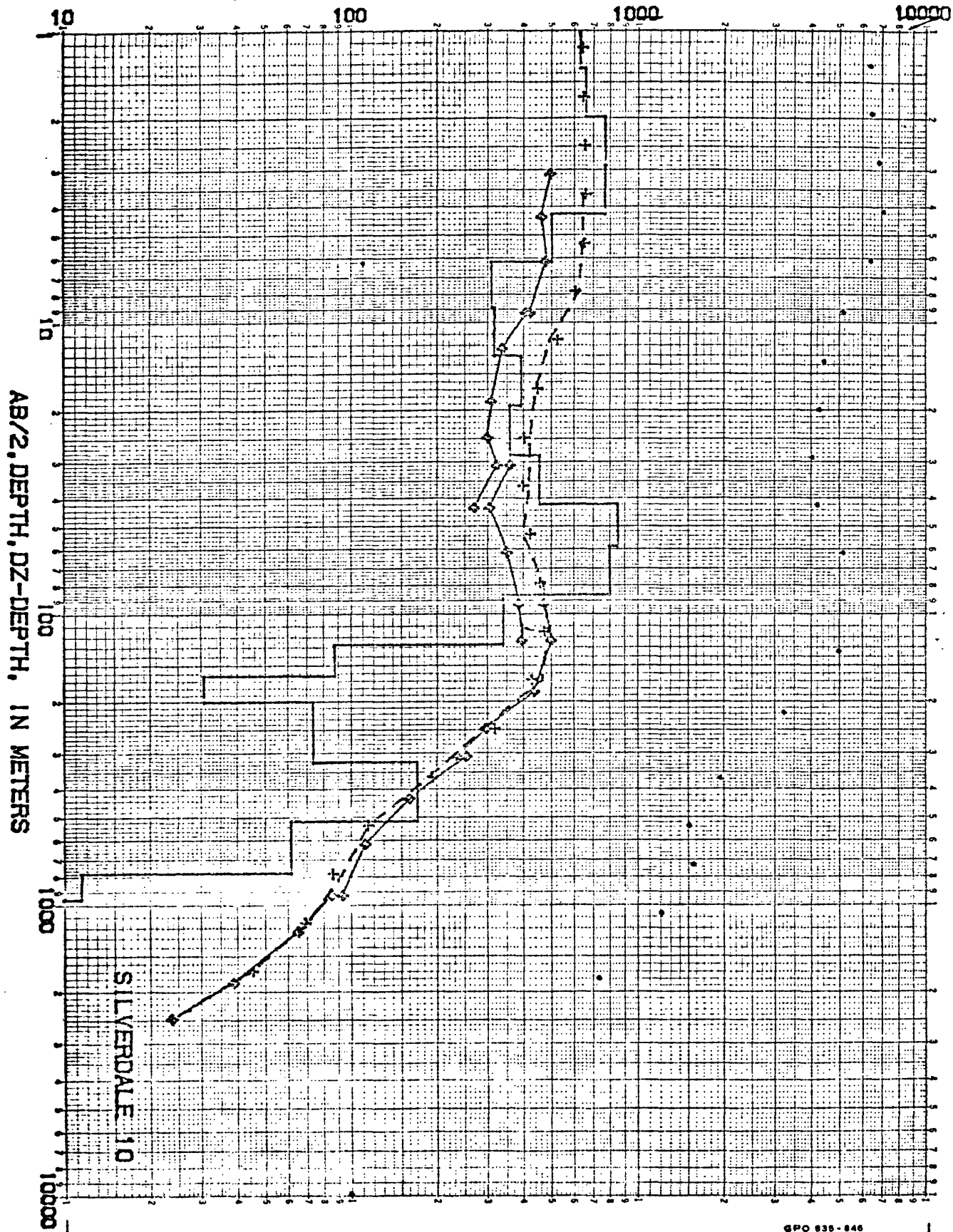
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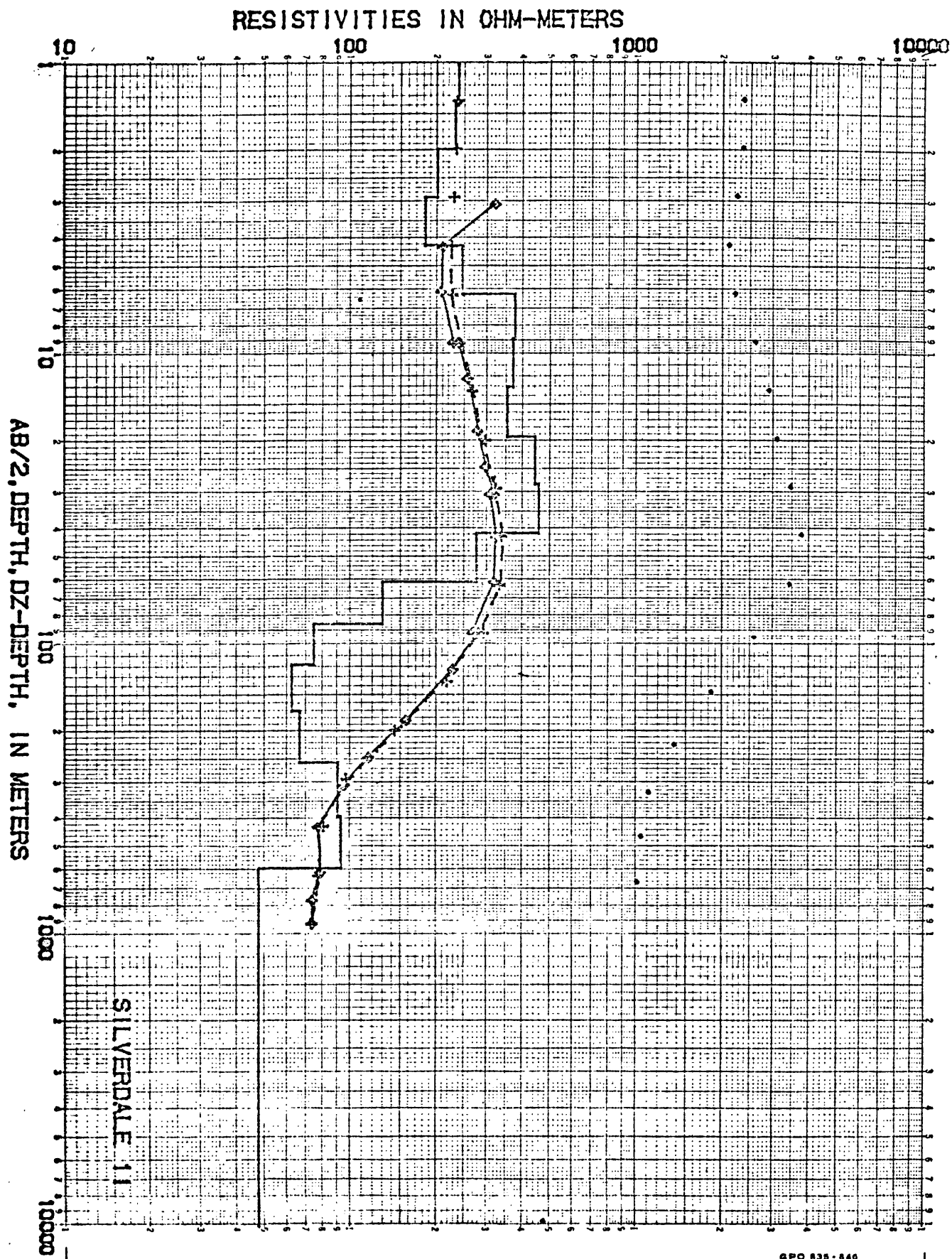
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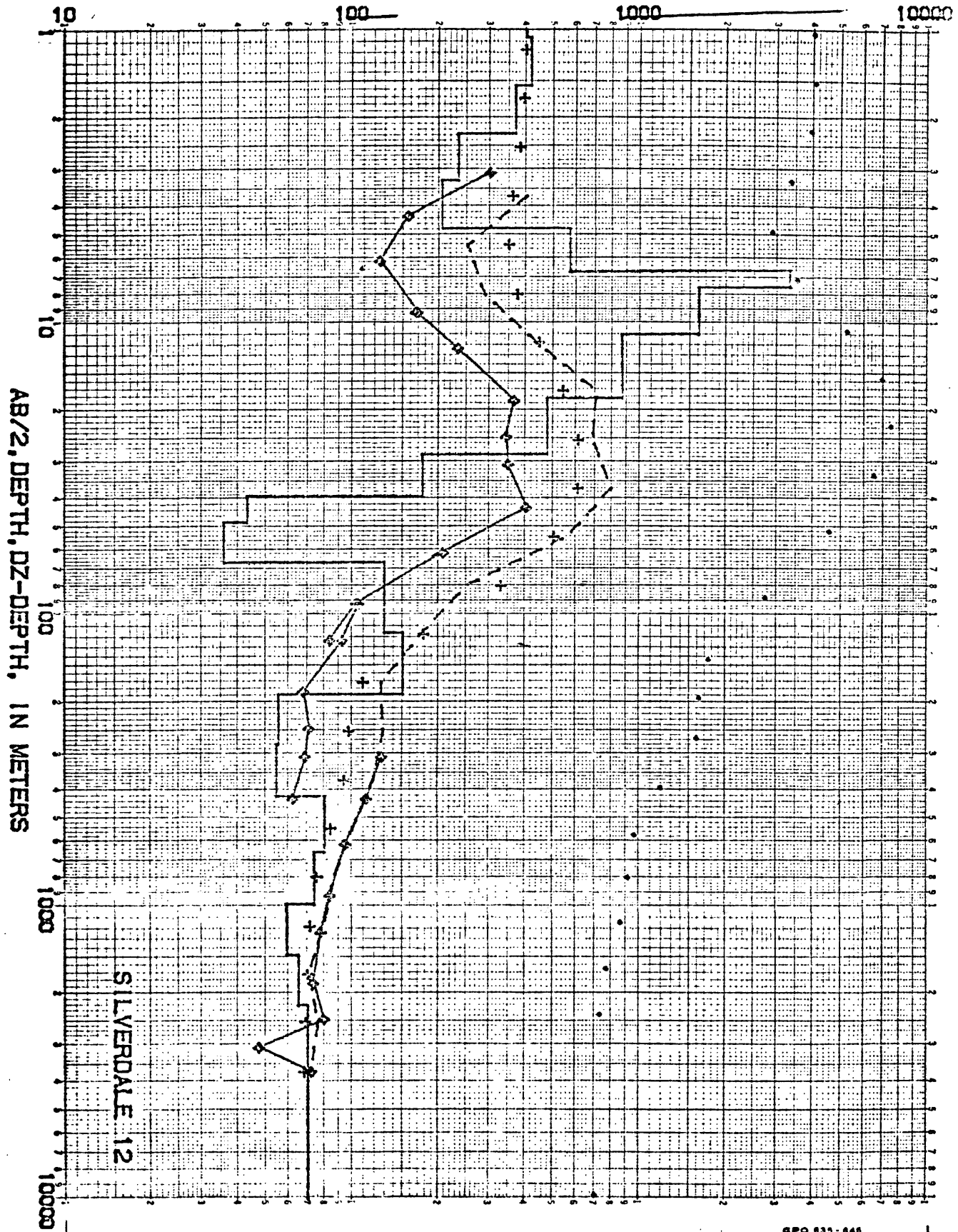
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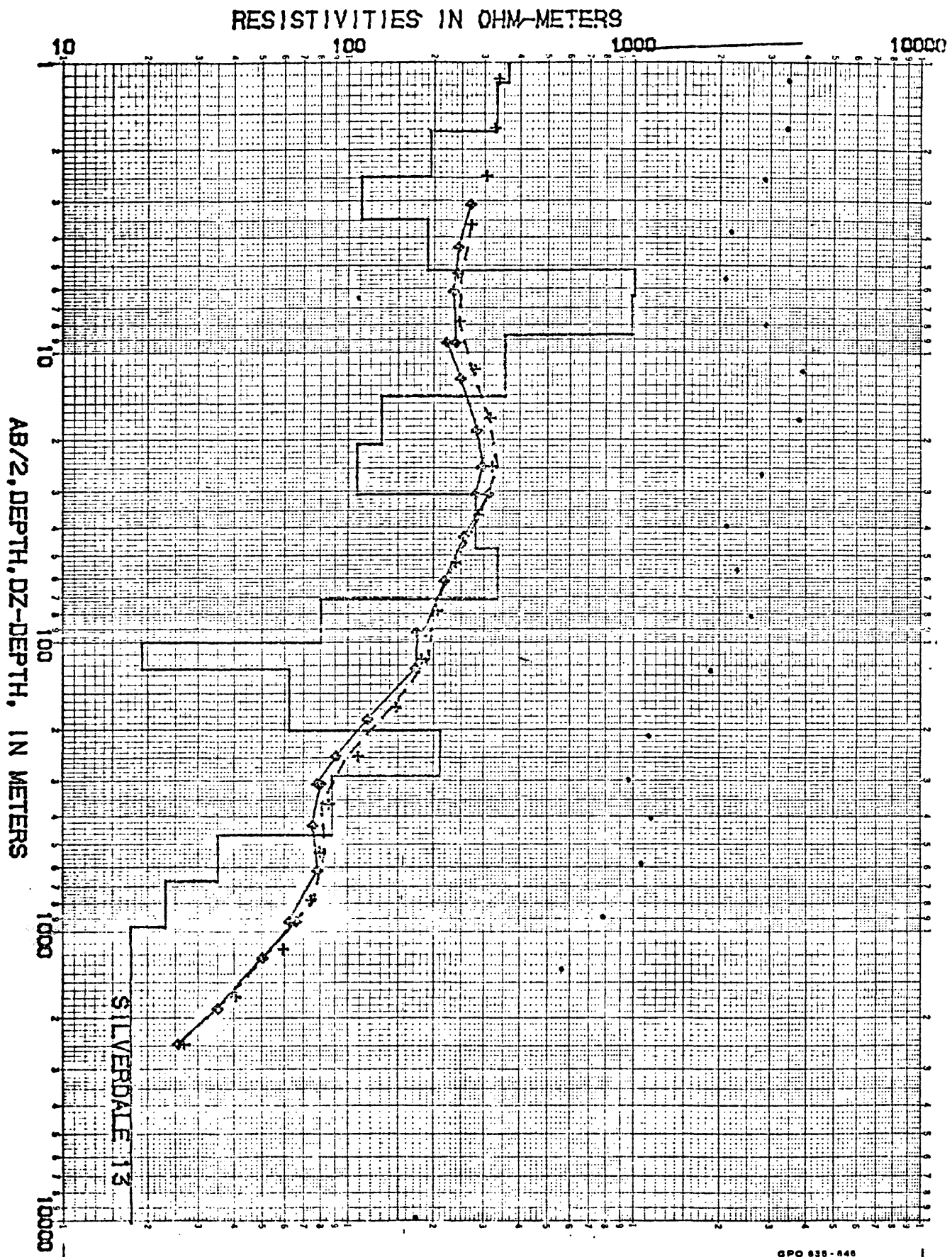


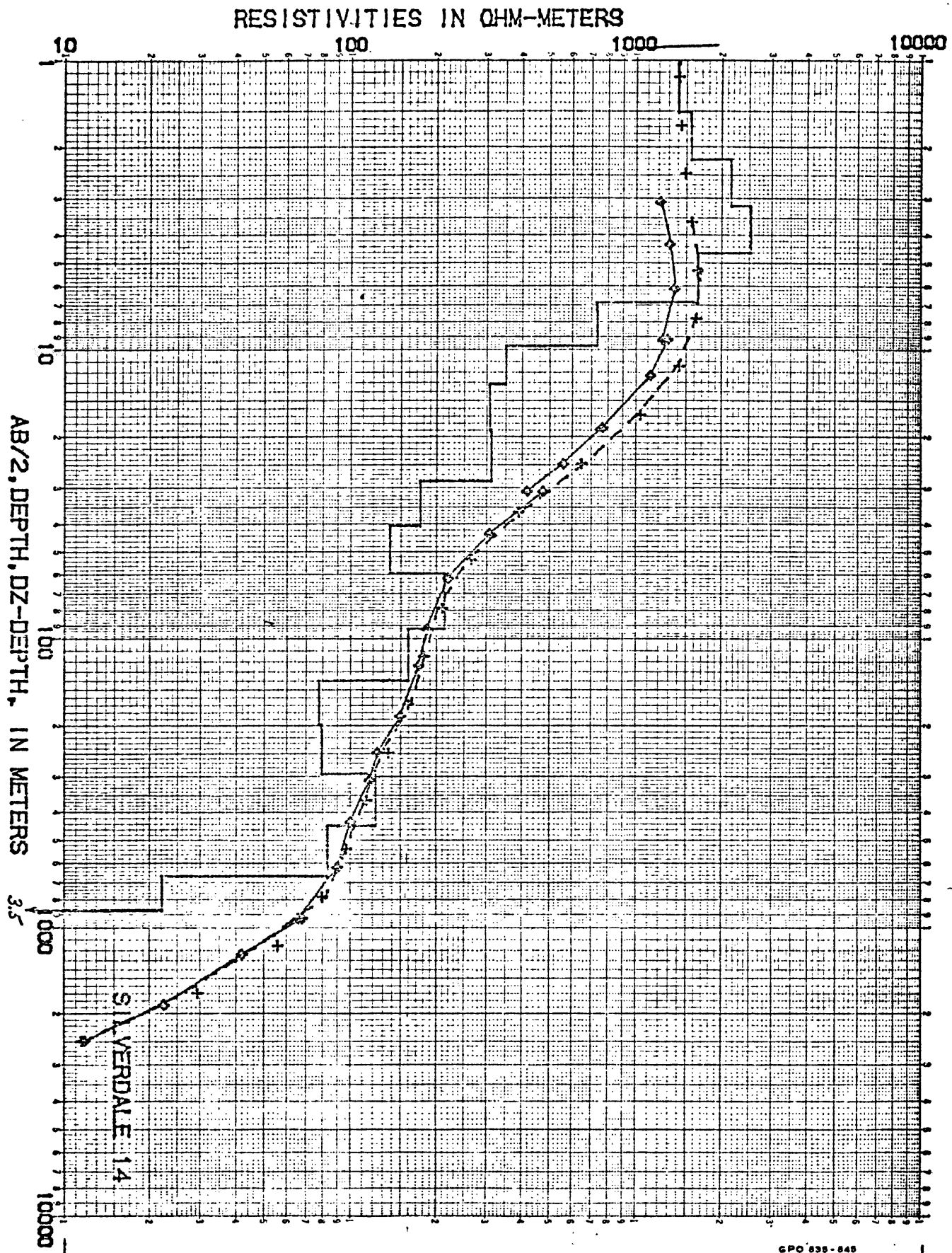


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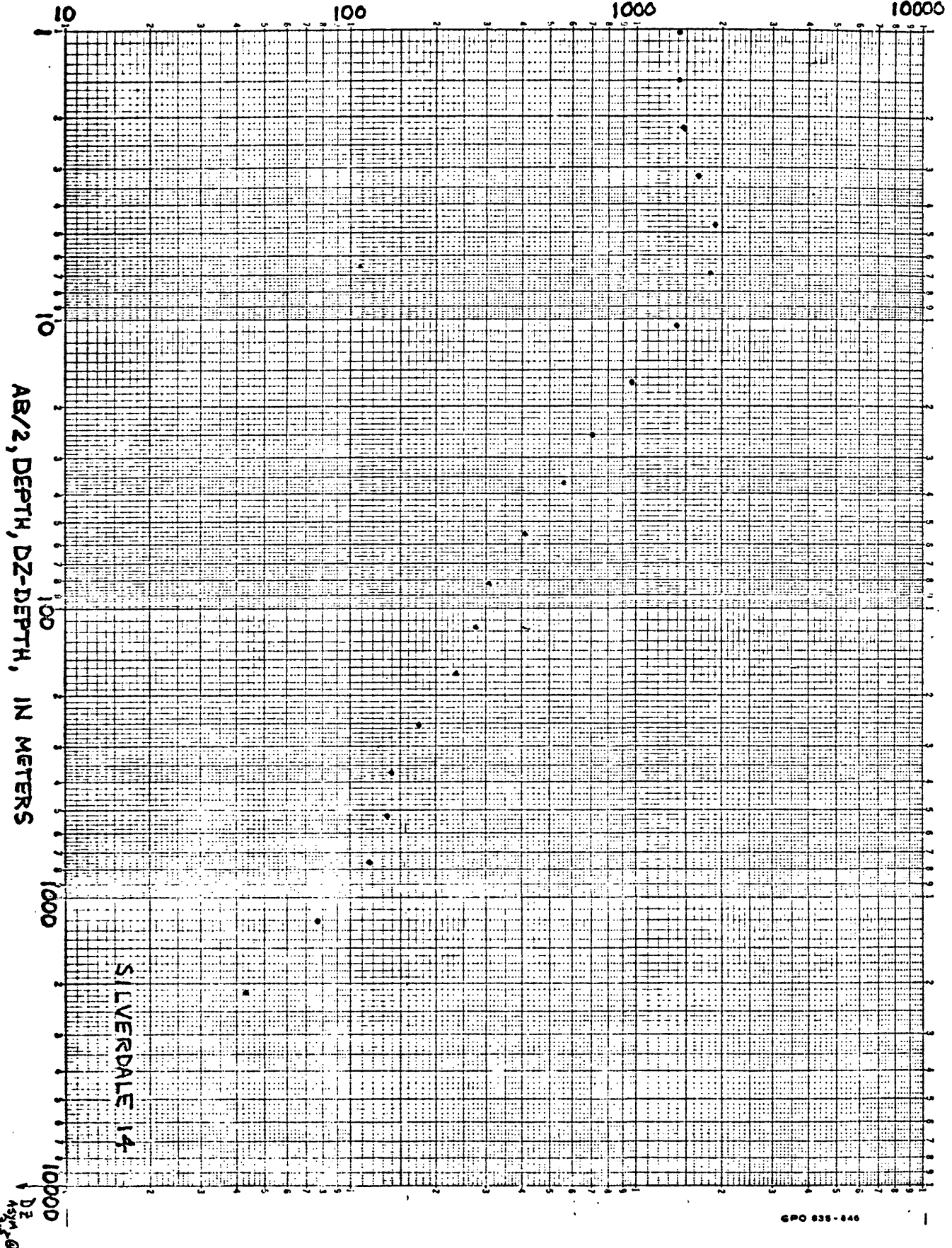
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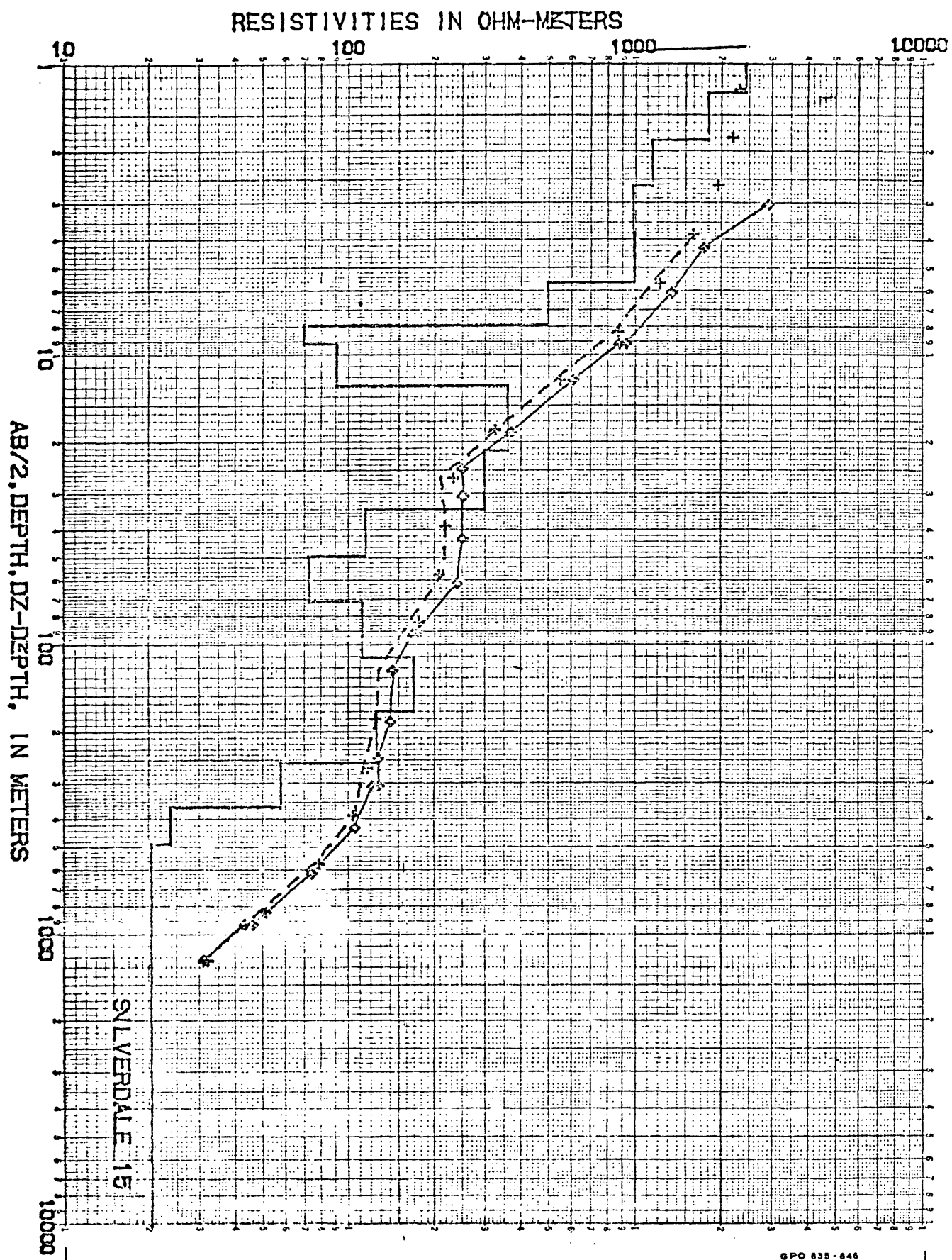




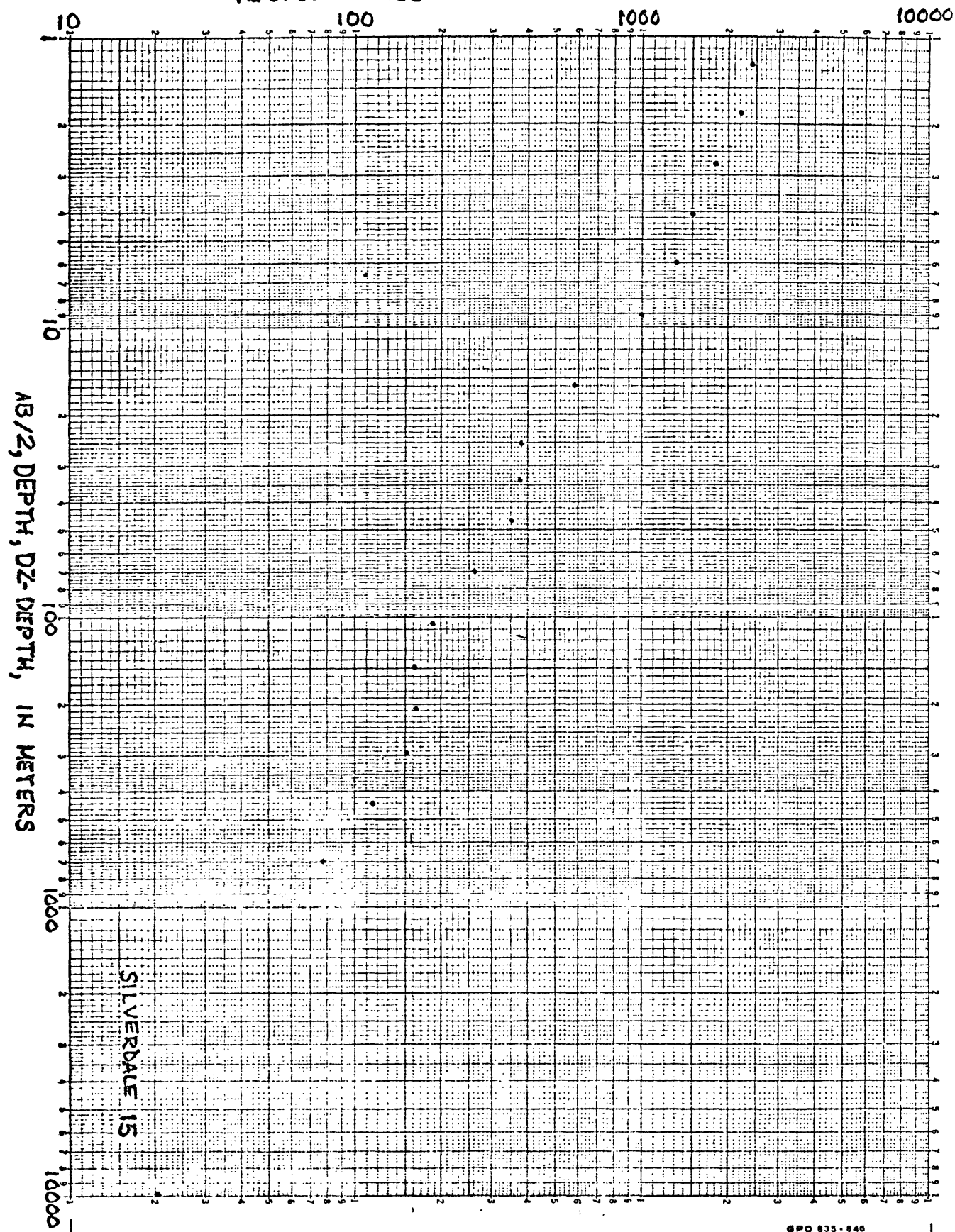


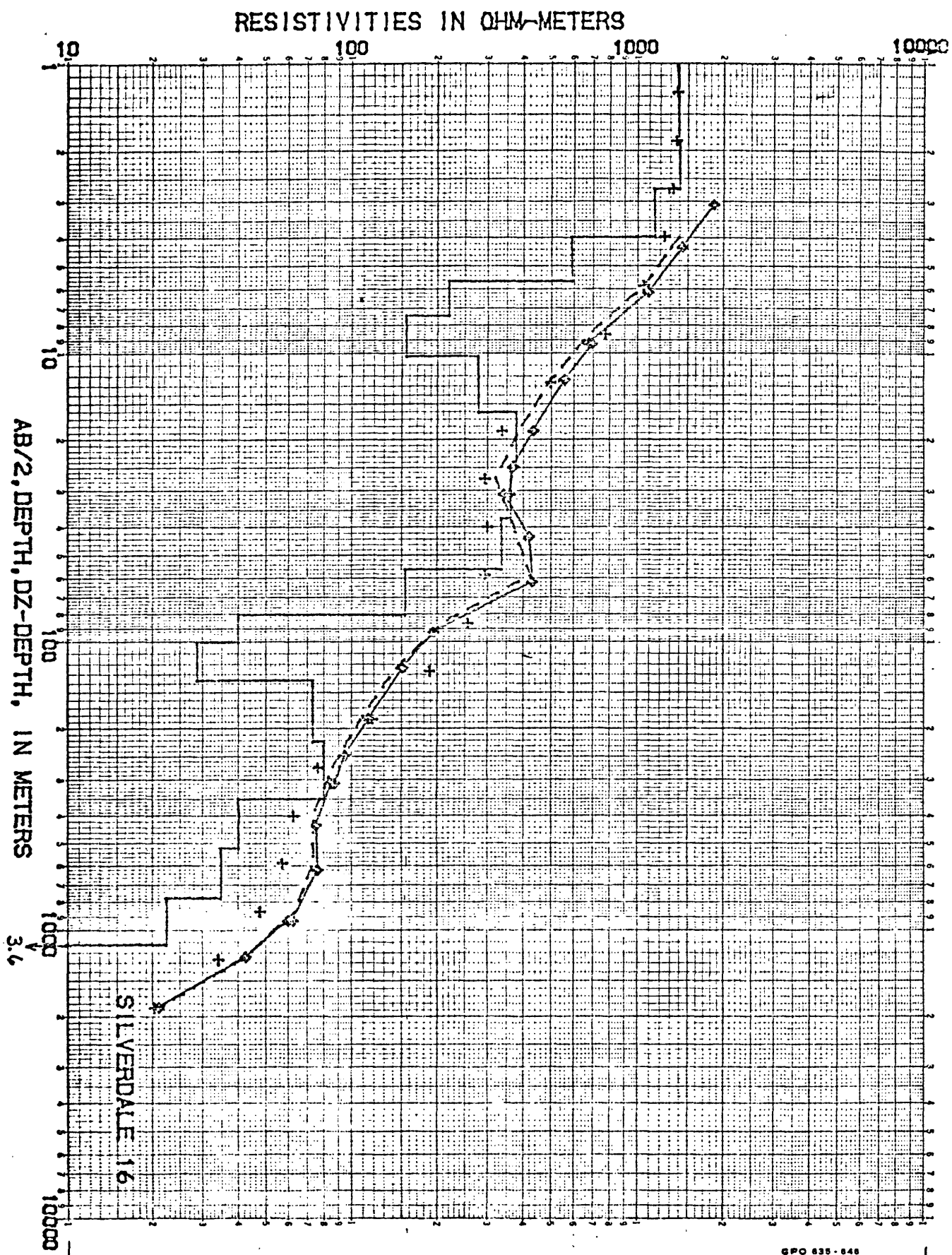
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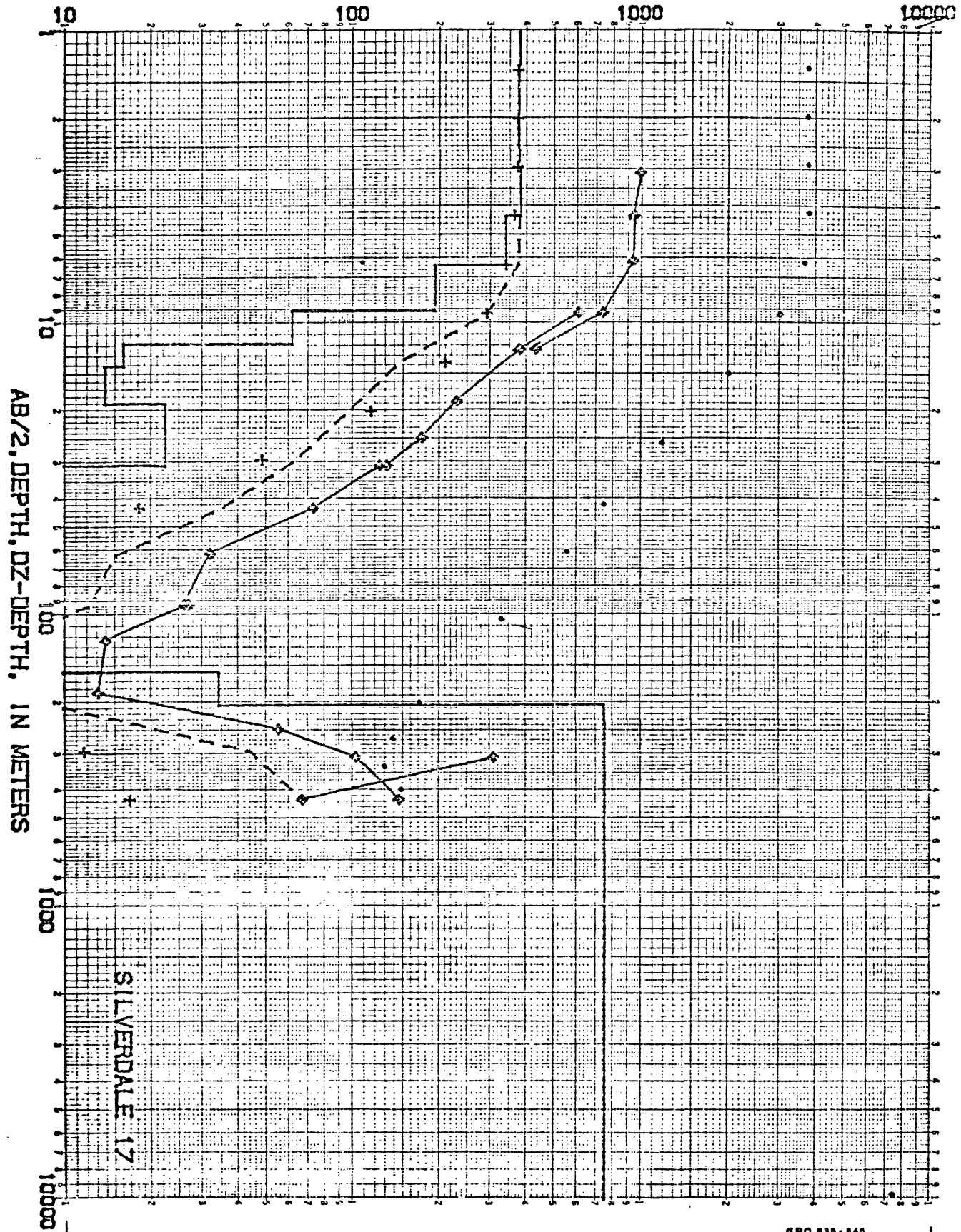
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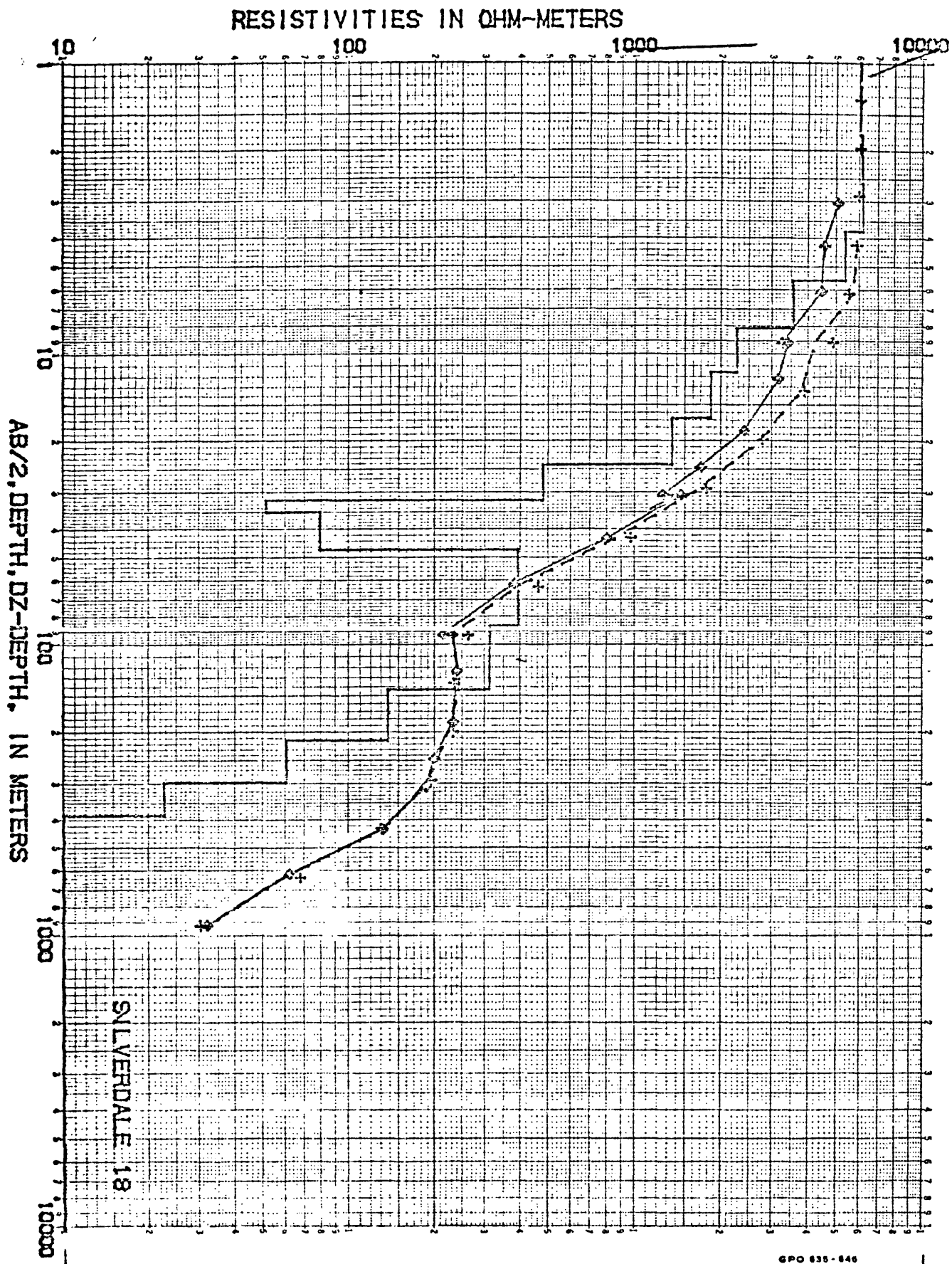
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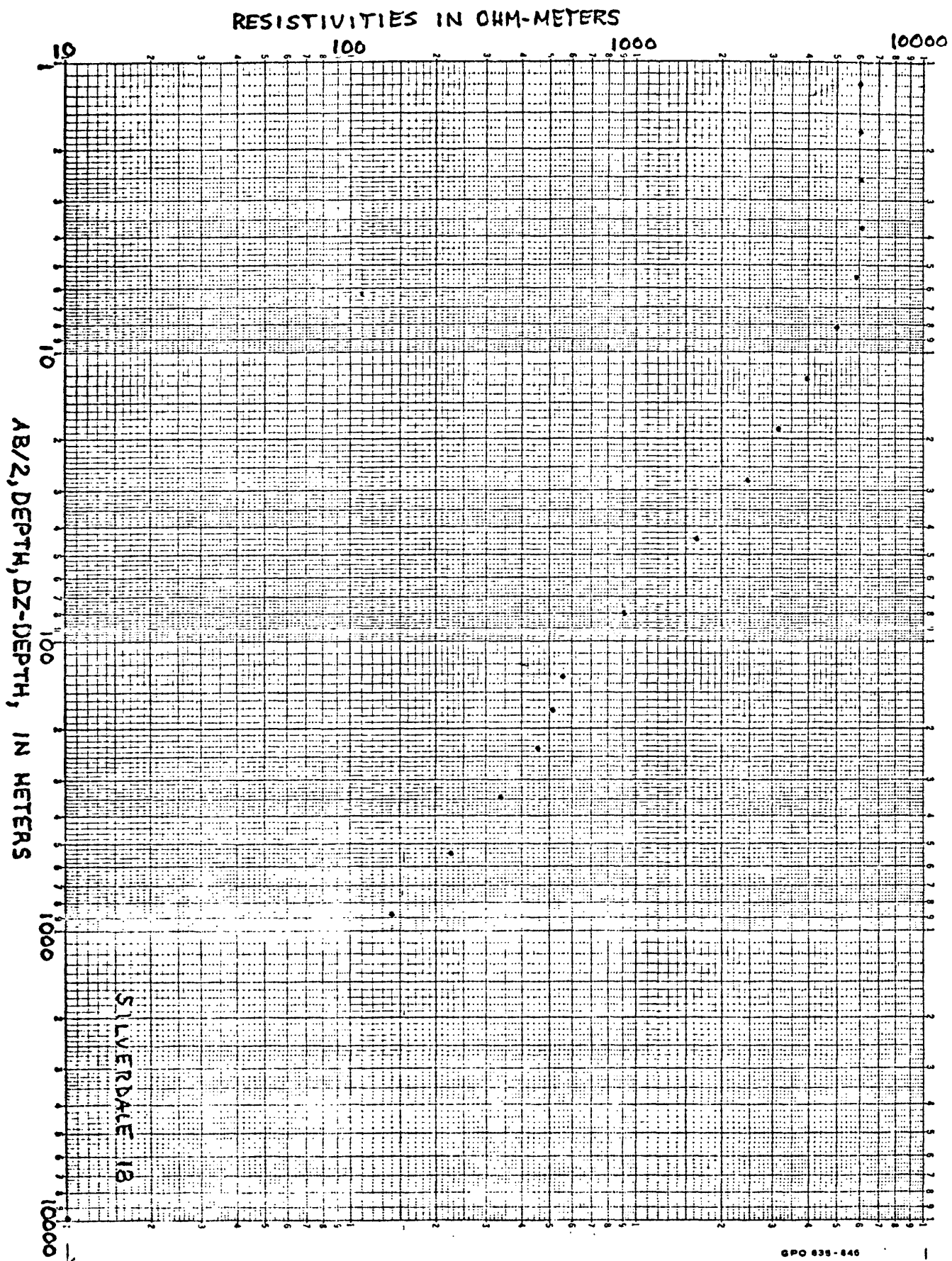
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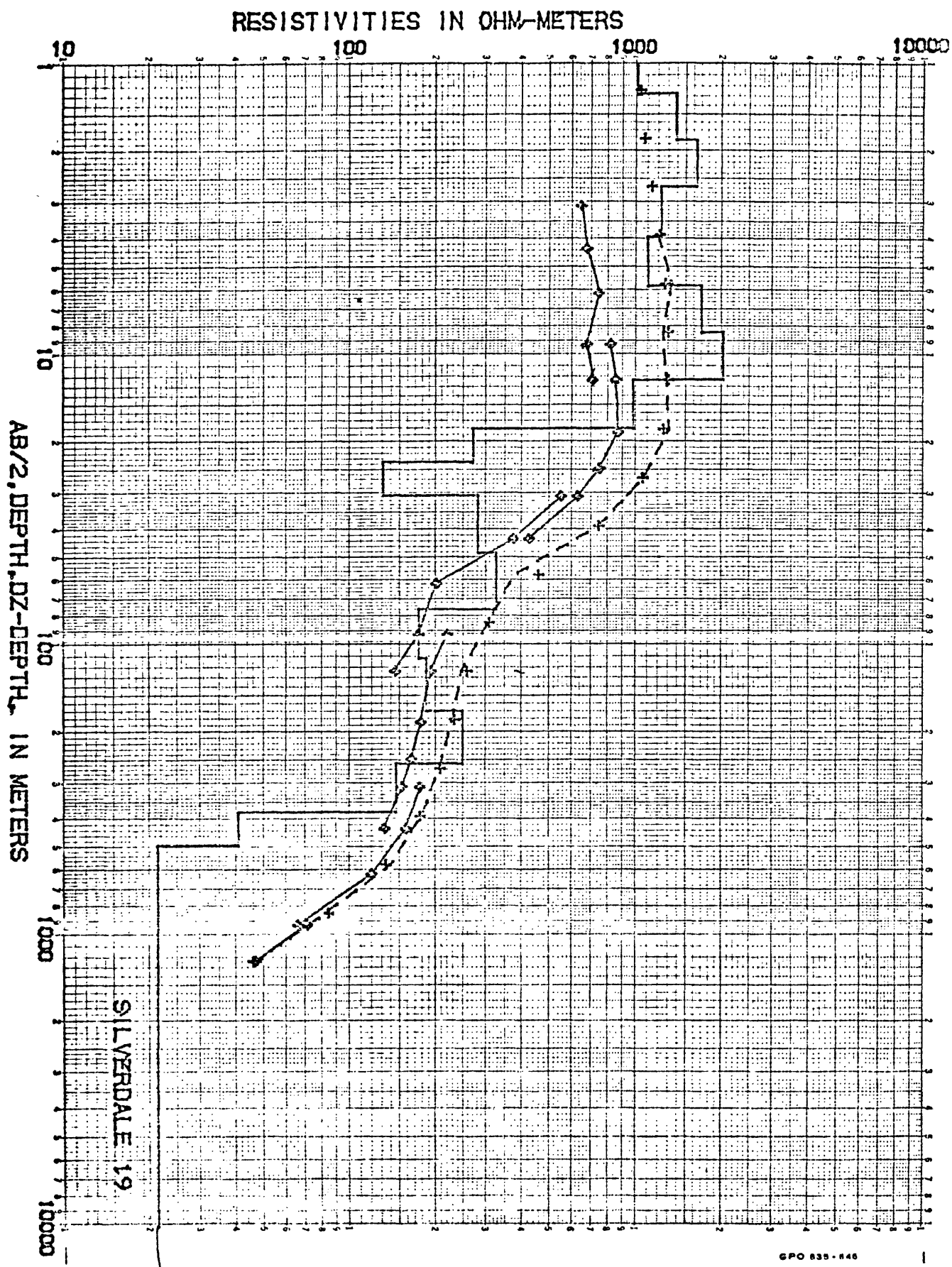
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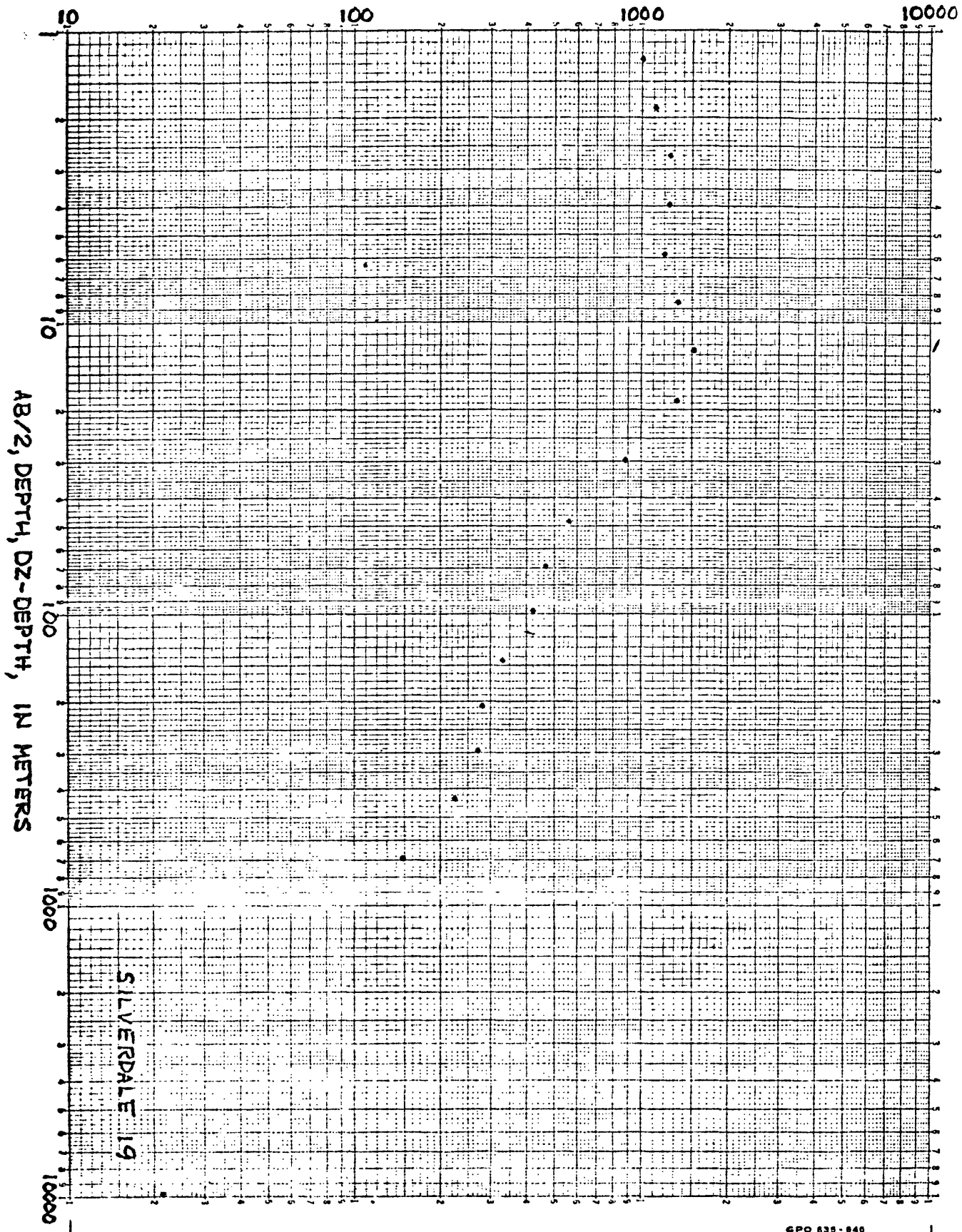








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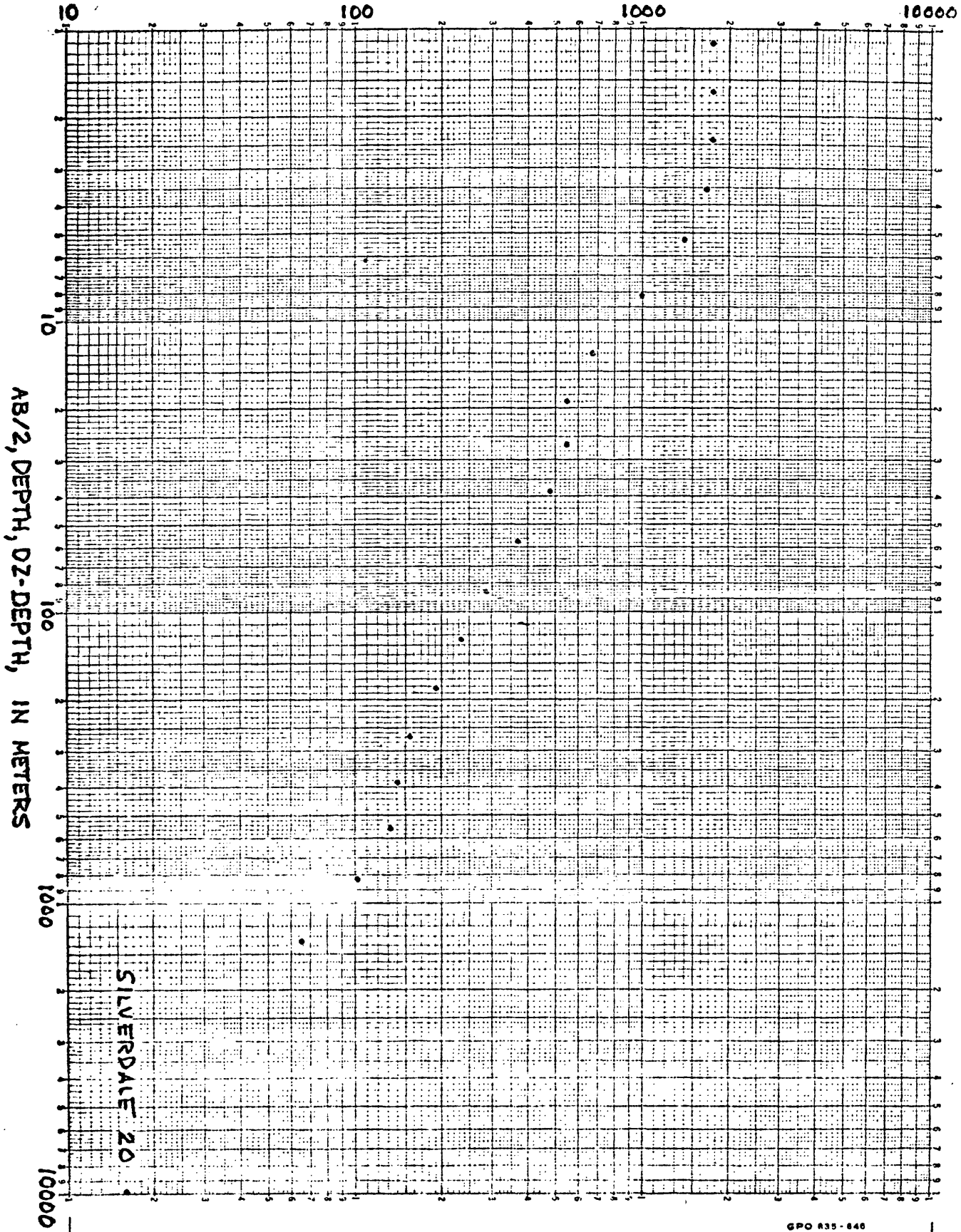
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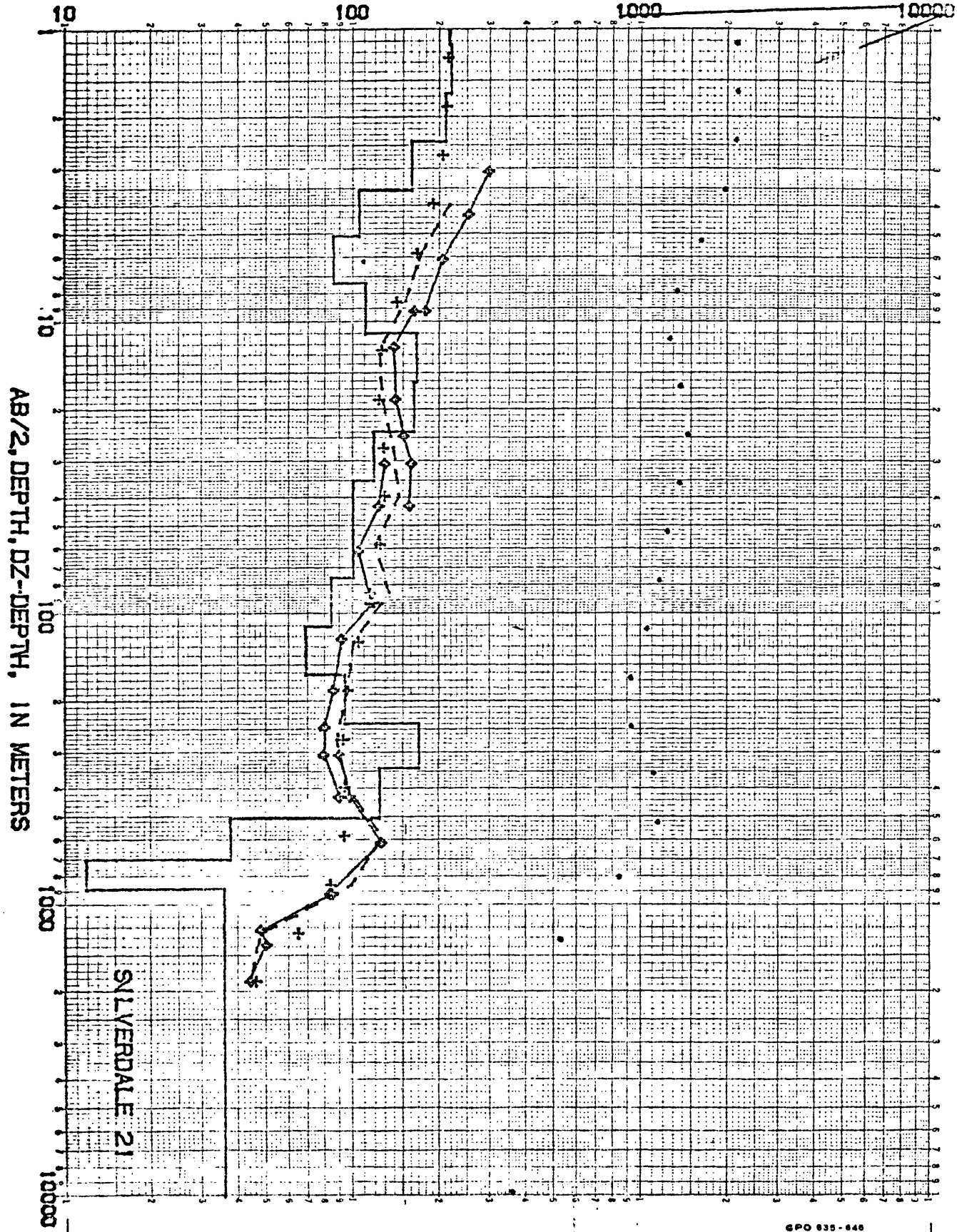
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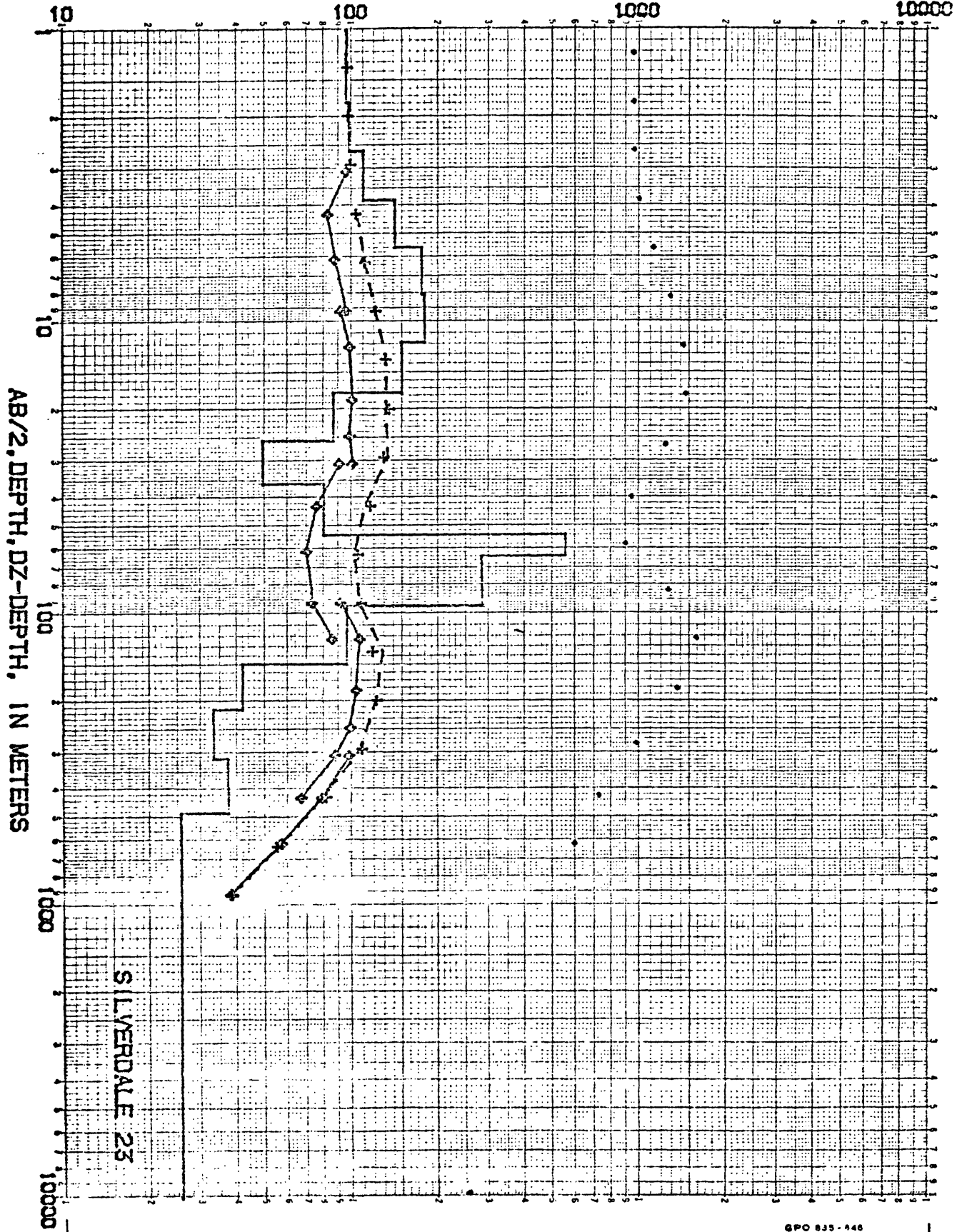
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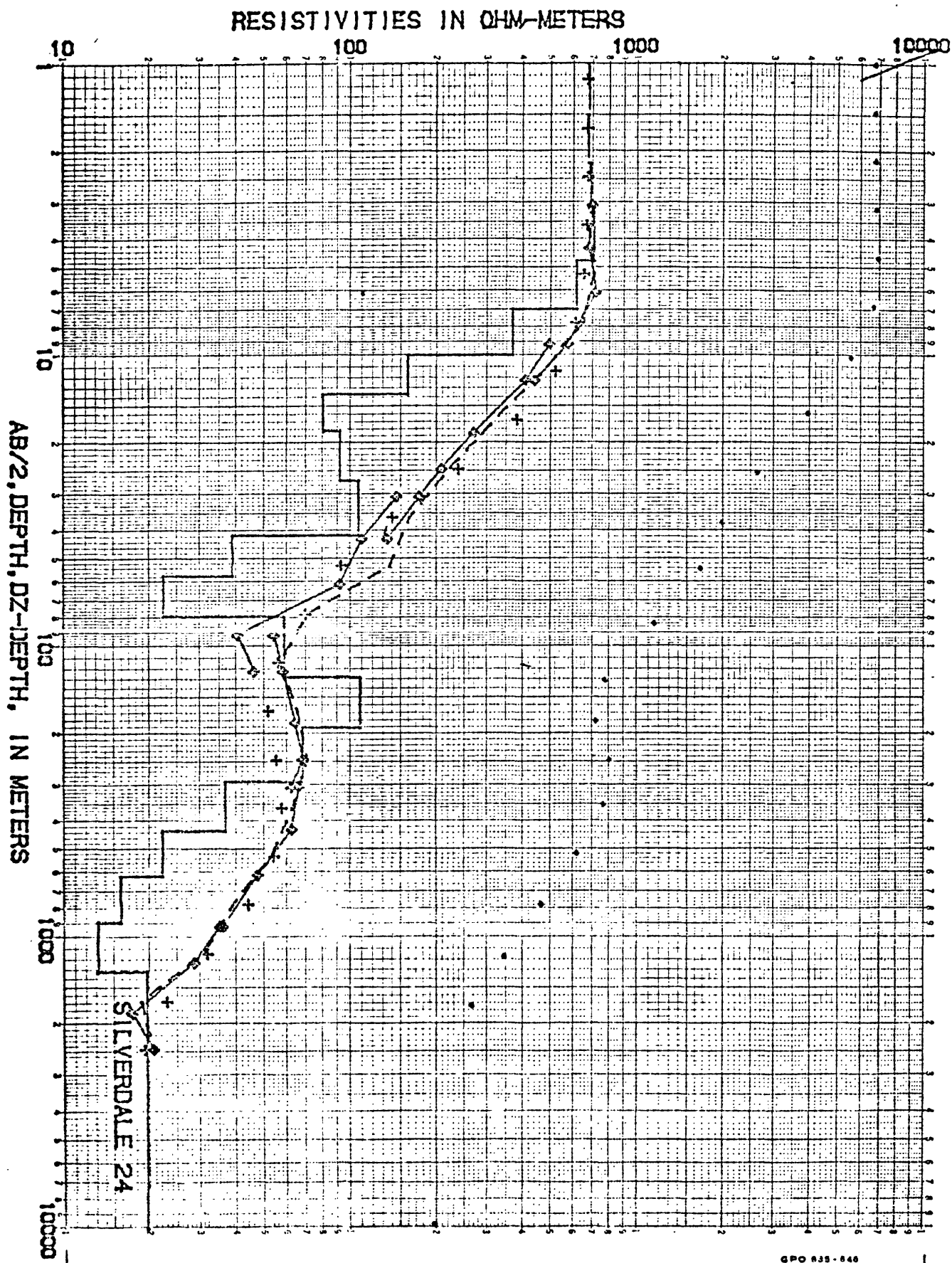


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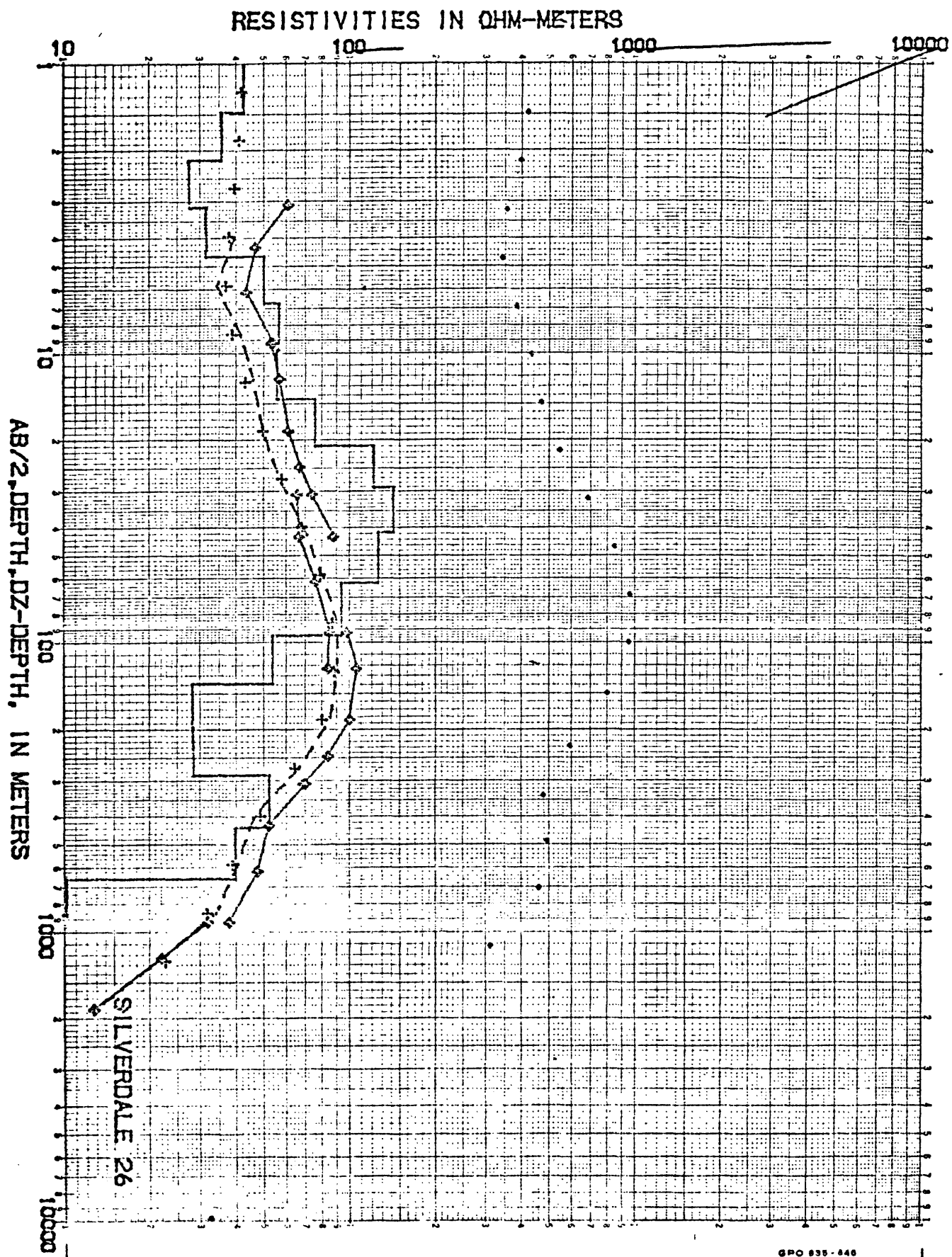


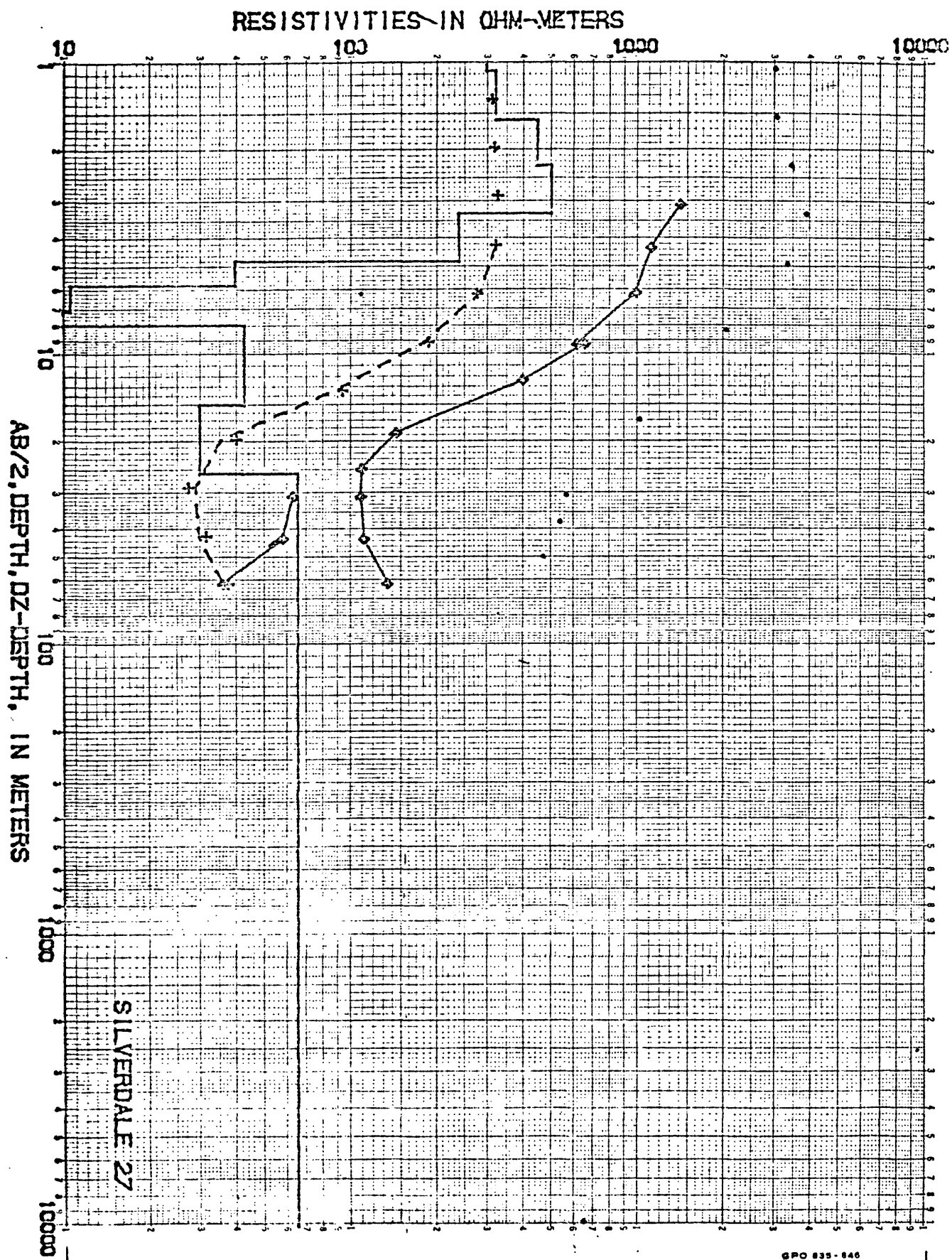
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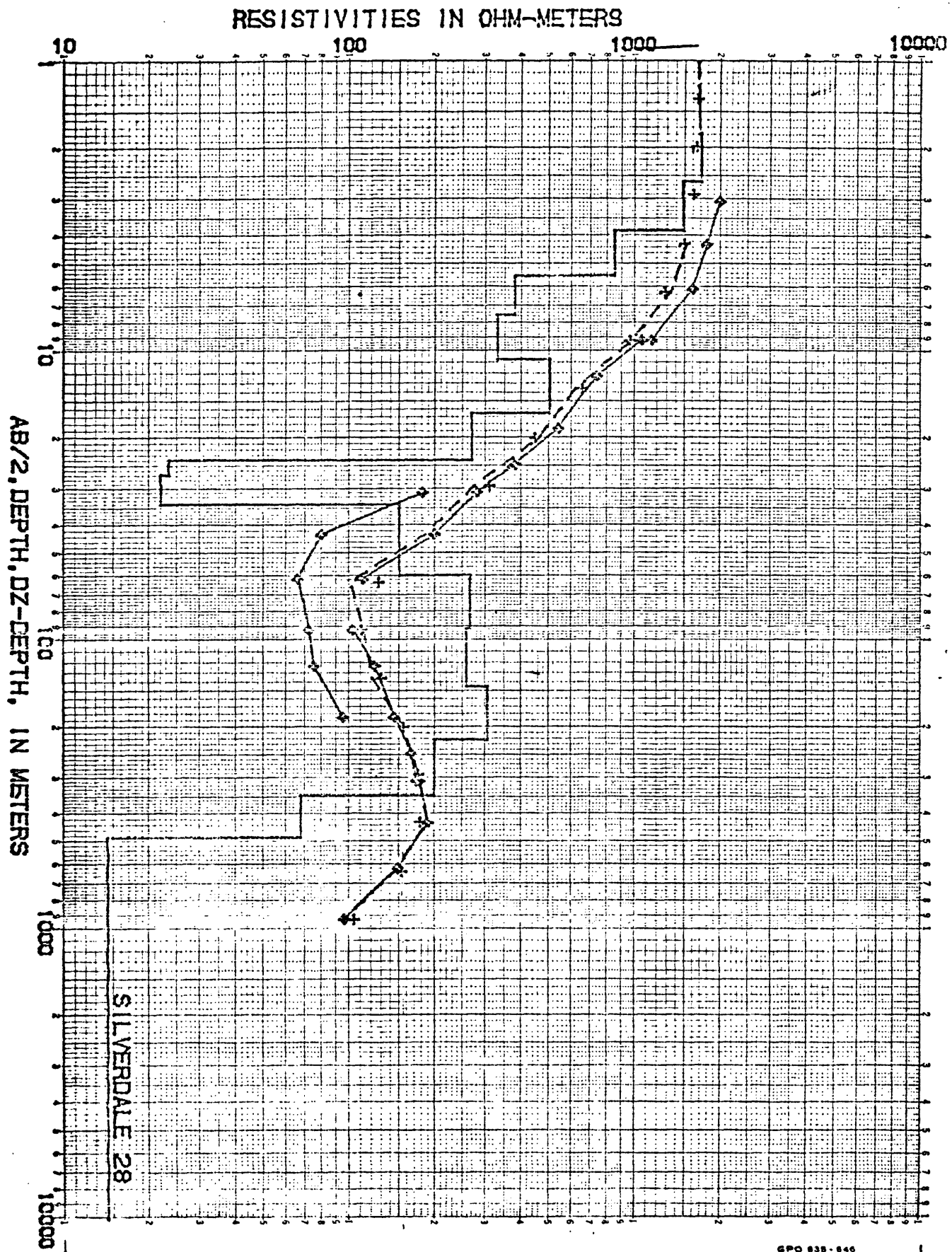
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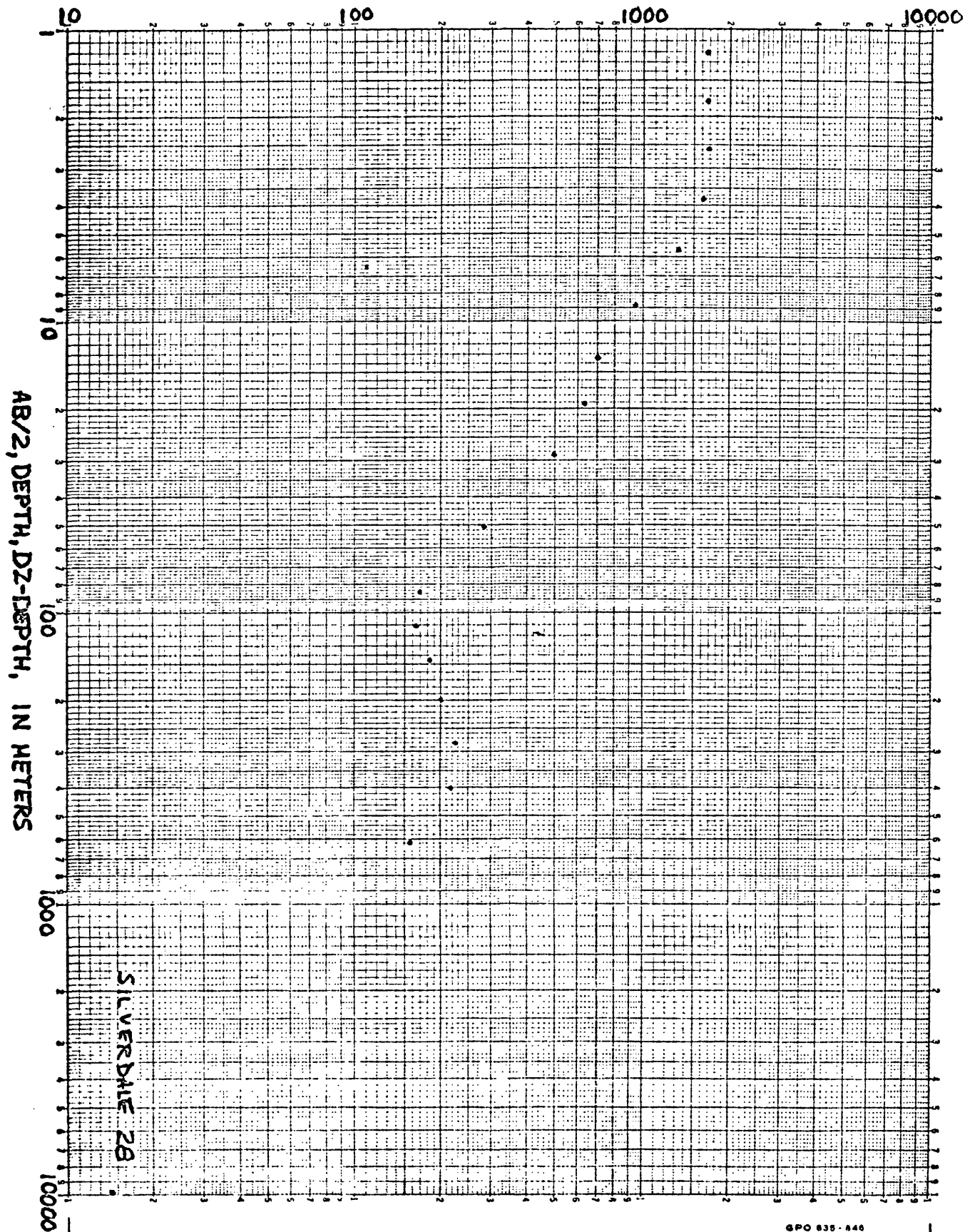
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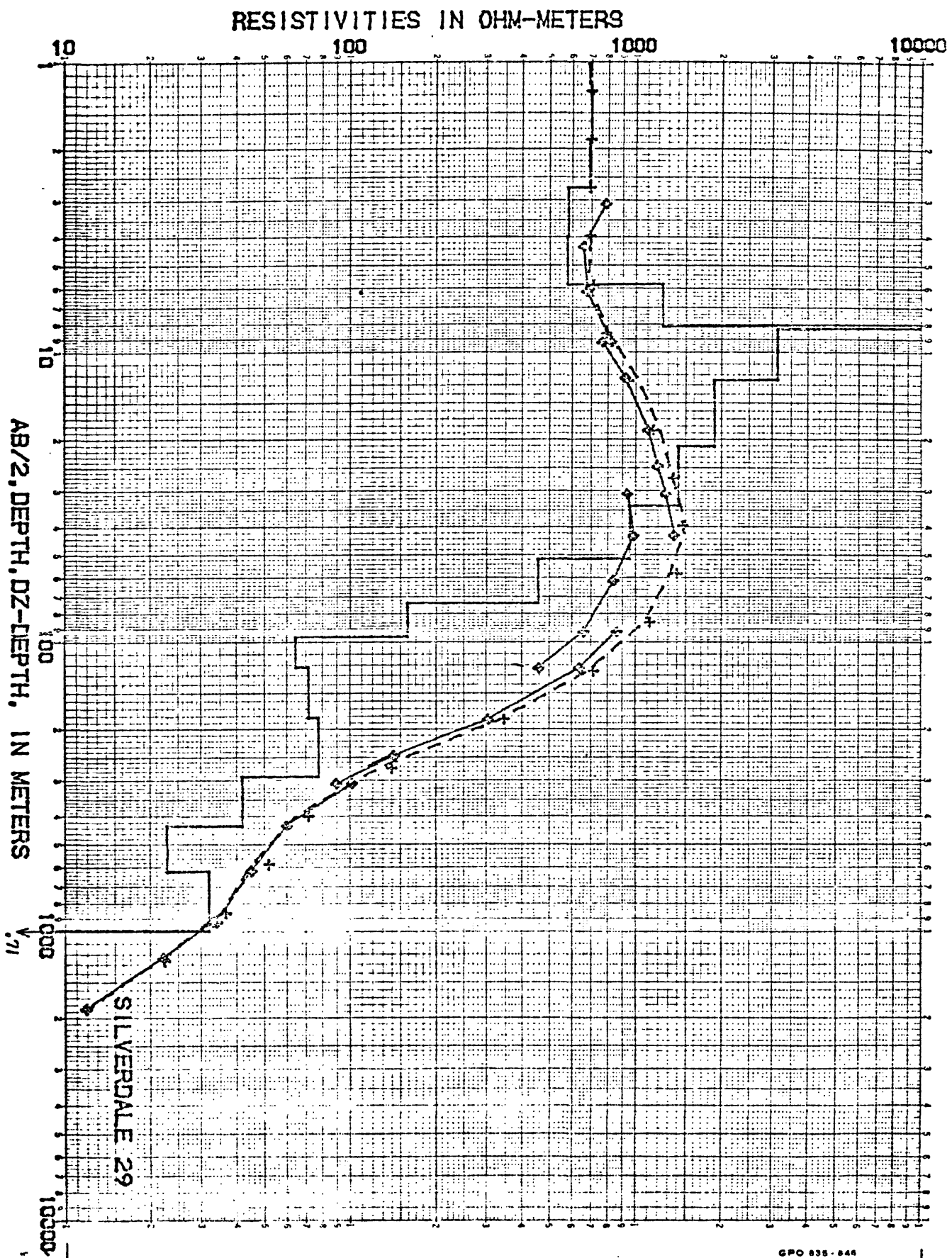




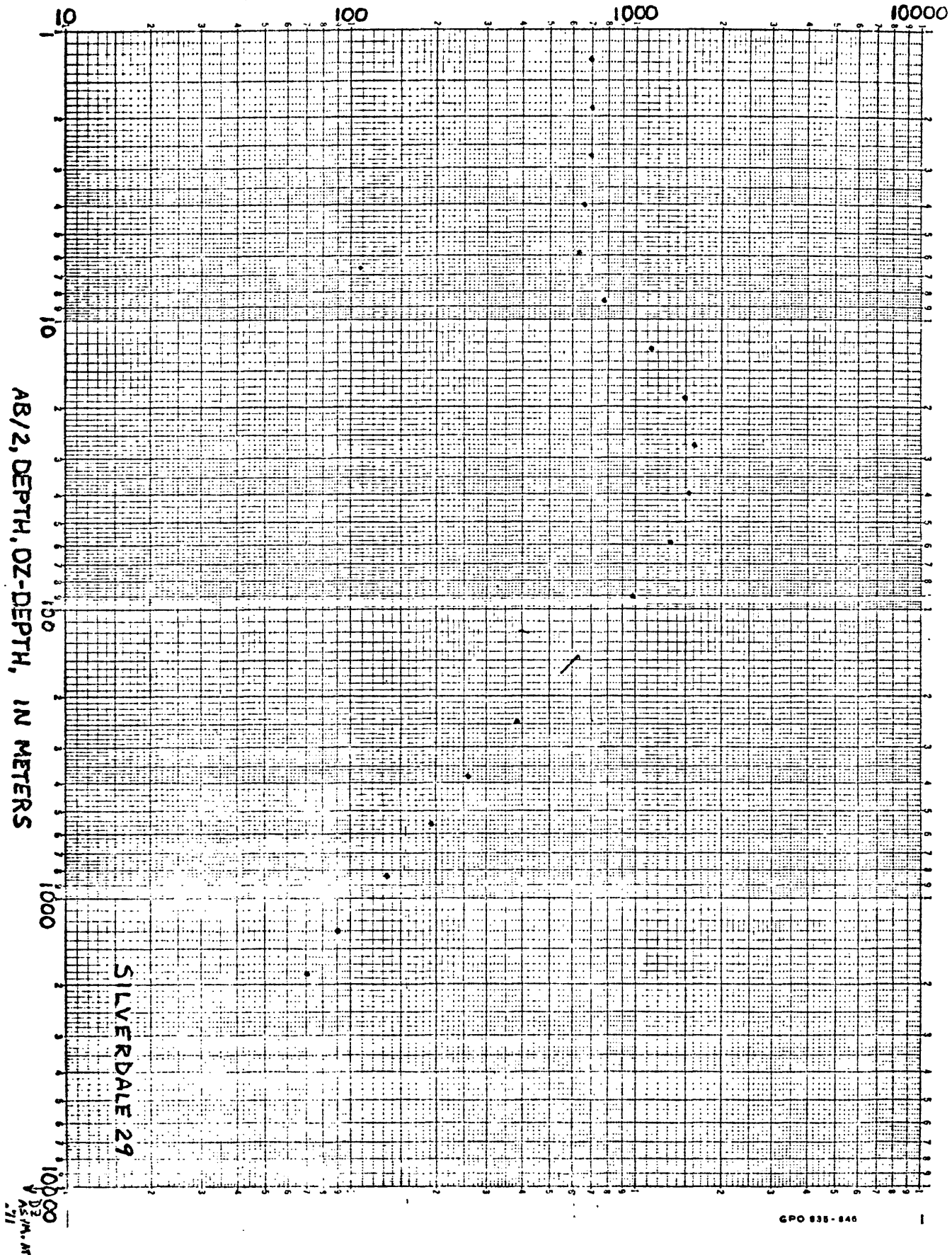


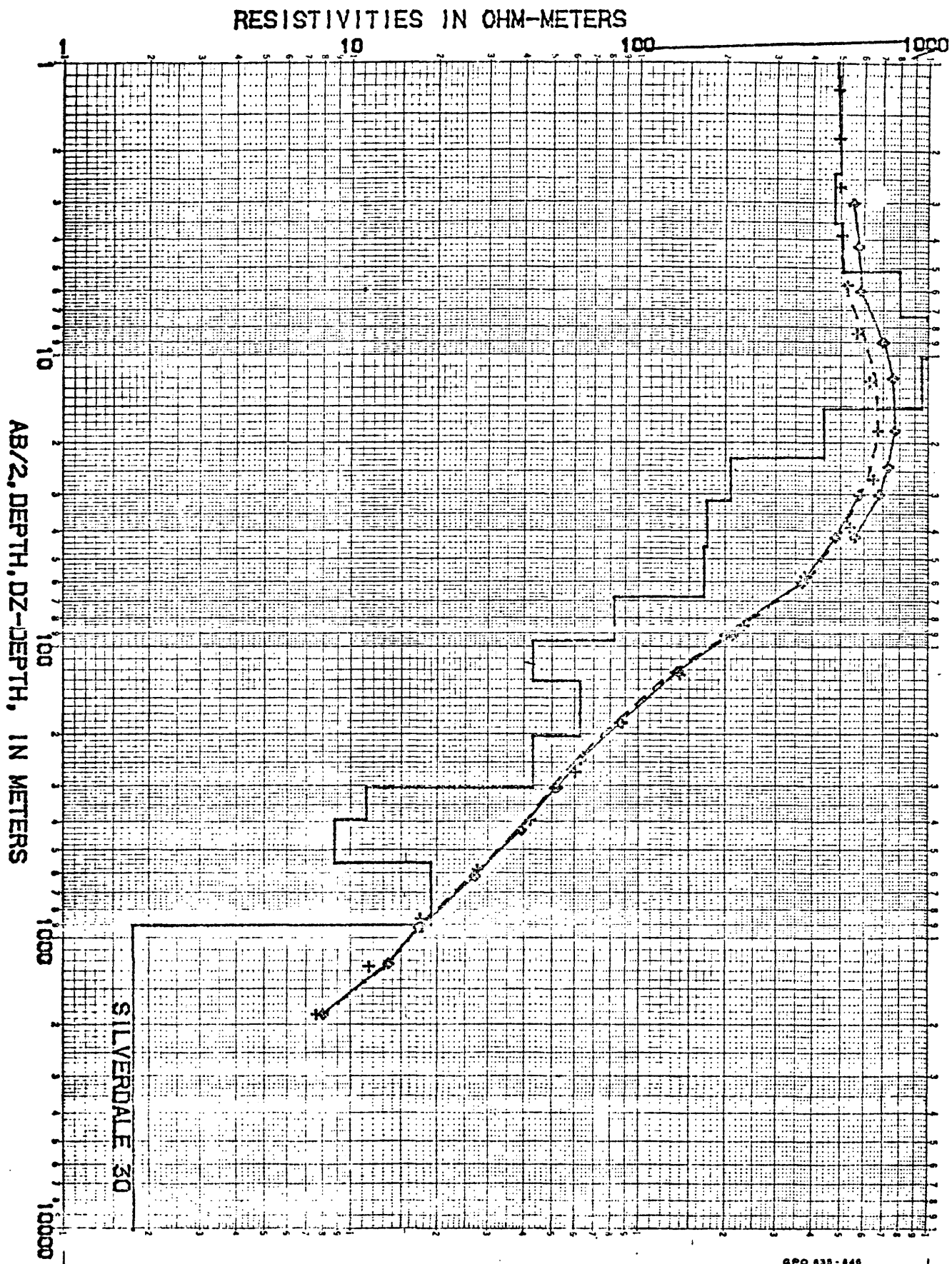
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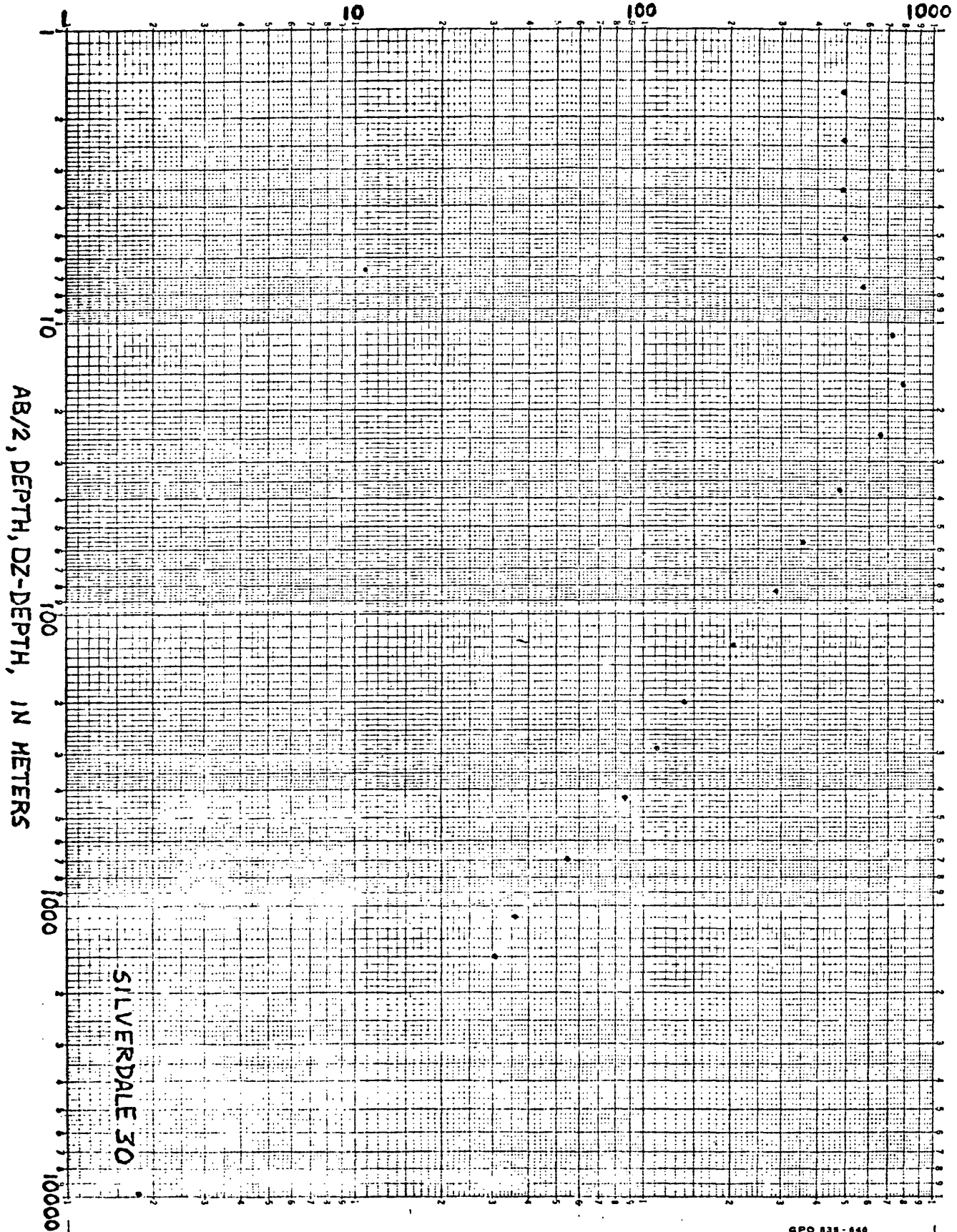


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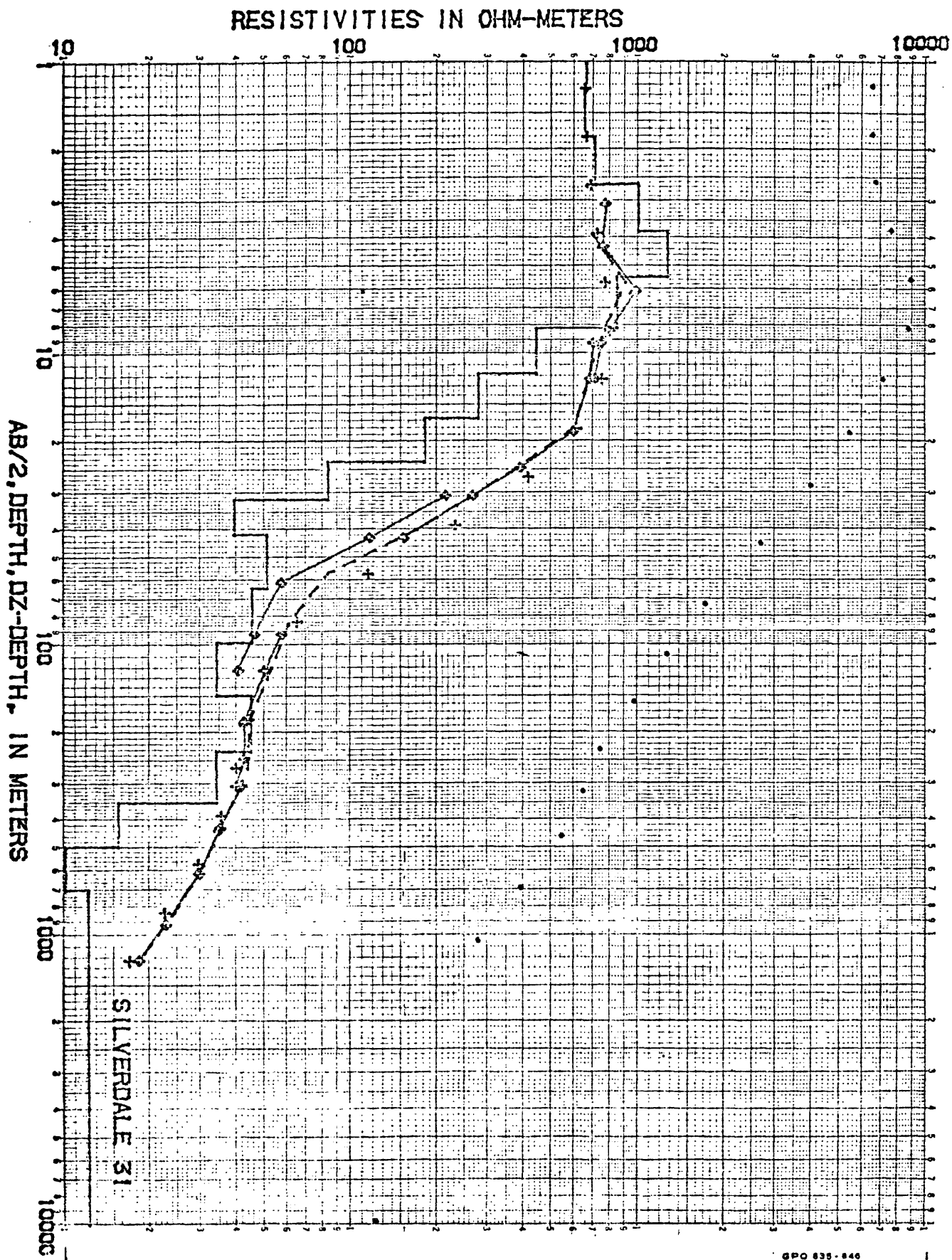




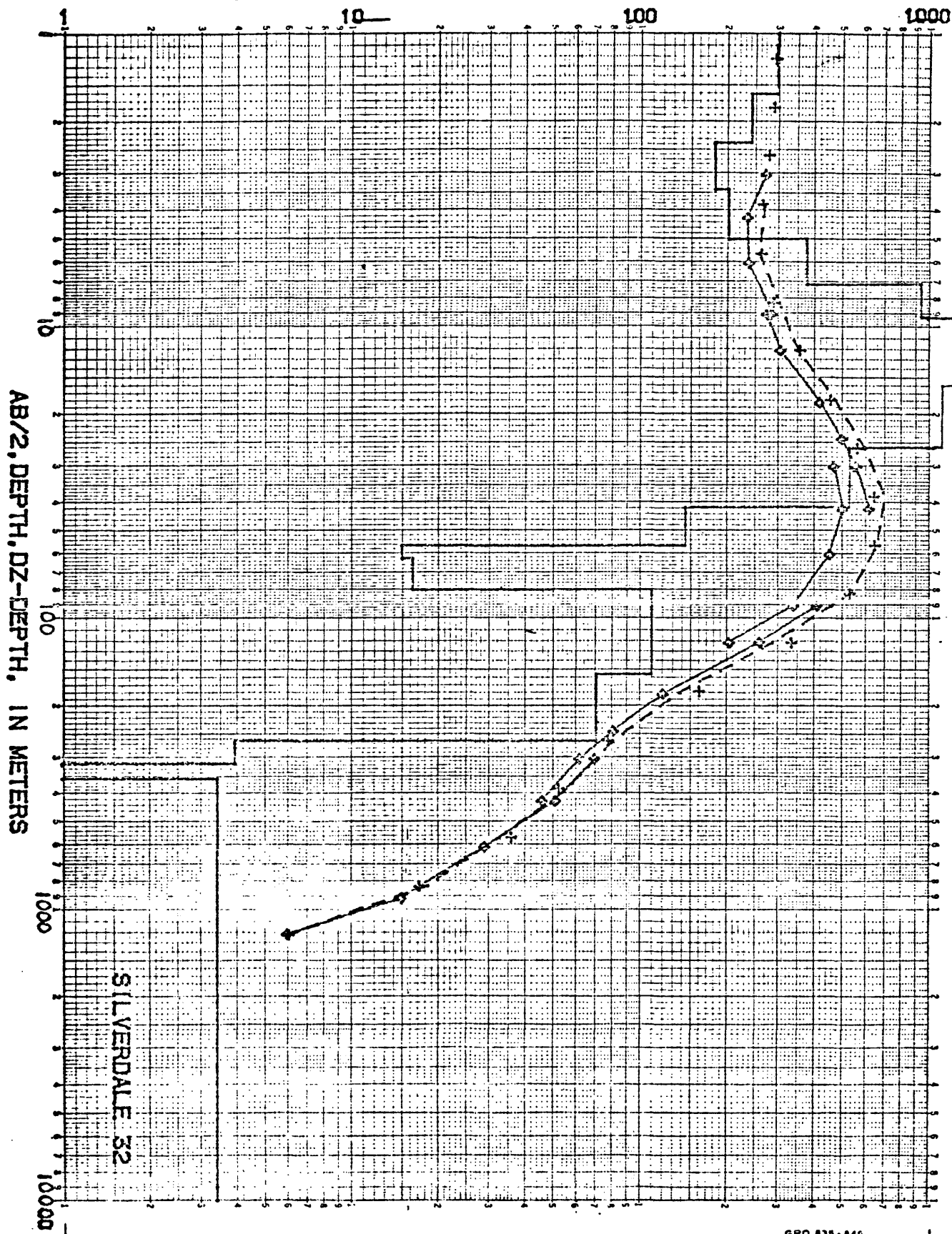
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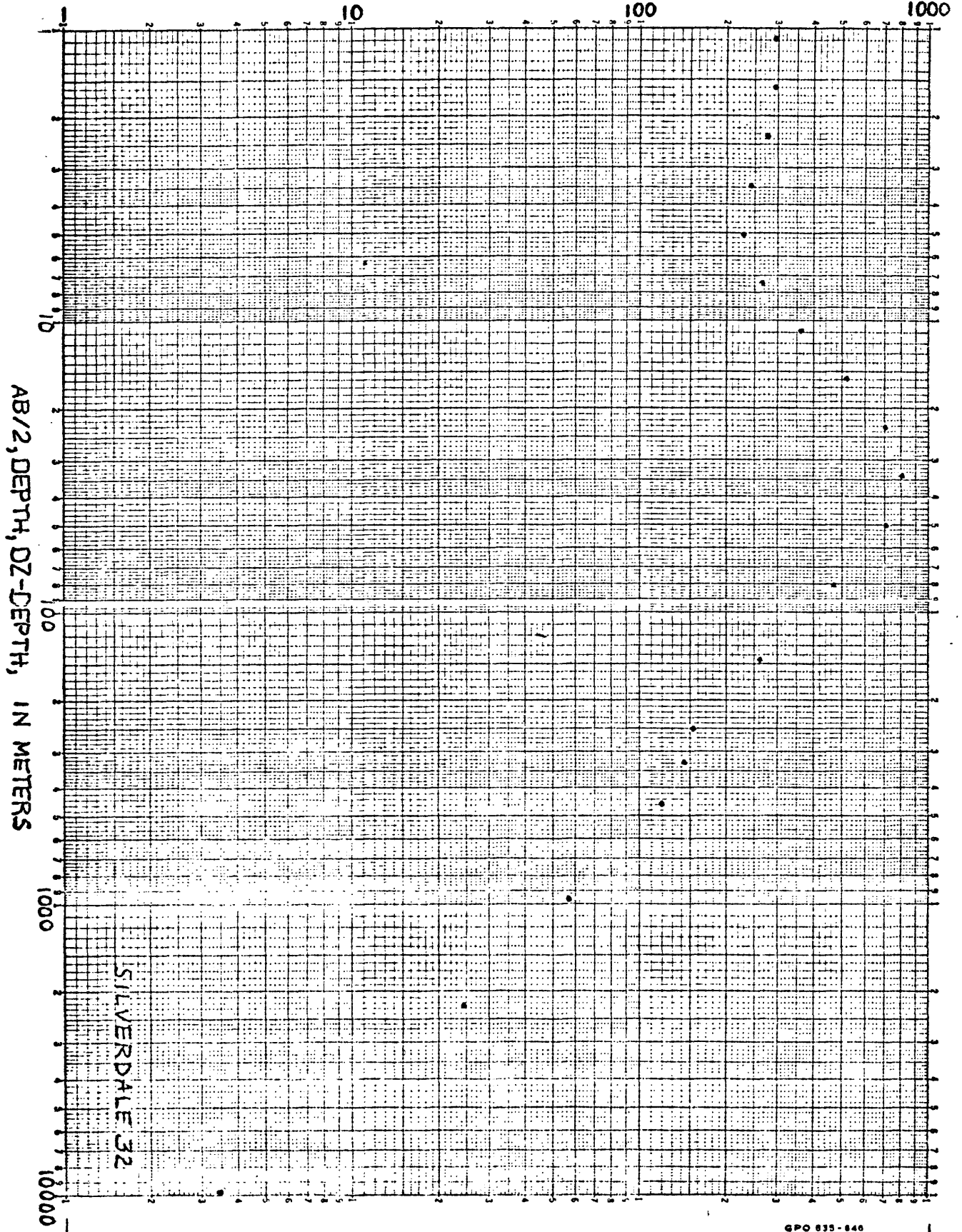


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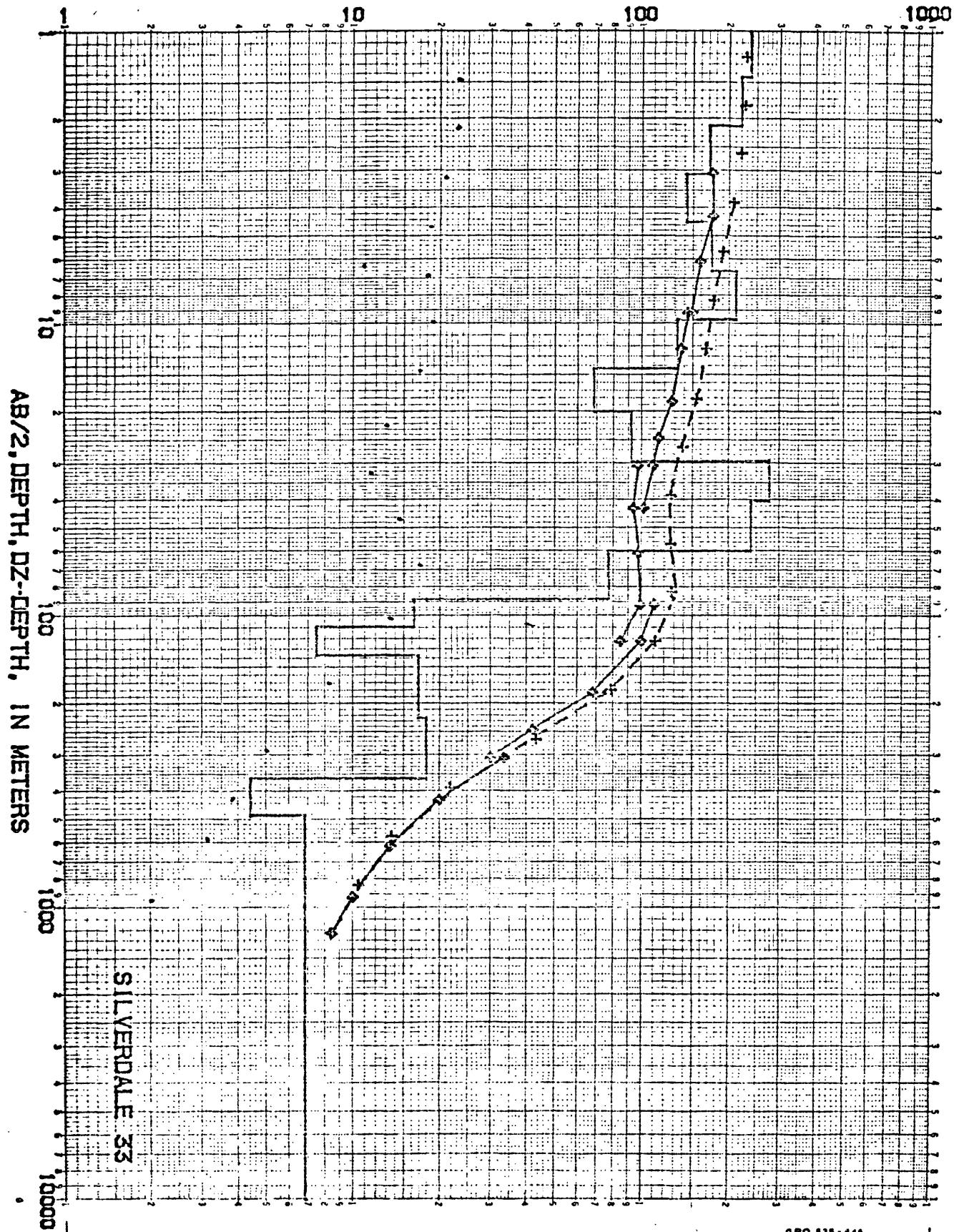
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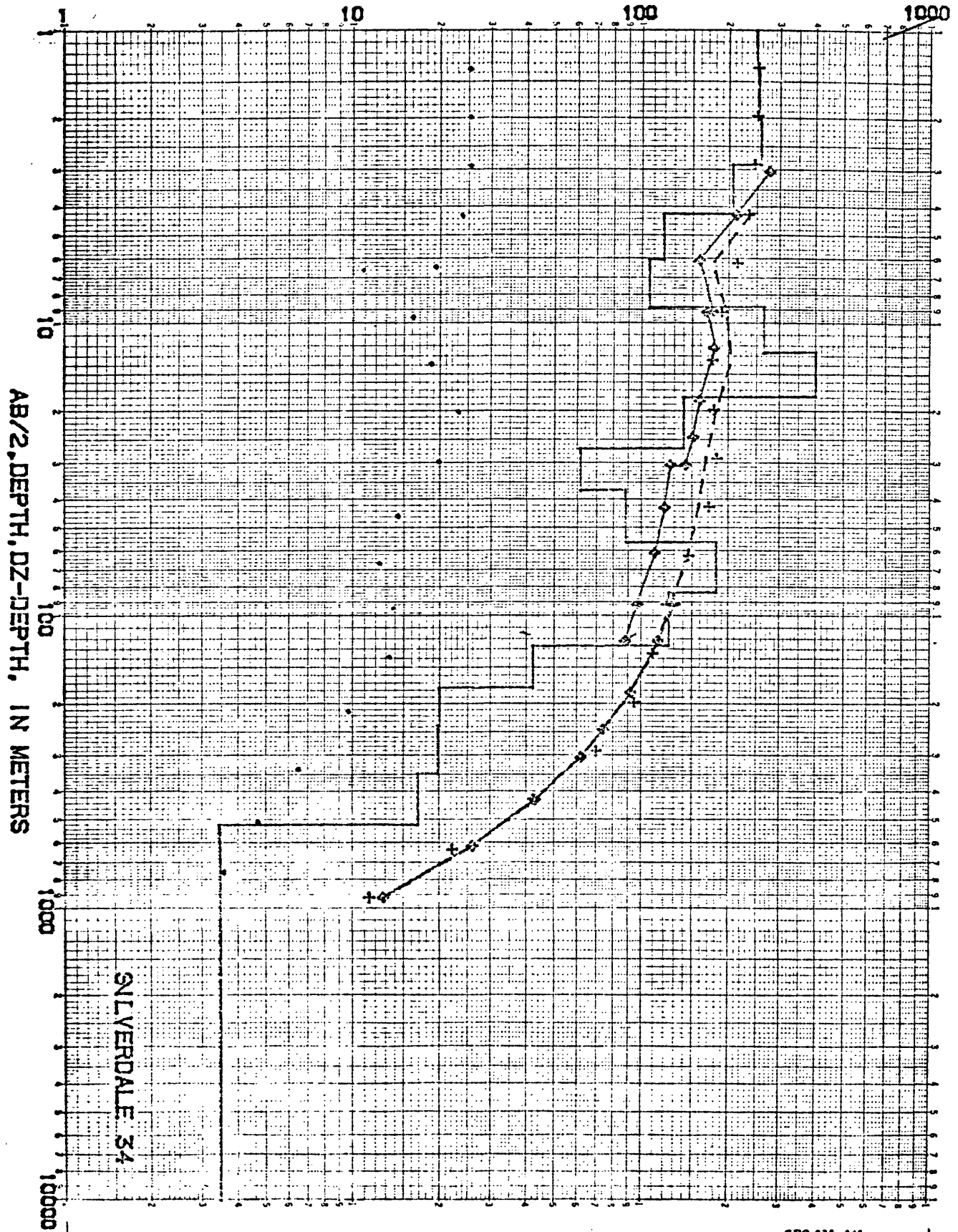


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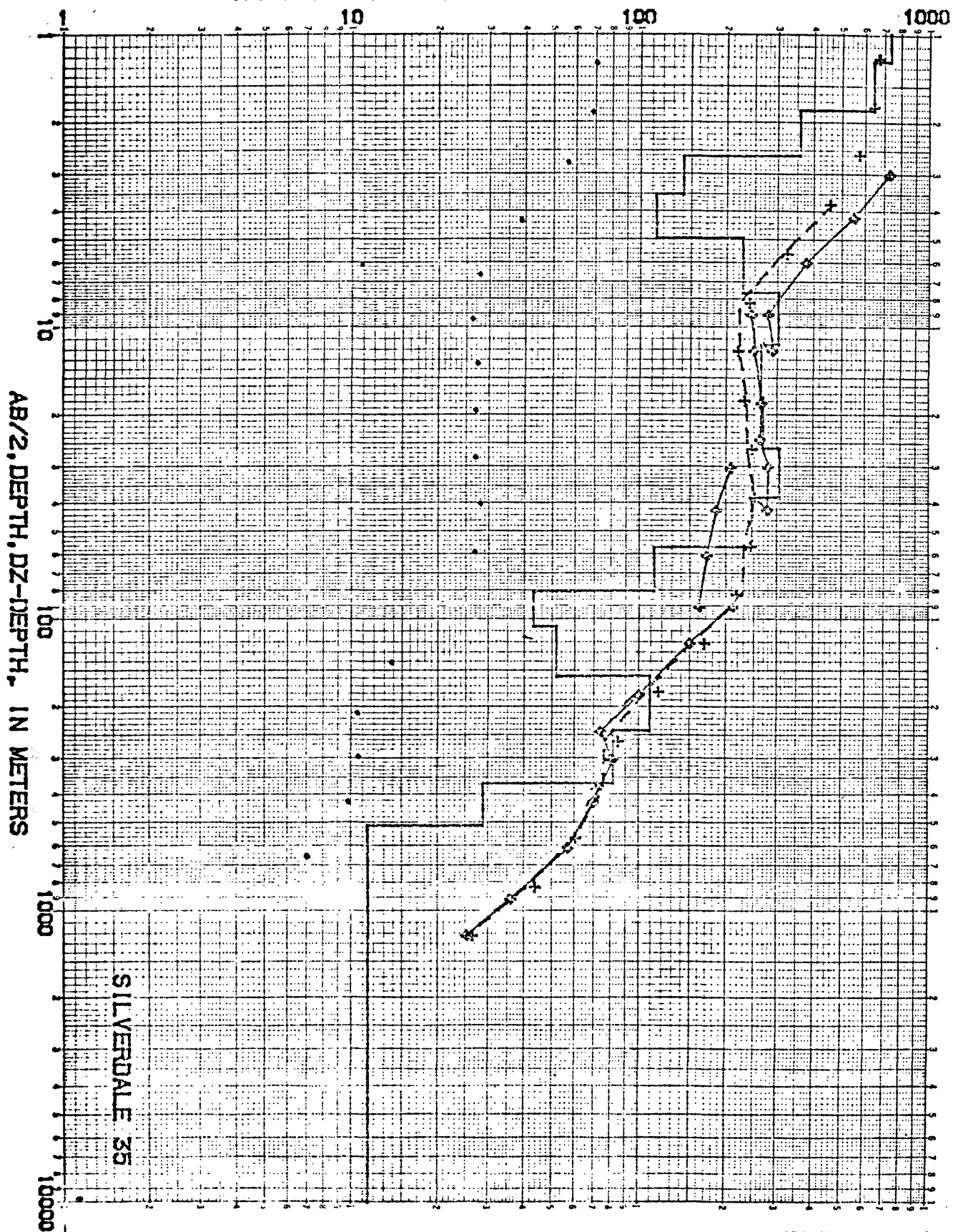


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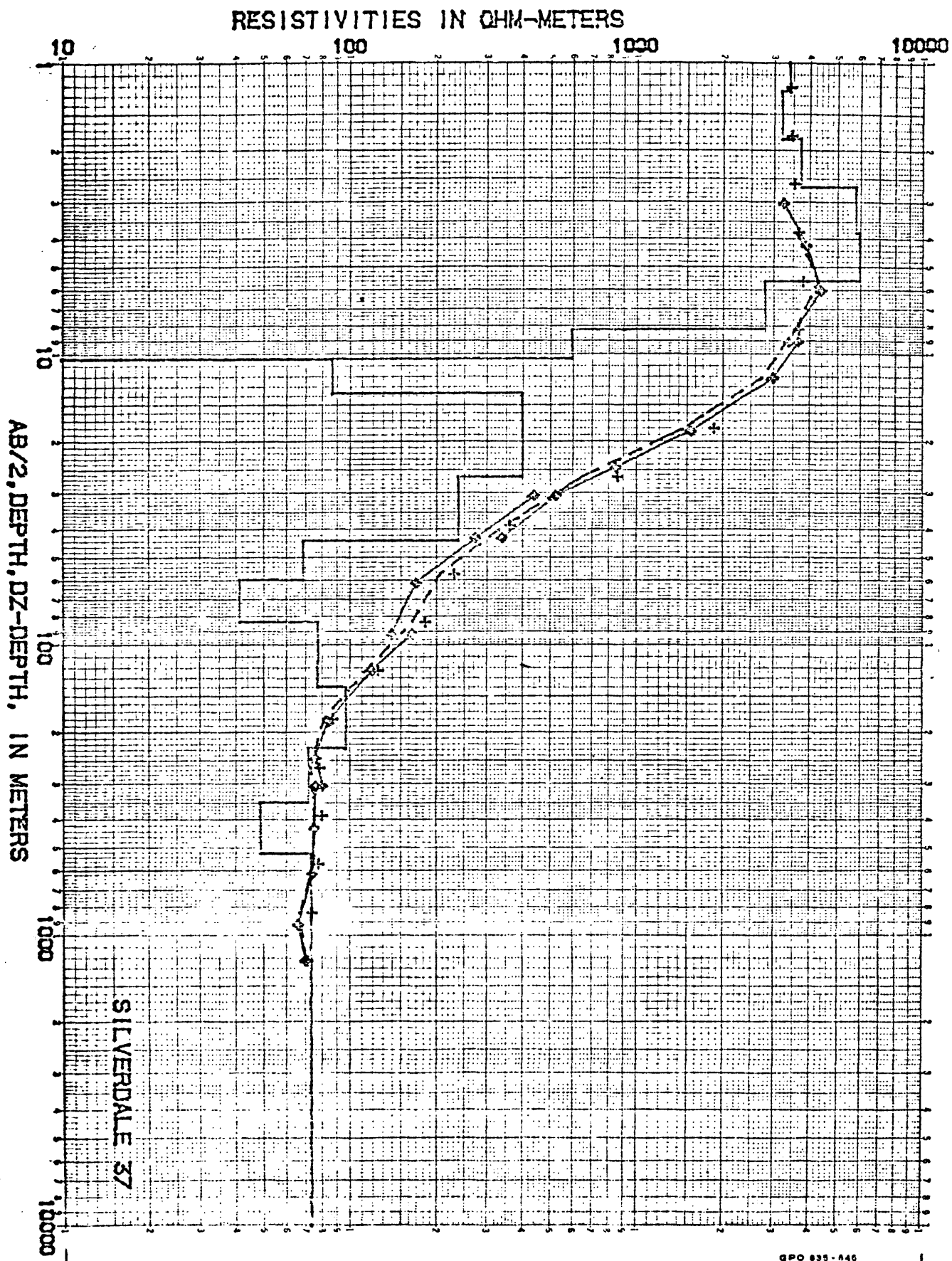
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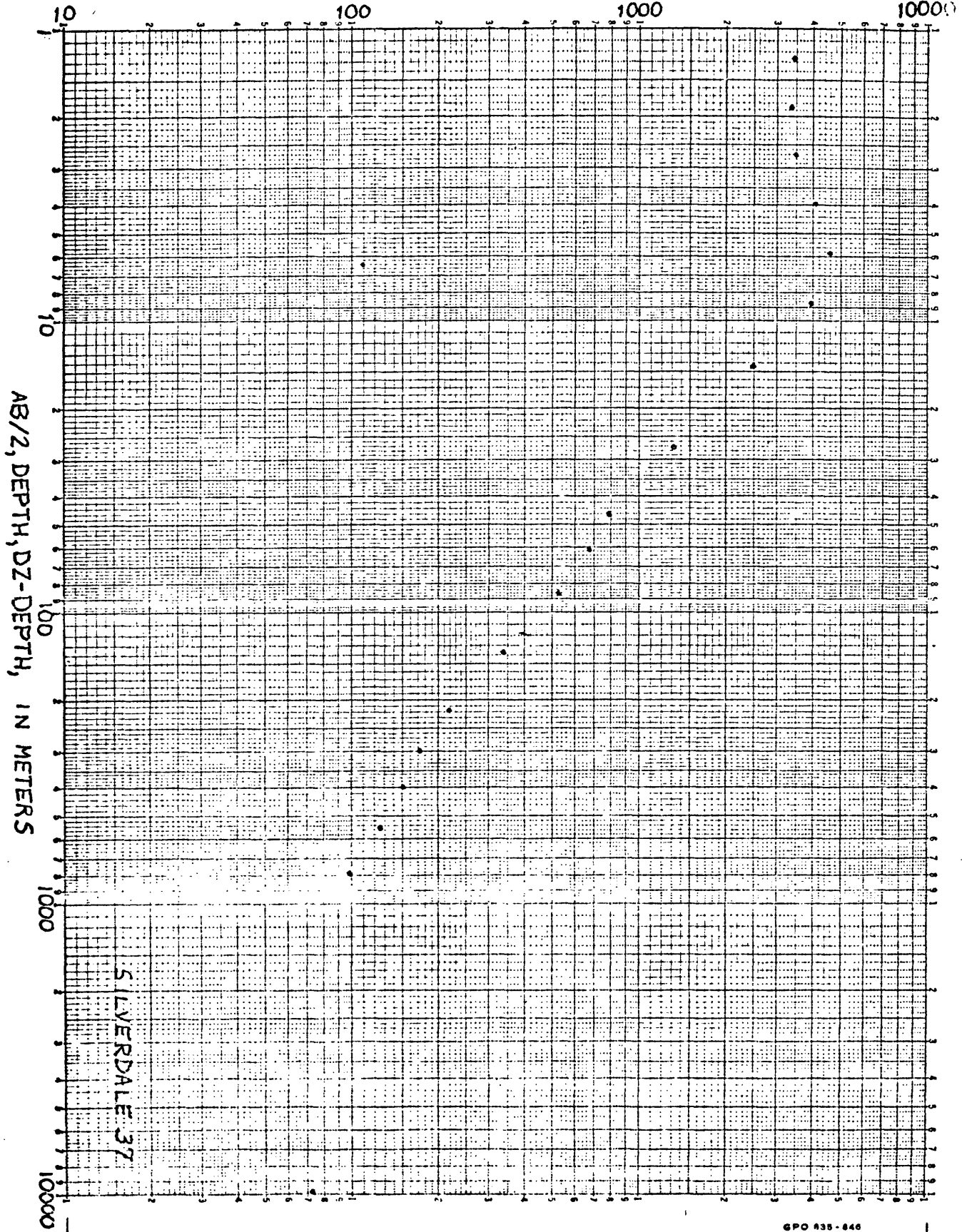
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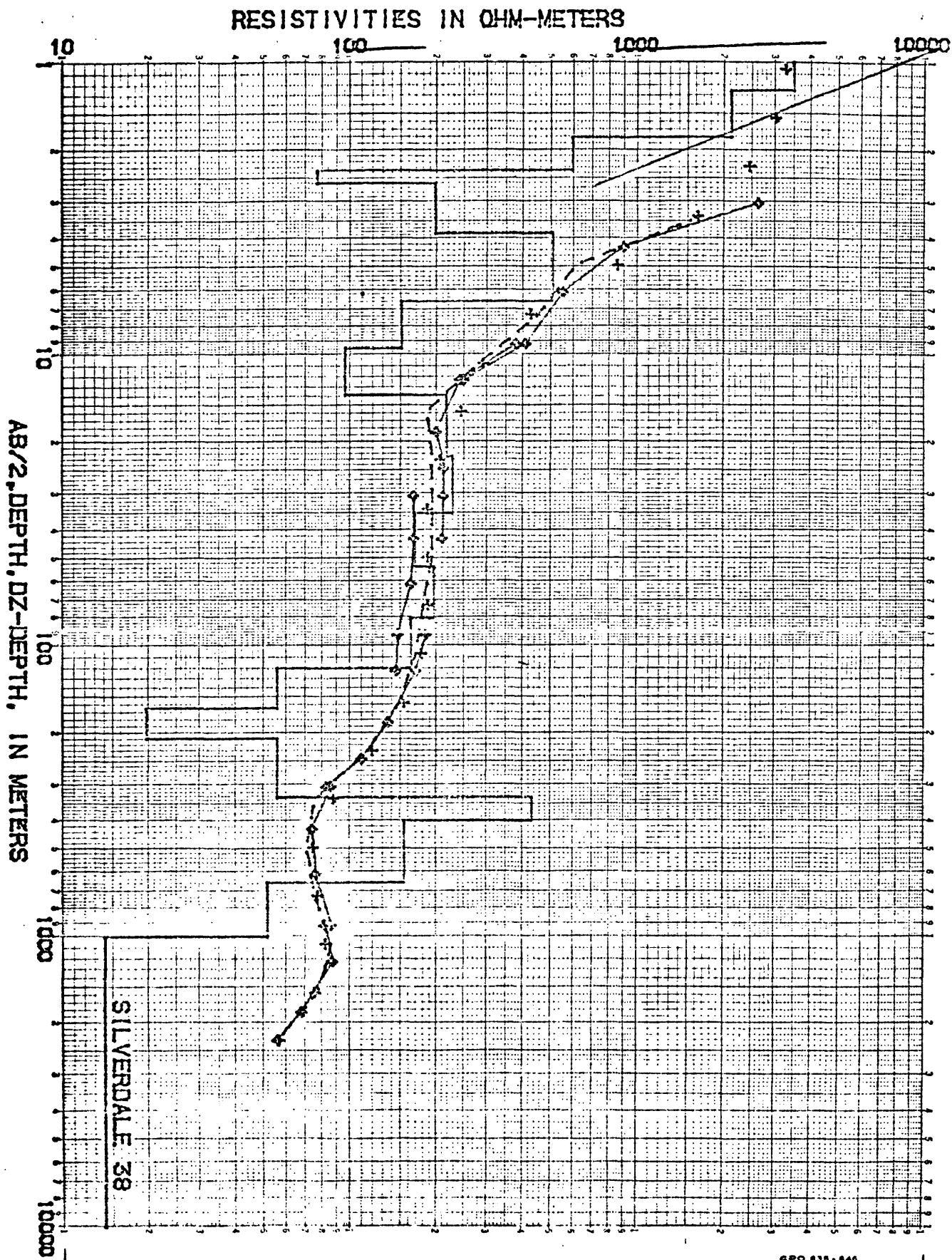
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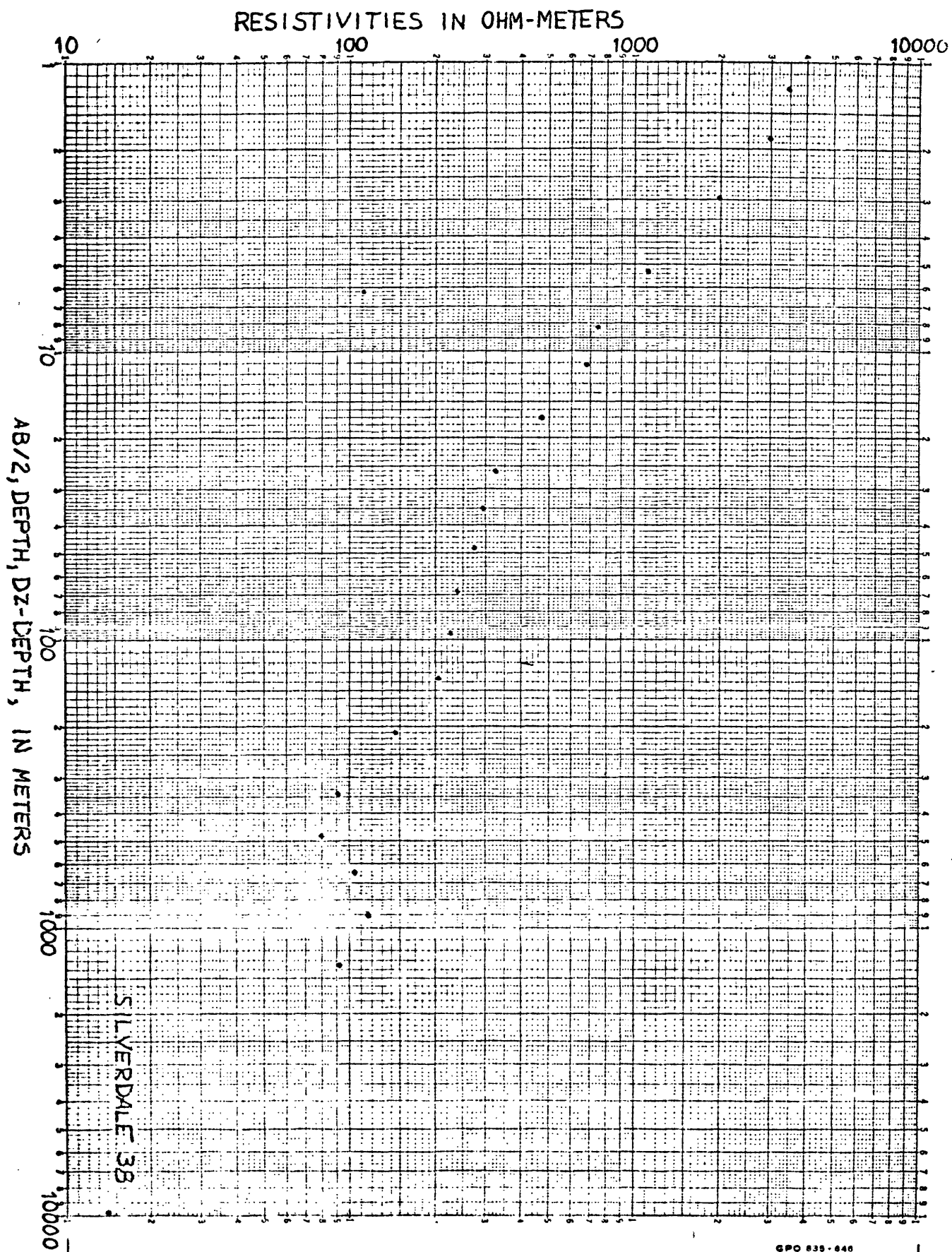
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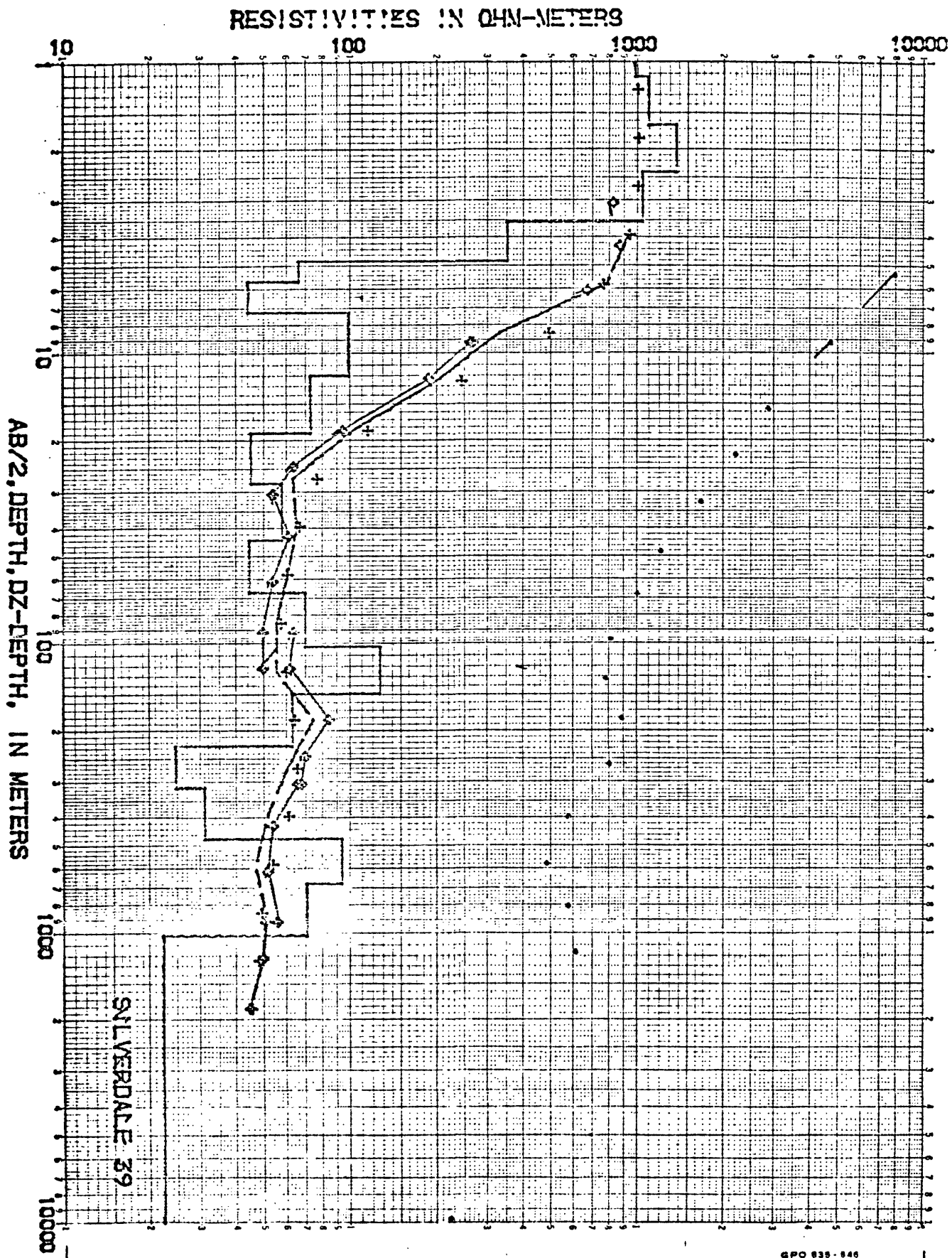


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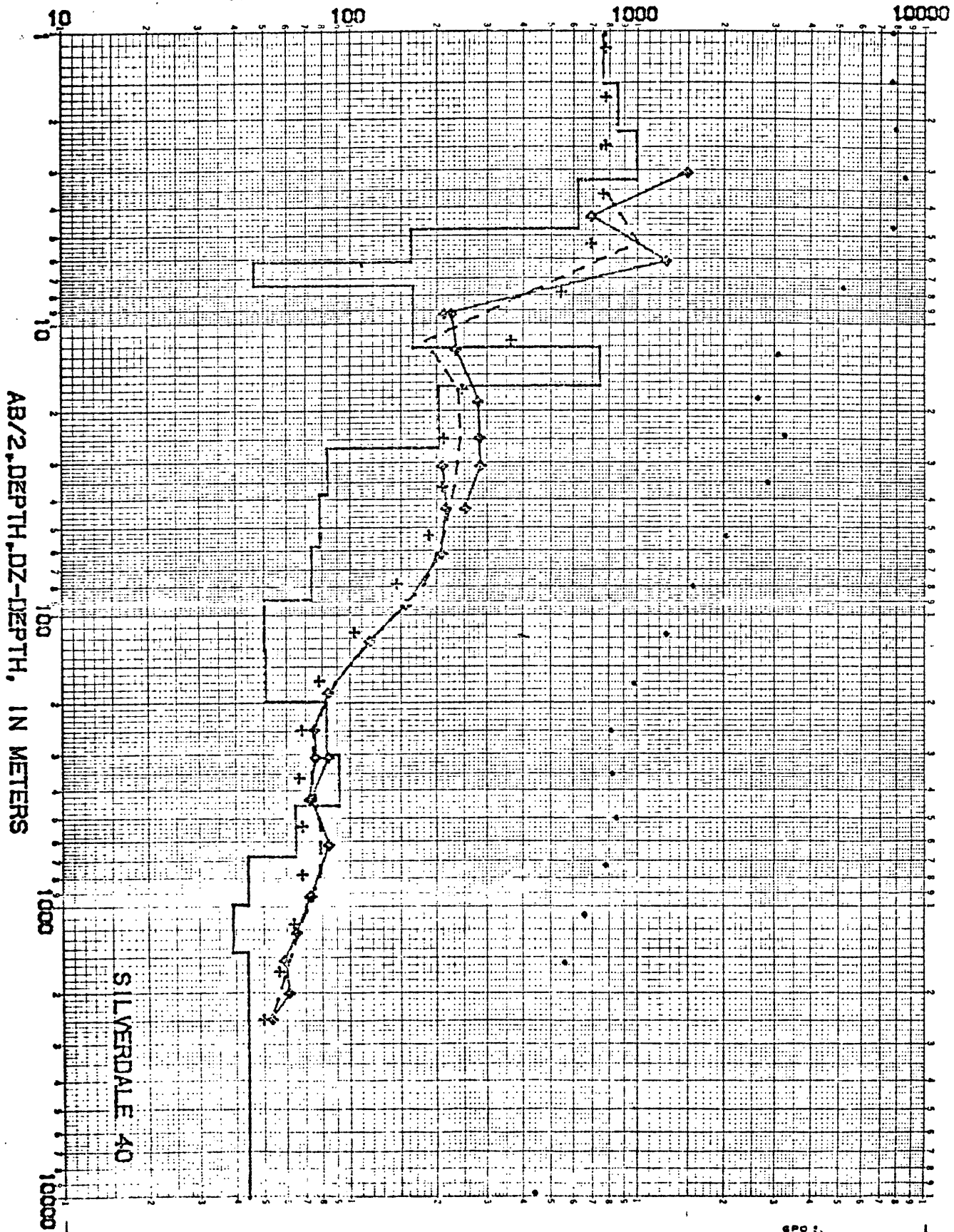


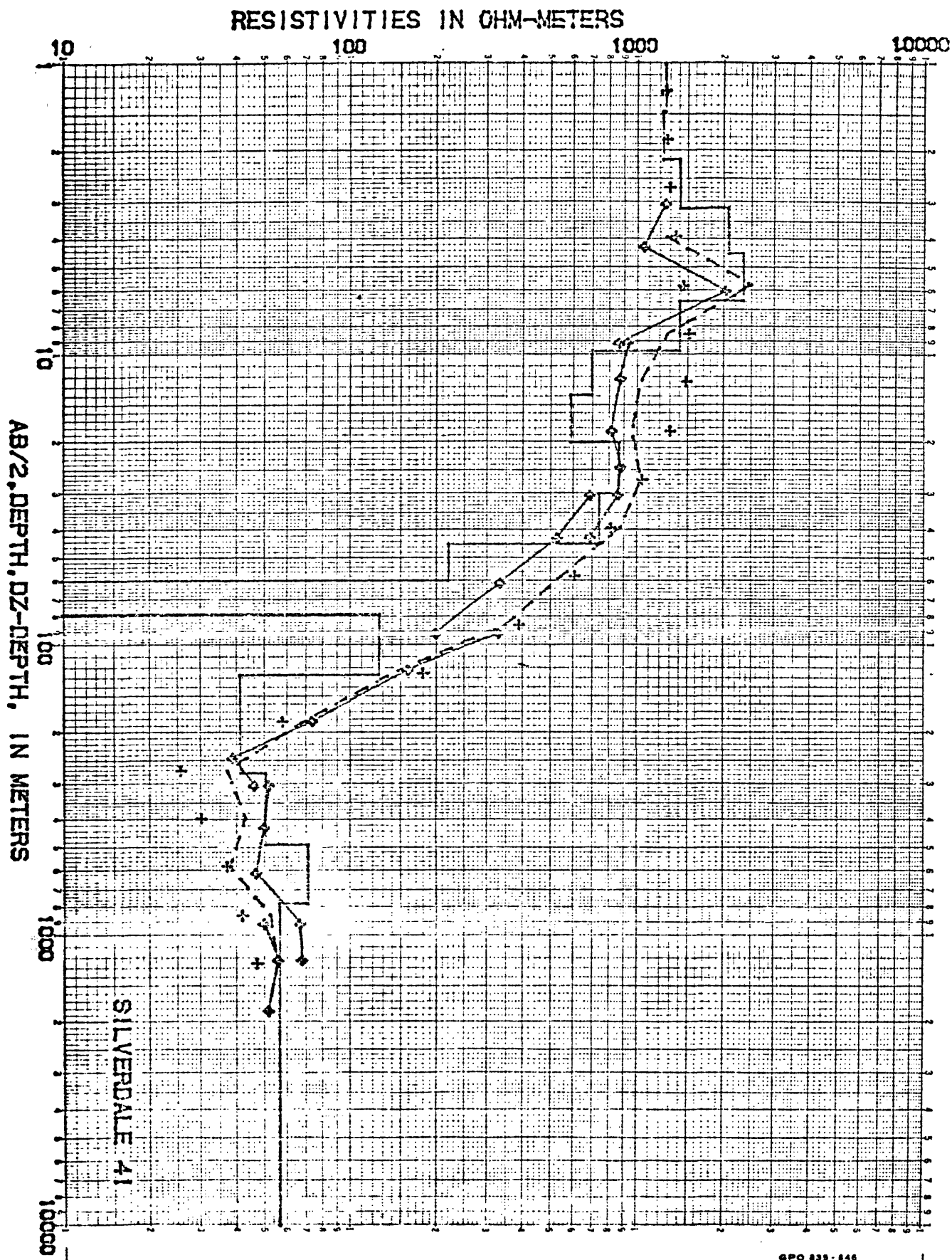




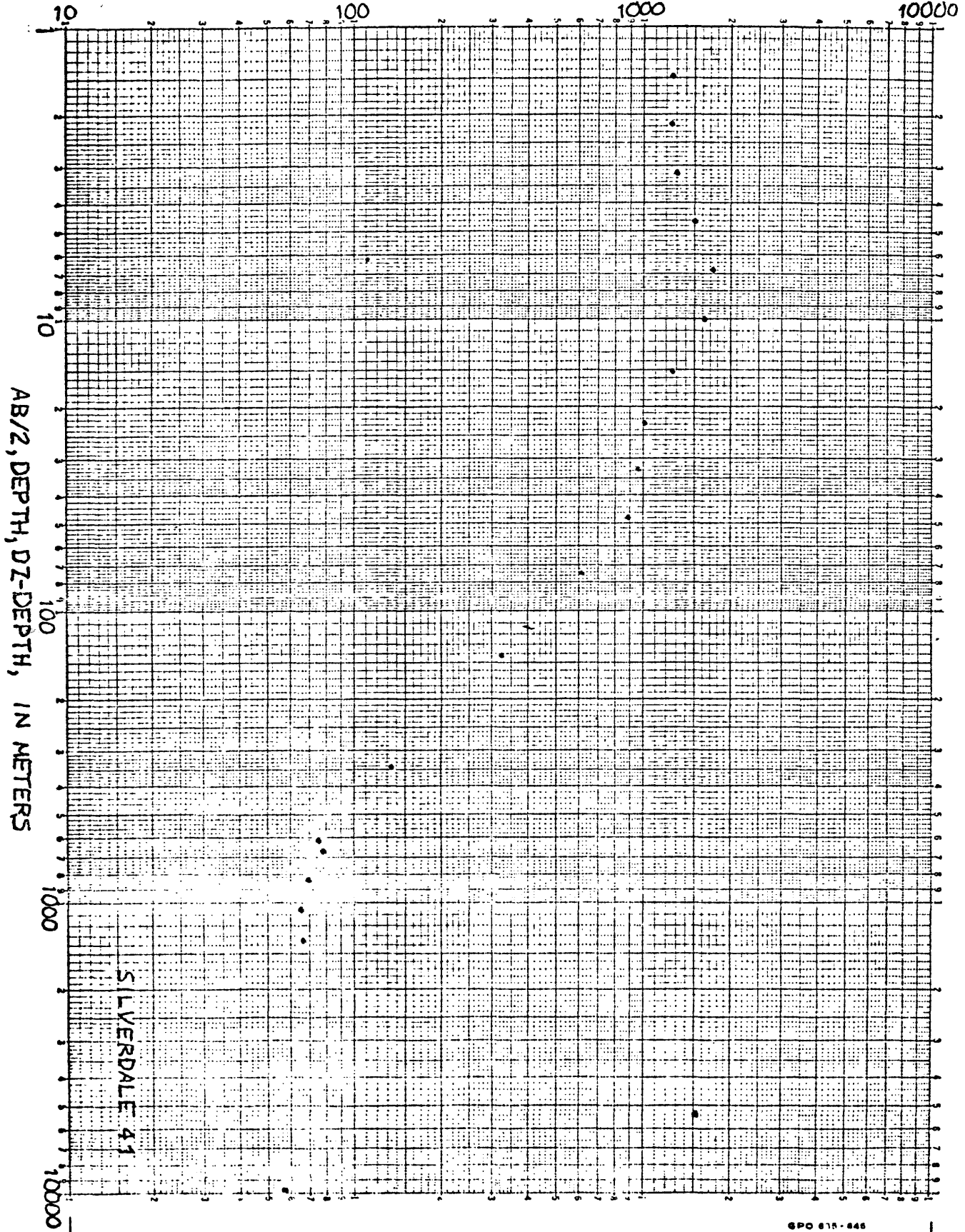


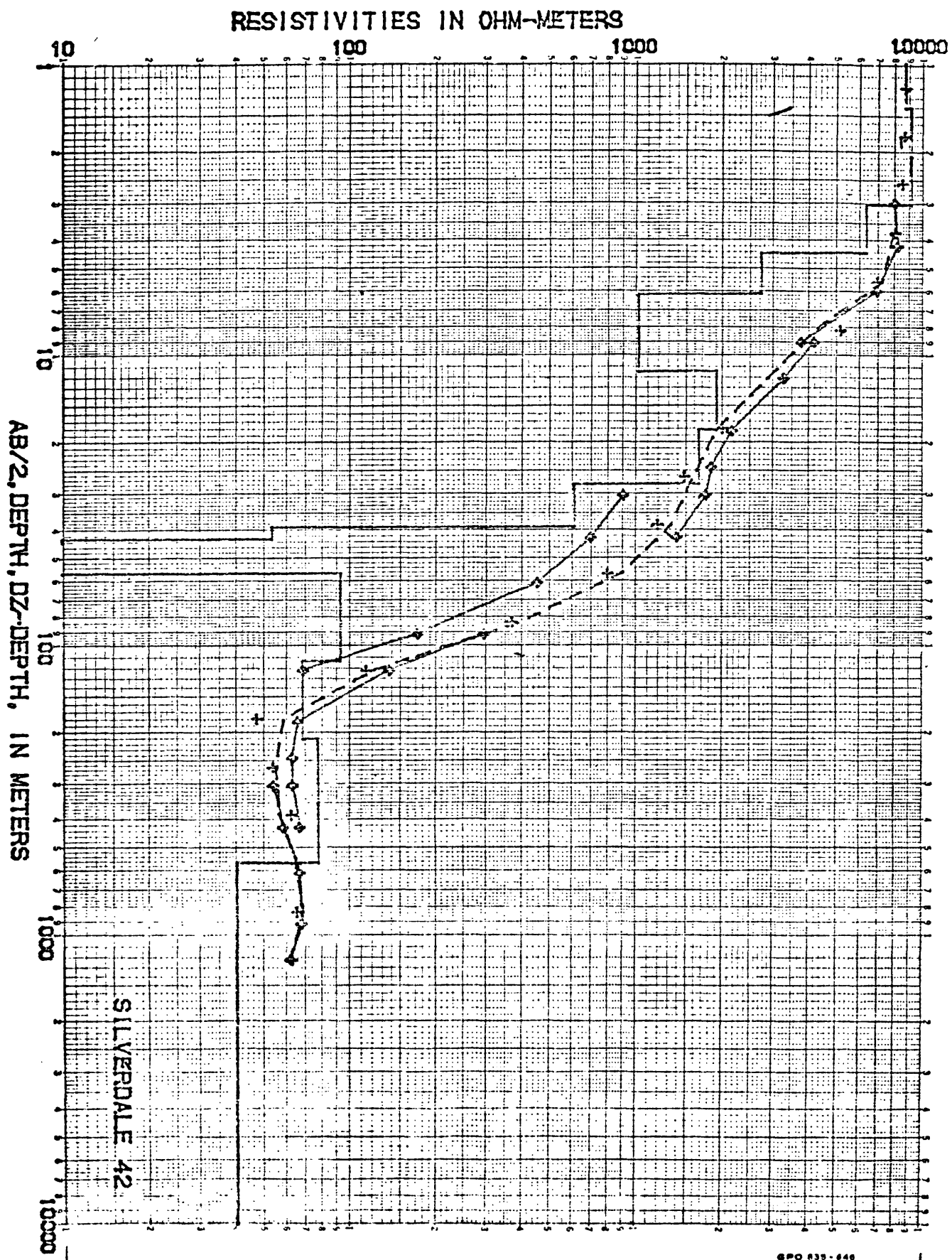
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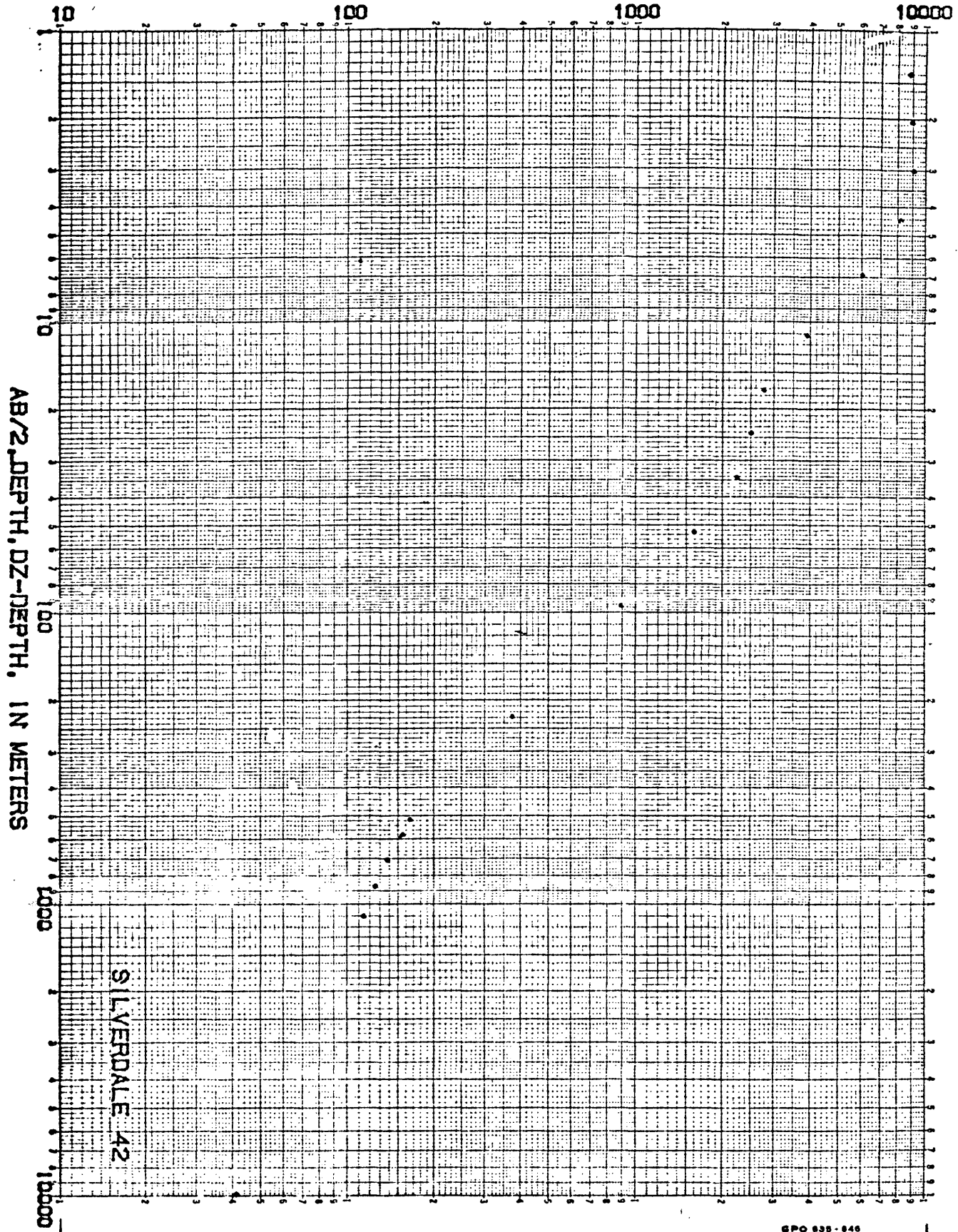


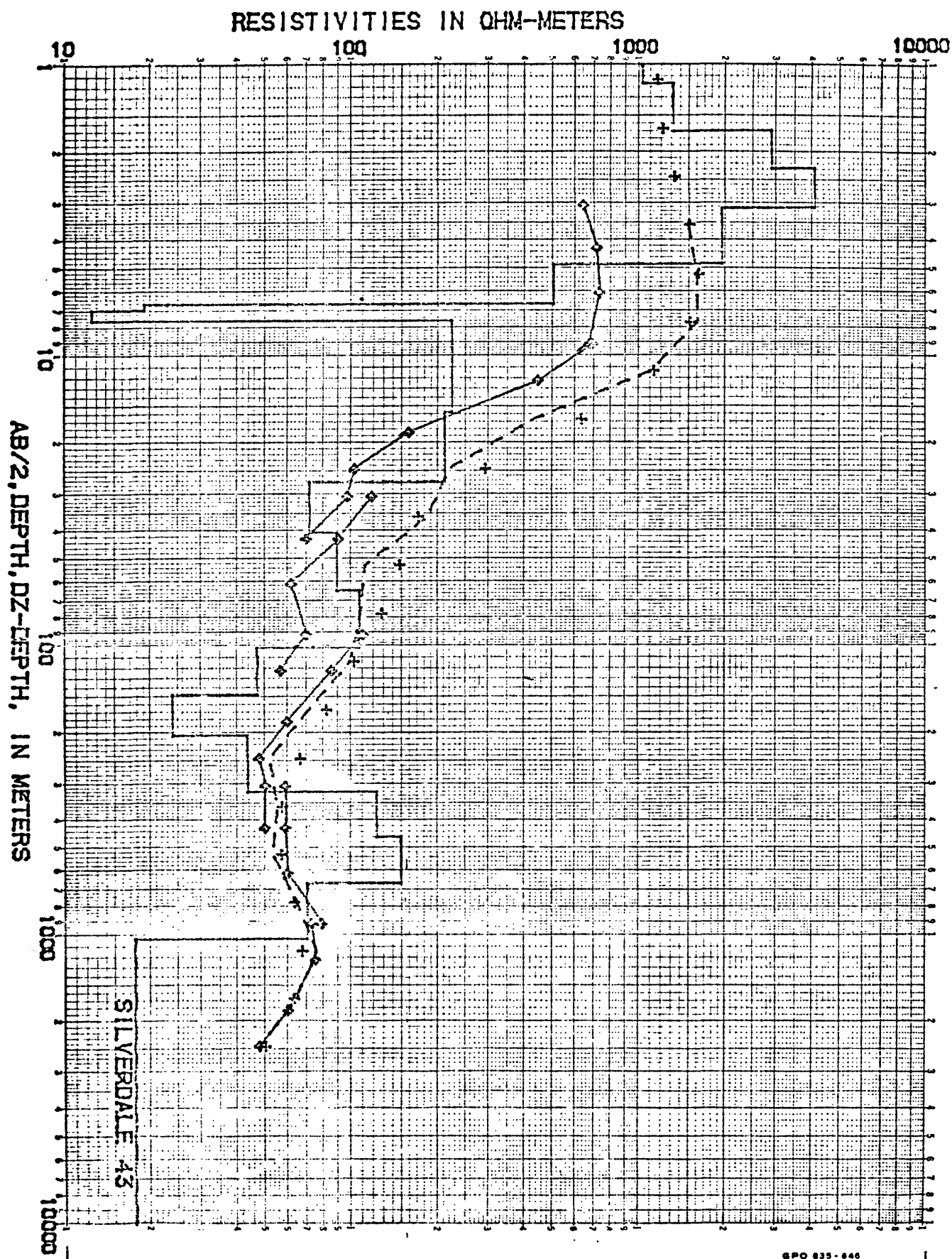
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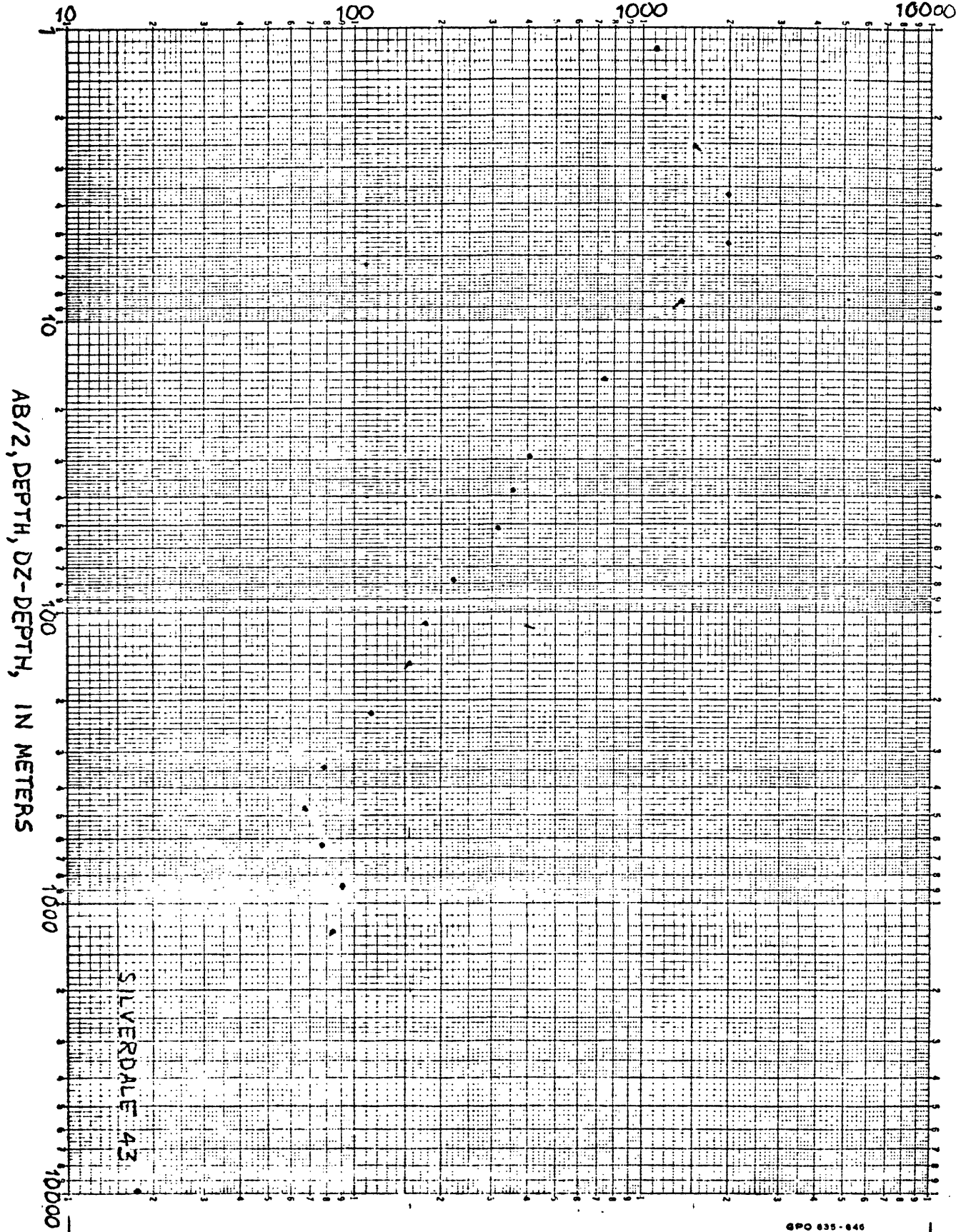
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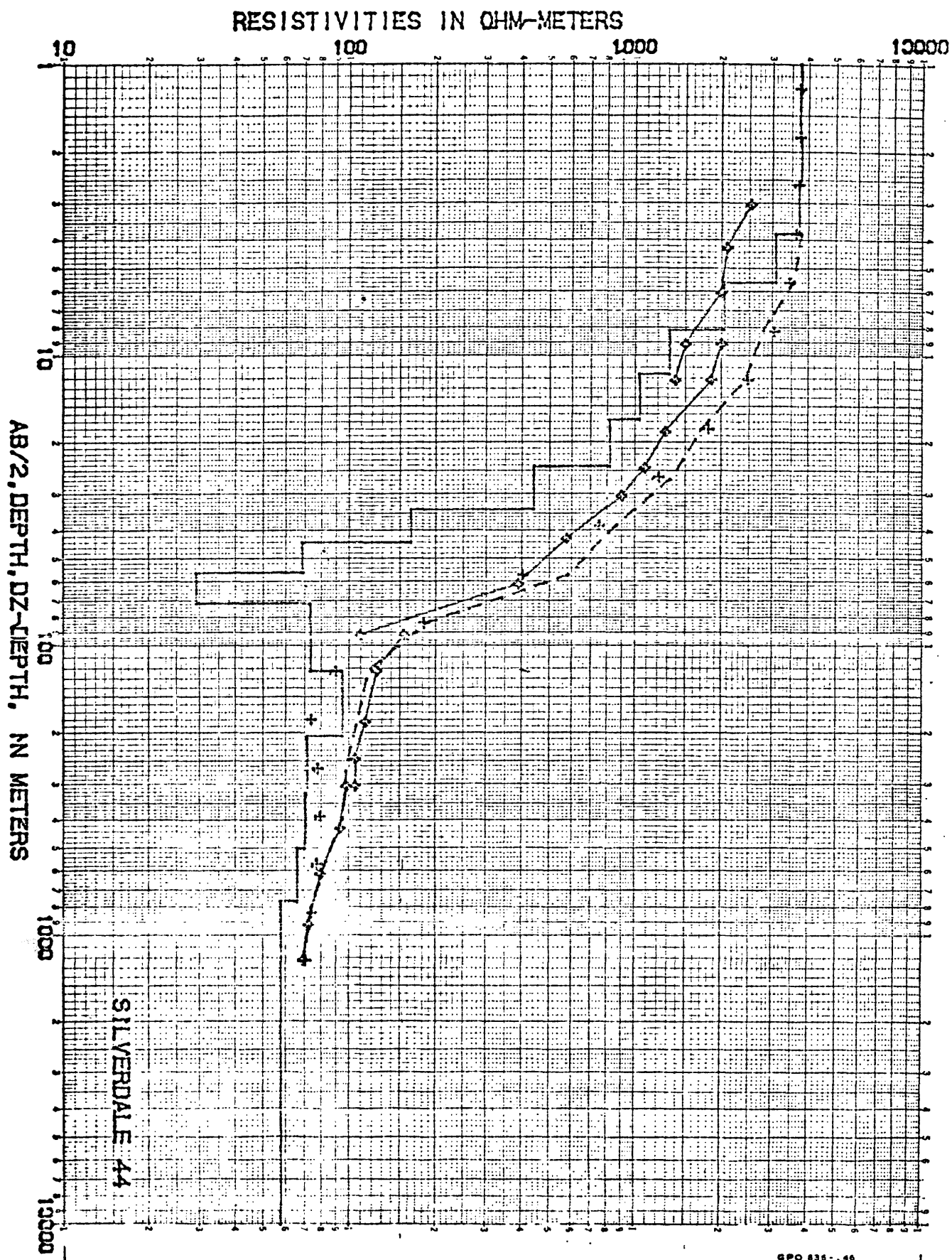




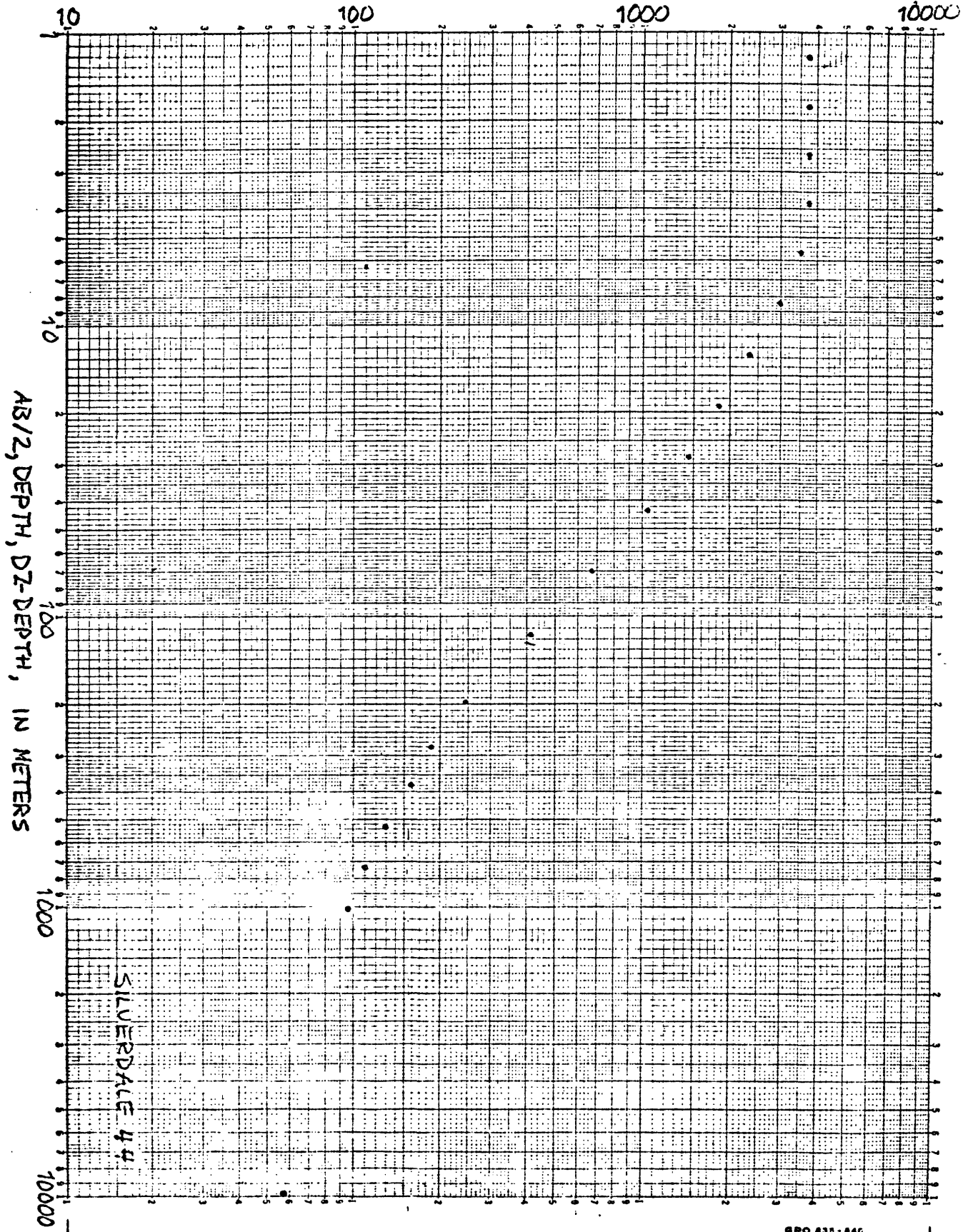
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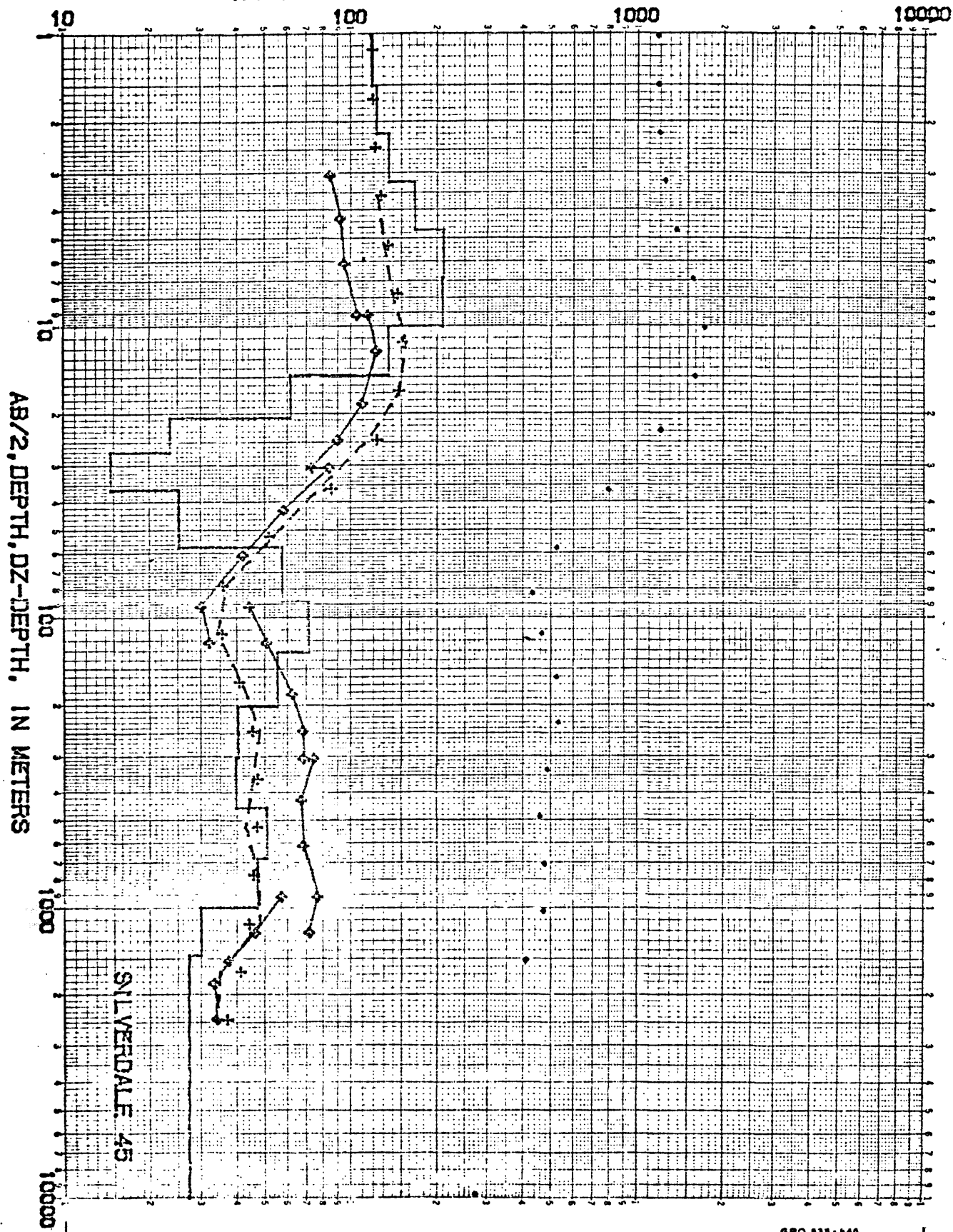


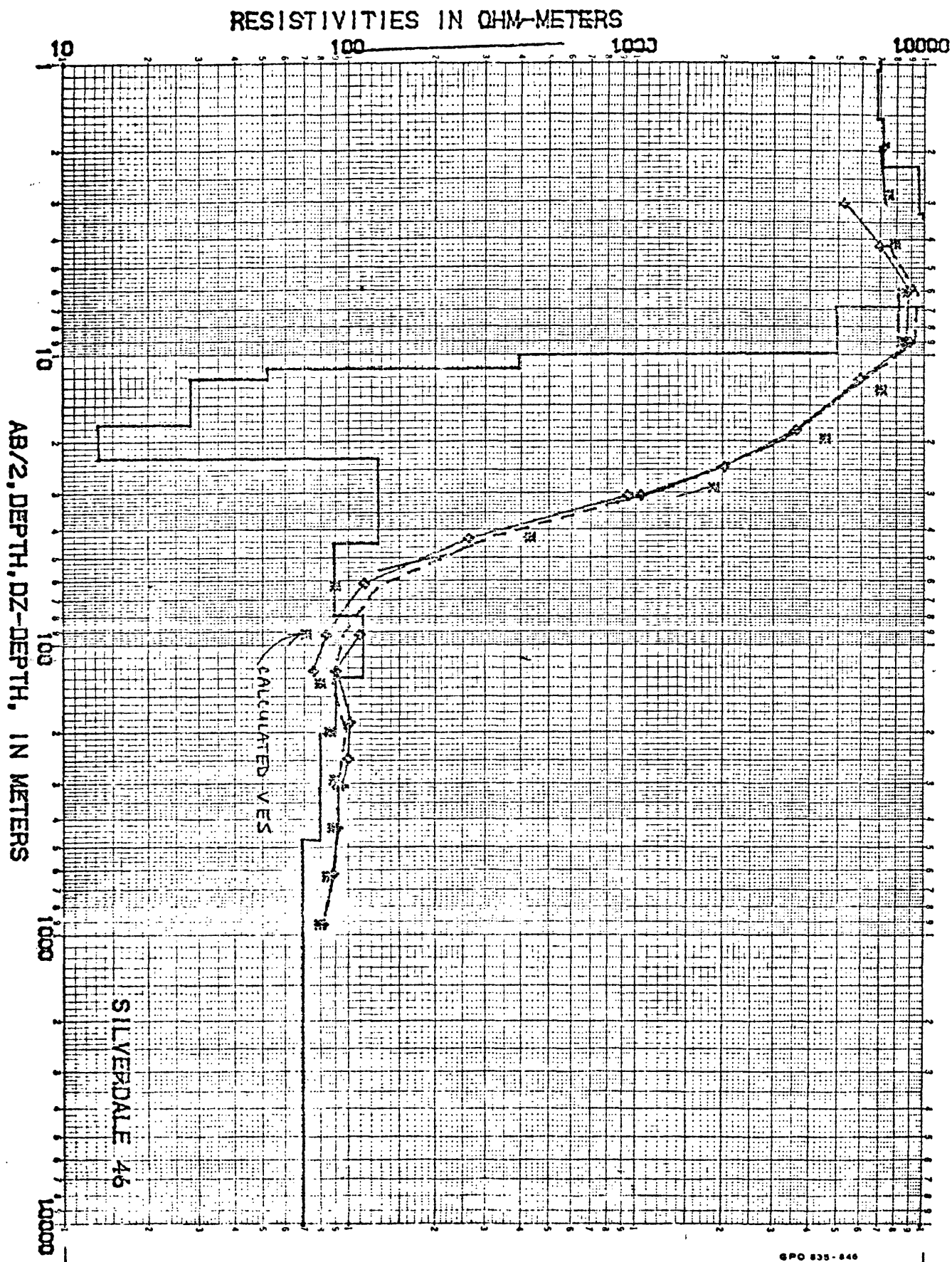


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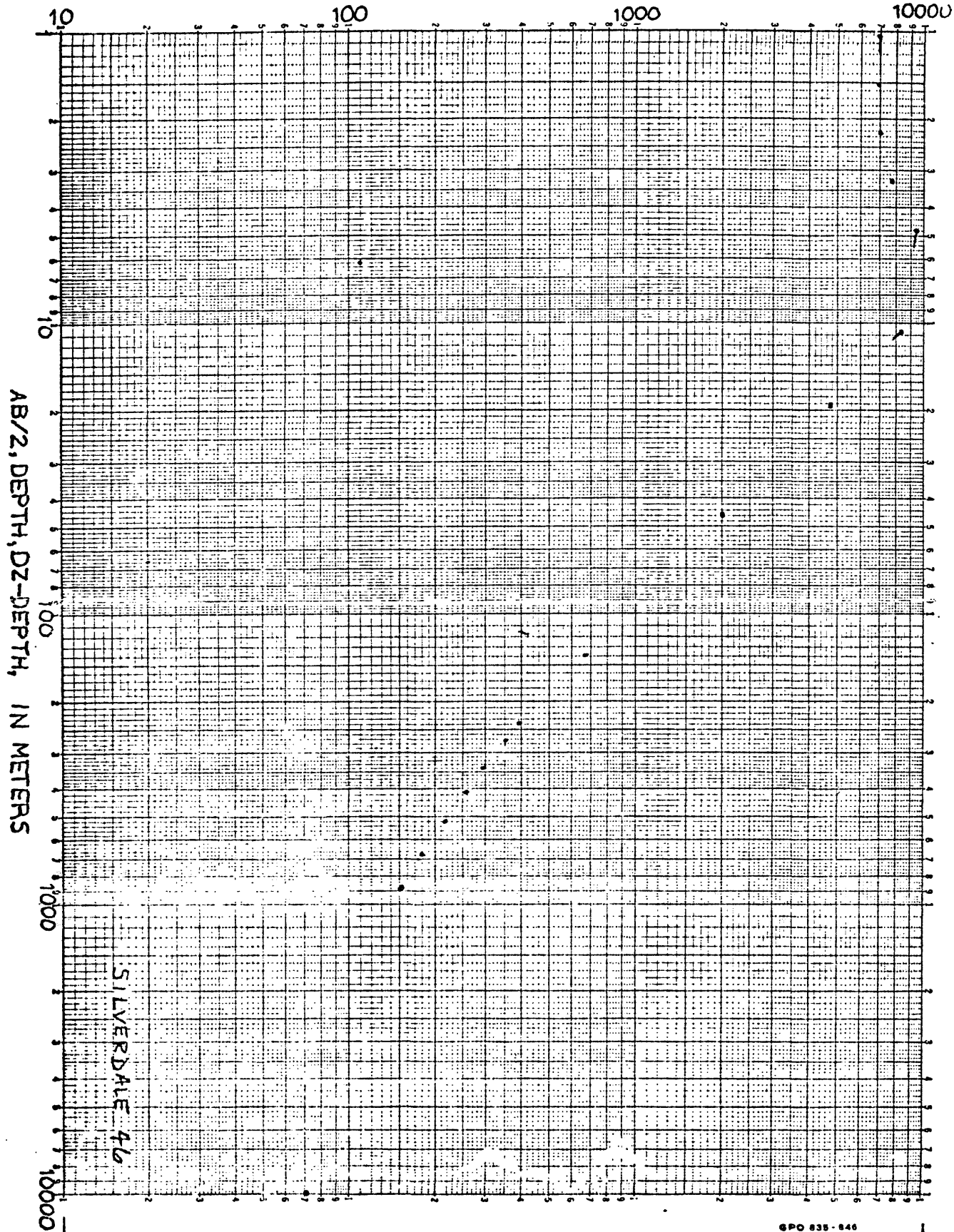


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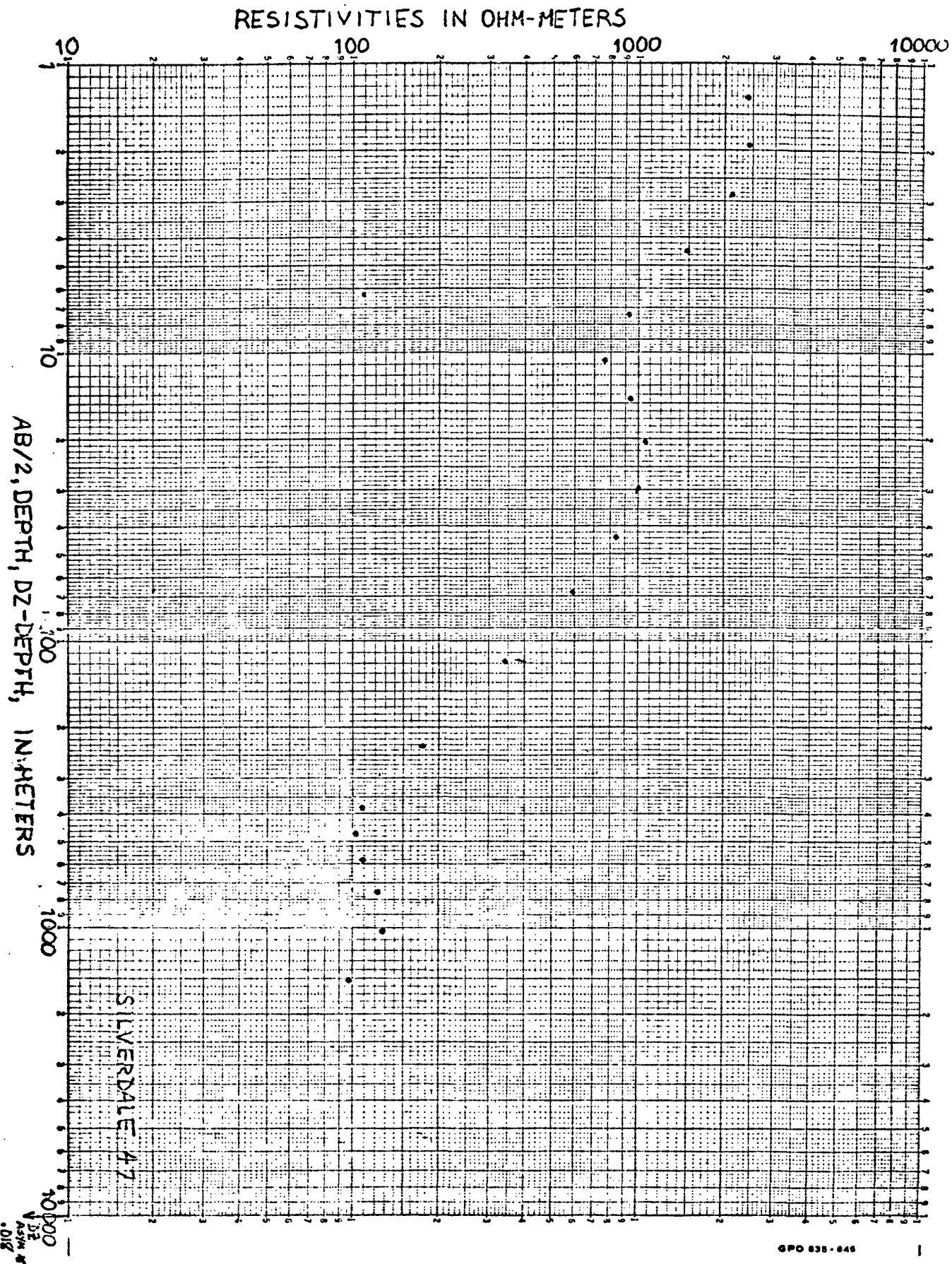


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