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DOWNWARD CONTINUATION OF TEMPERATURE DATA AT ANIMAS, NEW MEXICO

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Introduction

A three-dimensional heatflow downward-continuation program was developed by Teledyne Geotech during 1980, sponsored by a consortium of geothermal companies that included AMAX (Teledyne-Geotech, 1981). The effort resulted in a user's manual and computer code, presently being adapted to our DEC 10/Textronix system. A summary of the system and its application were described in a previous report (LANGE, 1981). The application is here demonstrated on temperature data from the Animas project, Hidalgo County, New Mexico.

Examples, Animas*

Figure 1: Thermal conductivity models were constructed along three east/west sections and extrapolated between them. The assigned conductivities in units of mcal/(cm sec ^{o}C) are based on measurements of cuttings in drillholes and on Pilkington's estimates of the inferred lithologies. The structure of the center line through the Hot Wells is determined from a gravity model by Lange (1977) and other geophysical and geological evidence (Smith, 1978). The north line was constructed from the Cockrell seismic section and the lithologic log of their oil test (Pilkington, 1980). The structure of the south line was deduced from geophysical evidences.

Figure 2: (Homogeneous half-space of conductivity 5 units). The overlay depicts the isothermal section derived from simple linear extrapolation of gradients. The base displays the contours resulting from application of the Teledyne program in the absence of a specific conductivity model. The latter did not apply the obviously convective gradients at the Hot Wells; the former did; hence, the "conduit" effect seen in the overlay.

Figure 3: The isotherms are computed using the conductivity model of the overlay. The effect of the model is to sharpen the anomalies somewhat and to depress the contours. An evident "recharge" zone east of the Hot Wells occurs (in the opinion of Dean Pilkington) because surface waters from the Pyramid Range sink into the gravels in this region and reduce the near-surface gradients. The program has projected these to depth, interrupting what is probably one broad thermal anomaly below 1km.

Figures 4a-h: Plan views of the isotherms to a depth of 3km are shown in successive figures, for the conductive model of Figure 1.

*For convenience in viewing the figures, figure descriptions are repeated on a fold out behind the illustrations.

Interpretation

A broad anomaly underlies the buried ridge and its faulted counterpart to the south. Near-surface it is interrupted by shallow recharge from the hills, forming a thermal depression along the eastern edge of the ridge and breaching the thermal anomaly as an east/west trough 1.75km south of the Hot Wells. The 200^o isotherm occurs at 1.8km depth around the Hot Wells (Figure 3); at 2.2km on the north line; and at 2.3km on the south line. Figure 4g, the plan view at 2.5km depth displays the extent of the 200^o isotherm area: 8.5km long in the north/south direction and about 2km wide or approximately 17km^2 in area. The thermal anomaly turns towards the southwest and the Cotton City landing field, where the temperatures appear reduced.

REFERENCES

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LANGE, ARTHUR L. (1981). Downward Continuation of Temperature Data at McCoy, Nevada. AMAX Exploration Inc., Geothermal Branch, Report. 15 April 1981. 4p., 12 Fig.

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SMITH, CHRISTIAN (1978). Geophysics, geology and geothermal leasing status of the Lightning Dock KGRA, Animas Valley, New Mexico. New Mexico Geological Society Guidebook, 29th Field Conference: 343-348.

TELEDYNE GEOTECH (1981). Heat Flow Continuation User's Manual. Report prepared for Heat Flow Consortium Members. 65p. + errata.

FIGURES

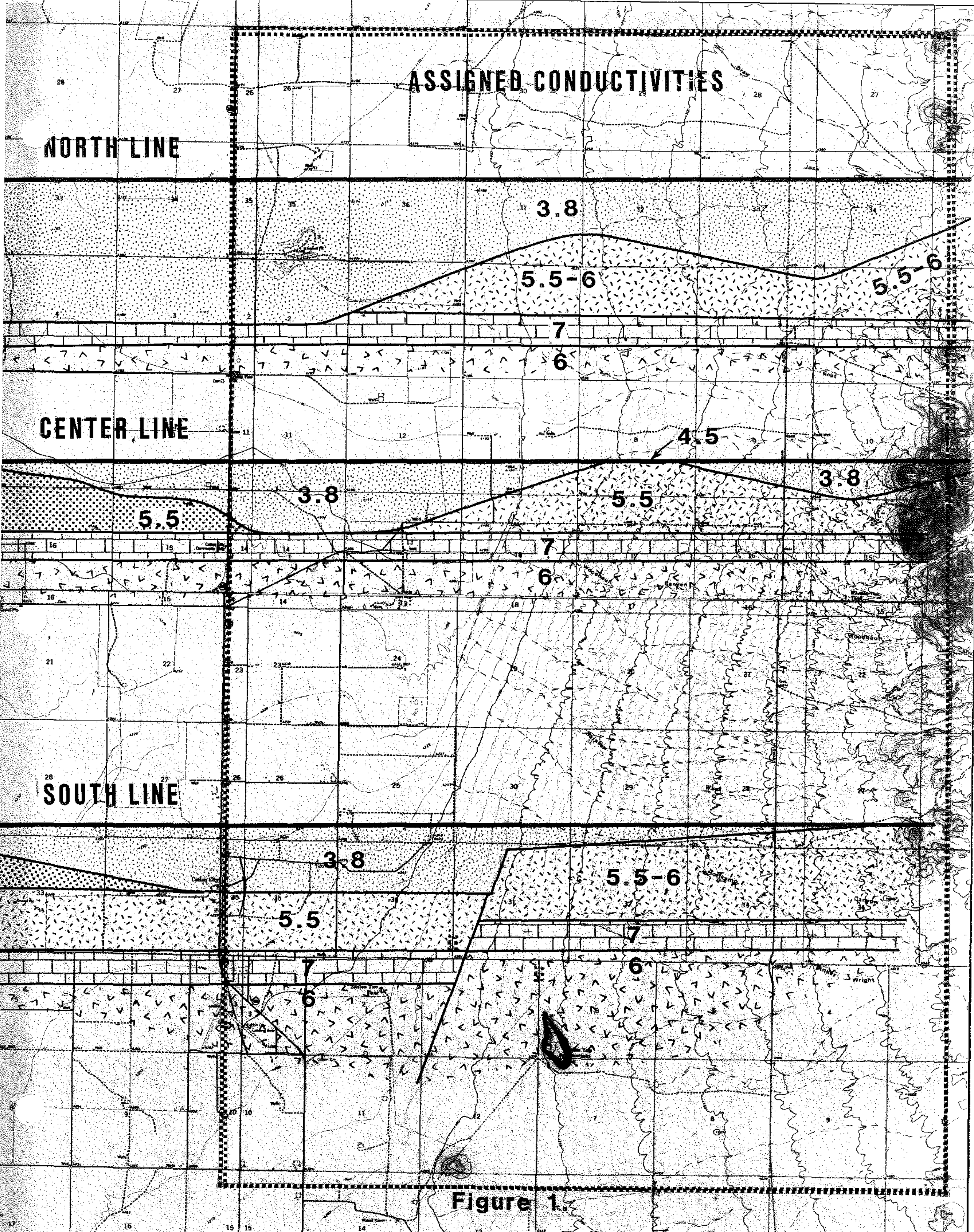
ASSIGNED CONDUCTIVITIES
NORTH LINE
3.8
5.5-6
5.5-6
7
6
CENTER LINE
4.5
3.8
3.8
5.5
5.5
7
6
SOUTH LINE
3.8
5.5-6
5.5
7
6
7
6

Figure 1.

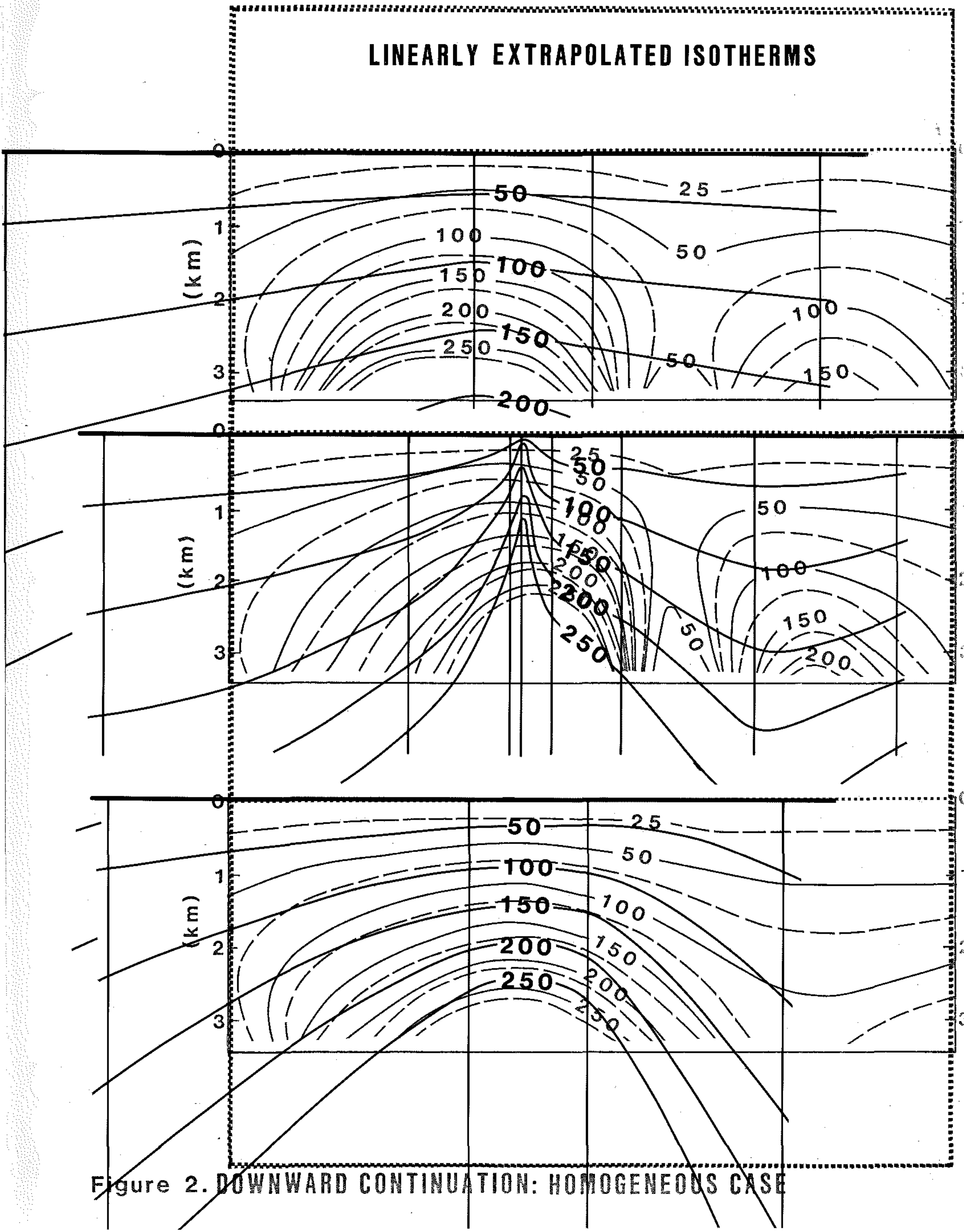

Figure 2. DOWNWARD CONTINUATION: HOMOGENEOUS CASE

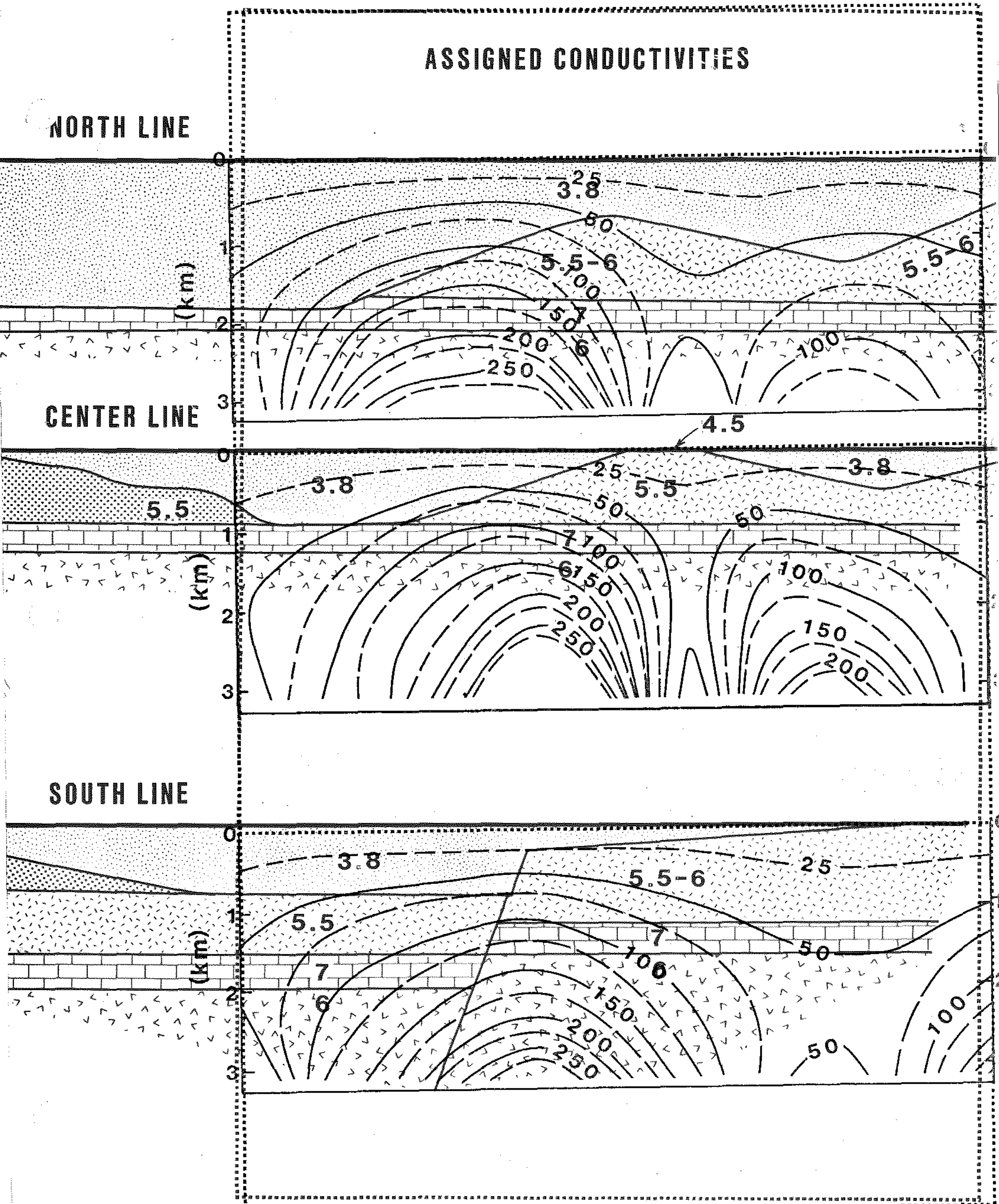

Figure 3. DOWNWARD CONTINUATION: CONDUCTIVE MODE

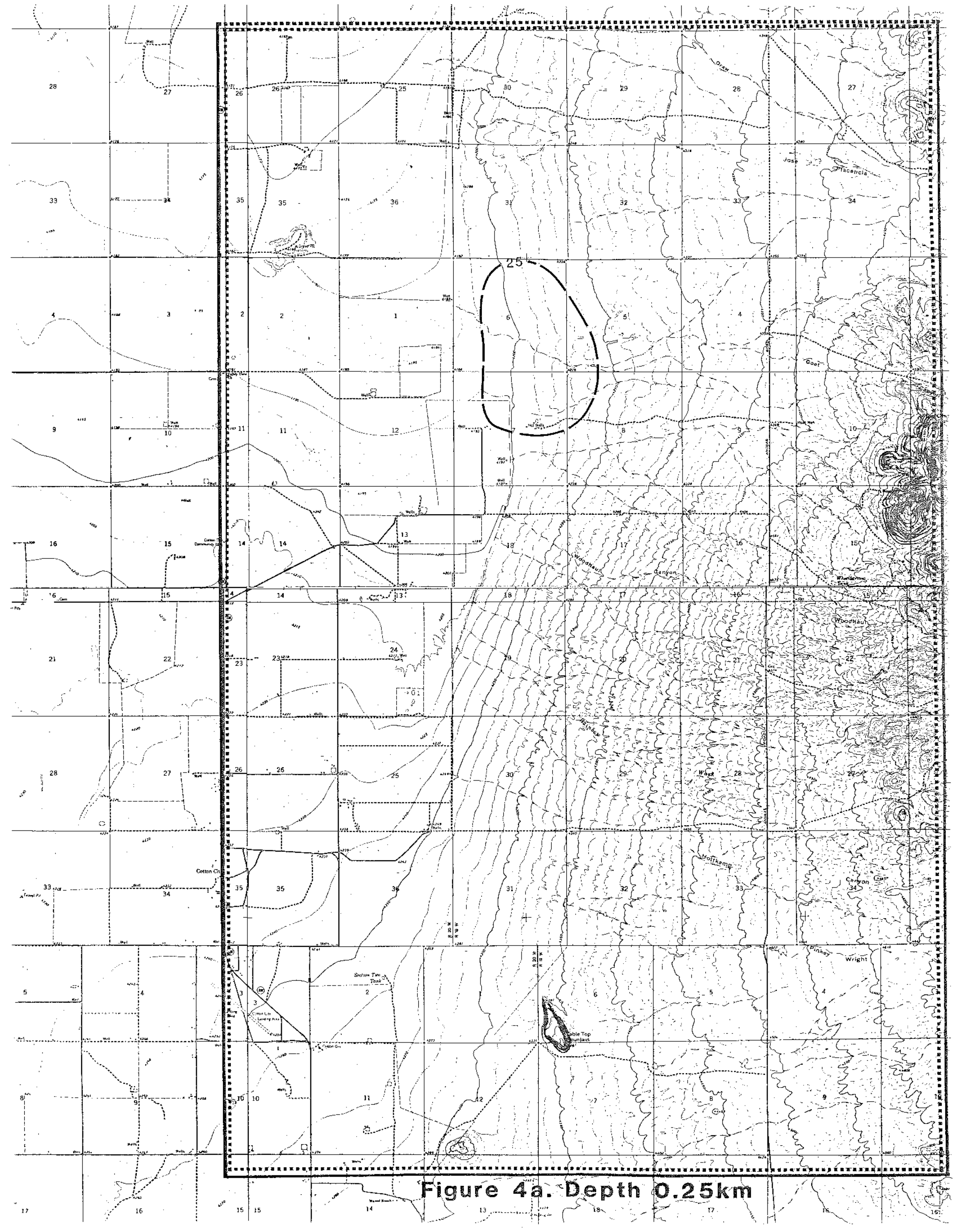

Figure 4a. Depth 0.25km

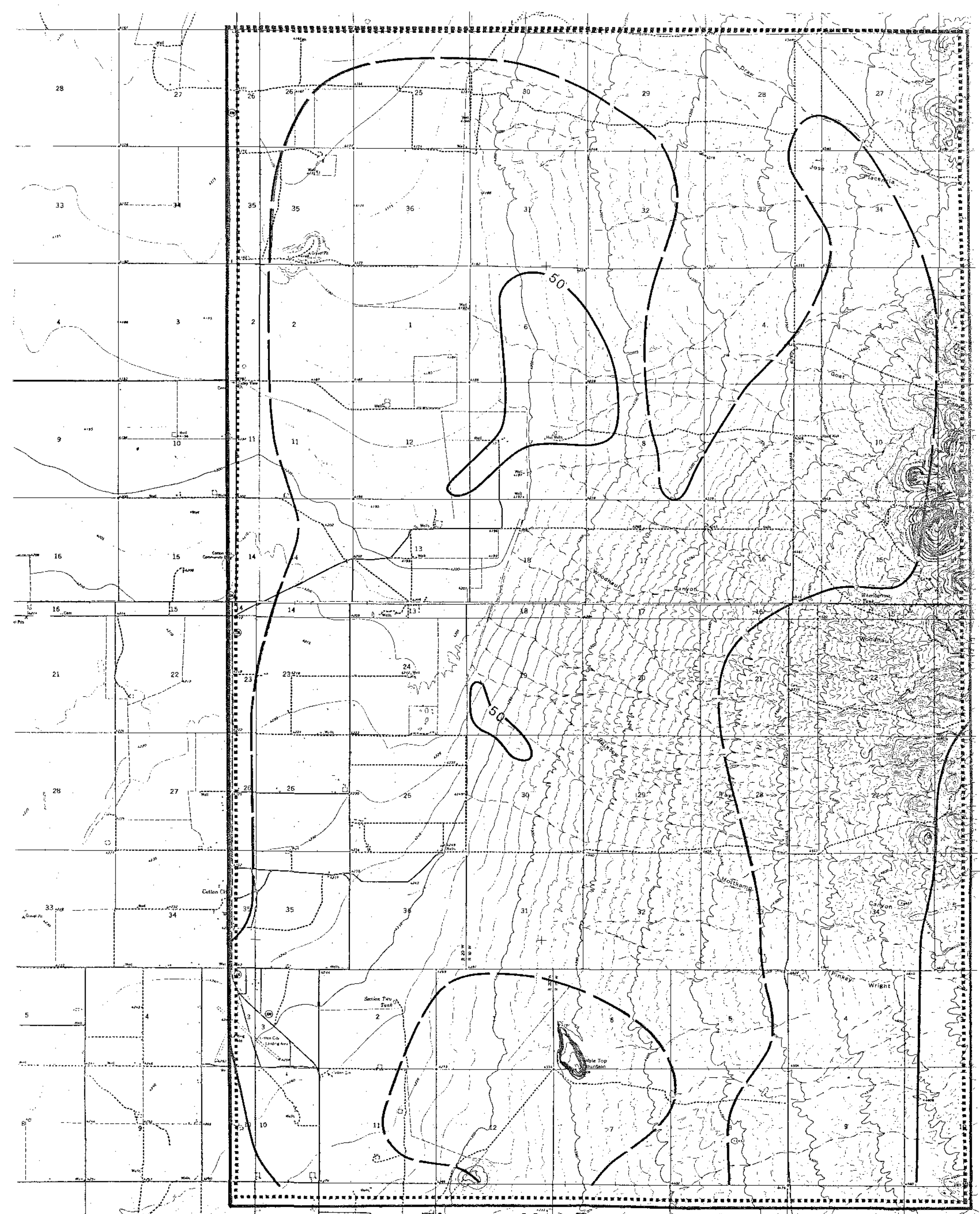

Figure 4b. Depth 0.50 km

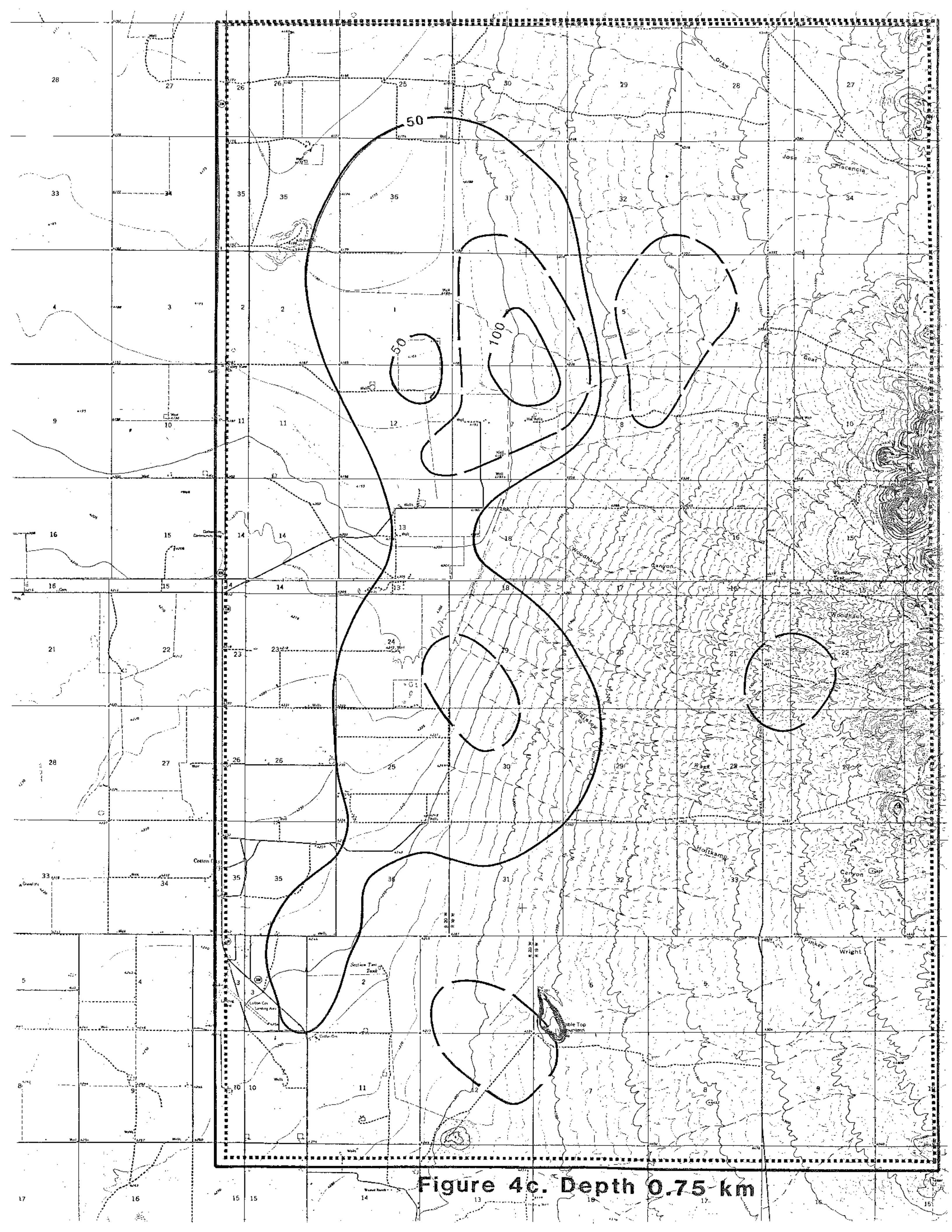

Figure 4c. Depth 0.75 km

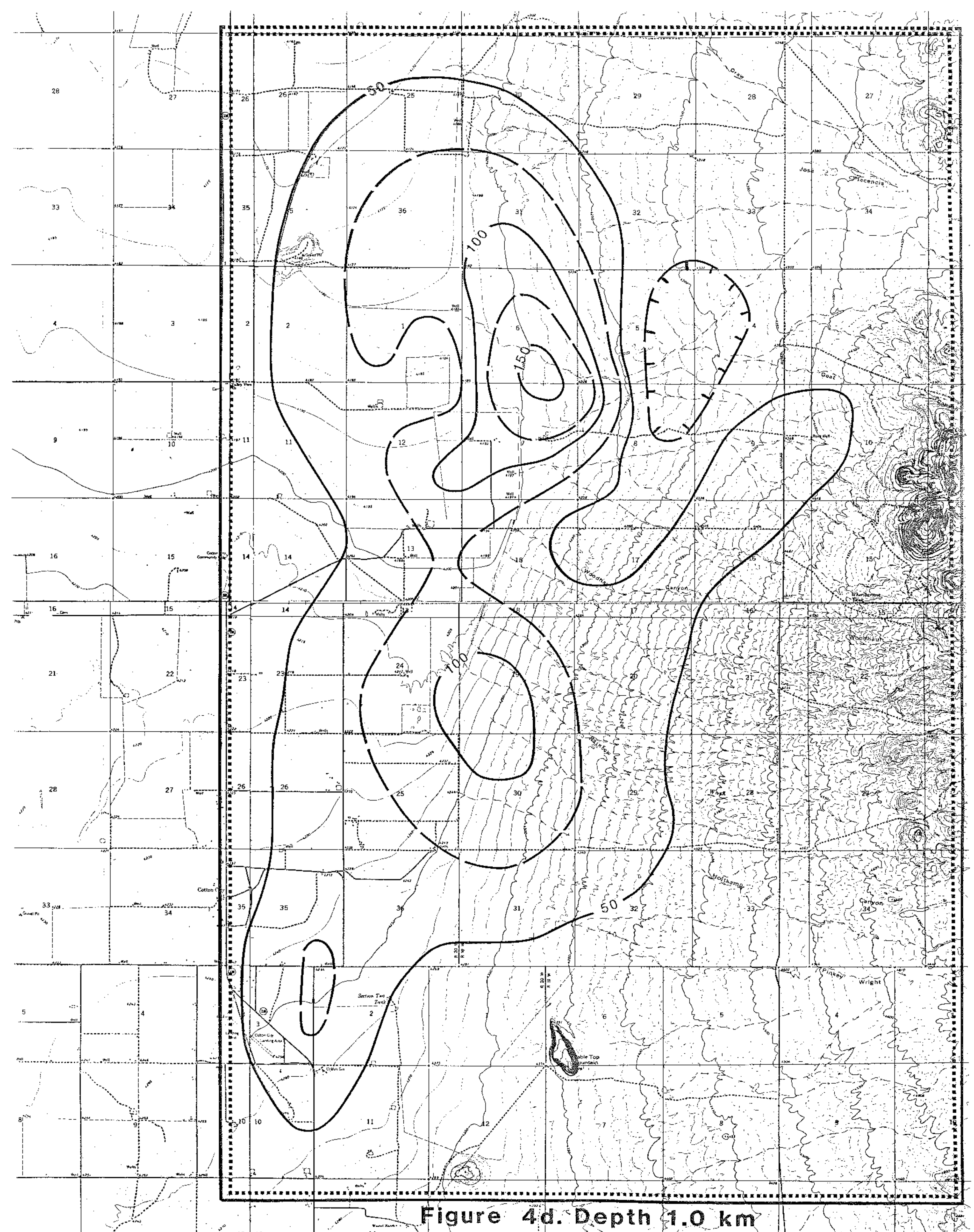

Figure 4d. Depth 1.0 km

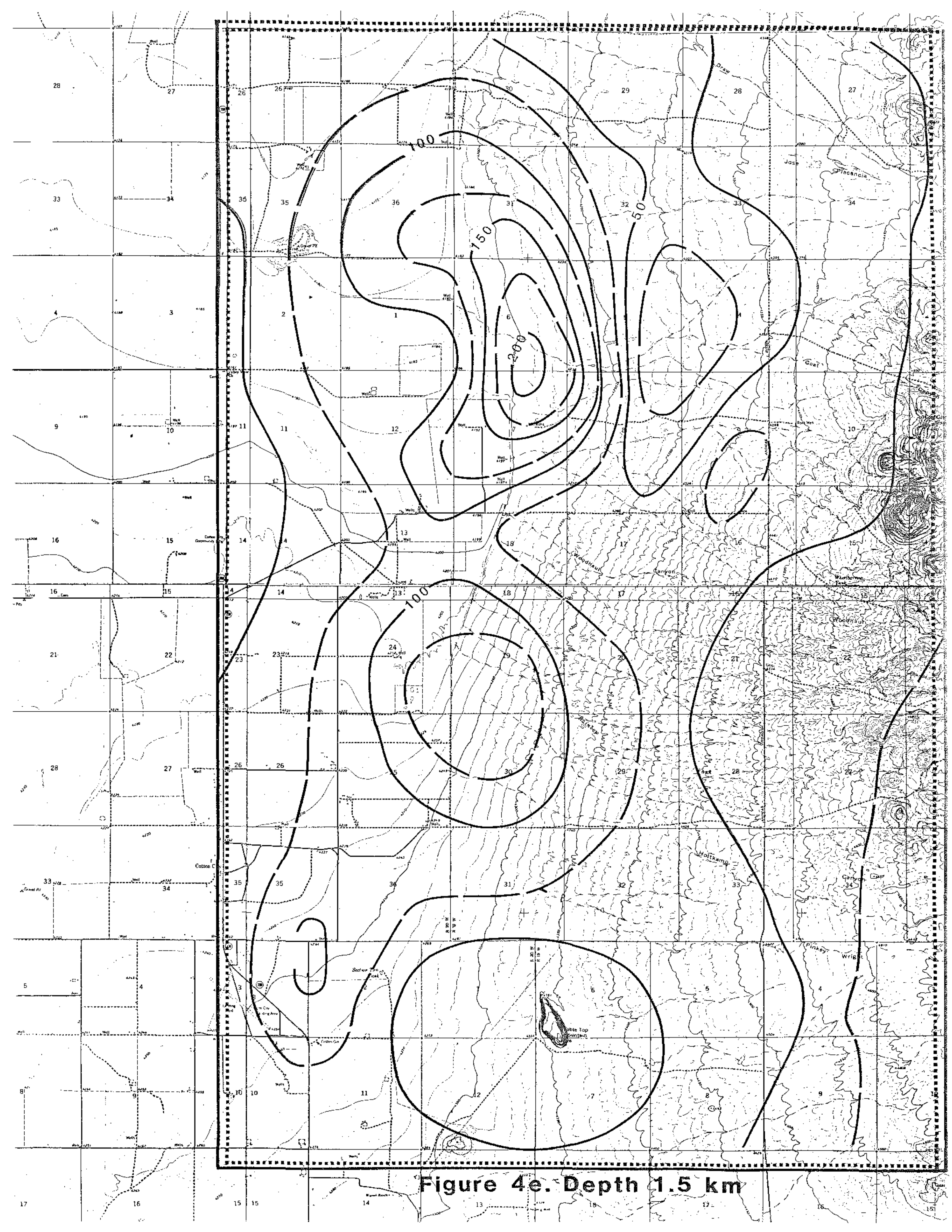

Figure 4e. Depth 1.5 km

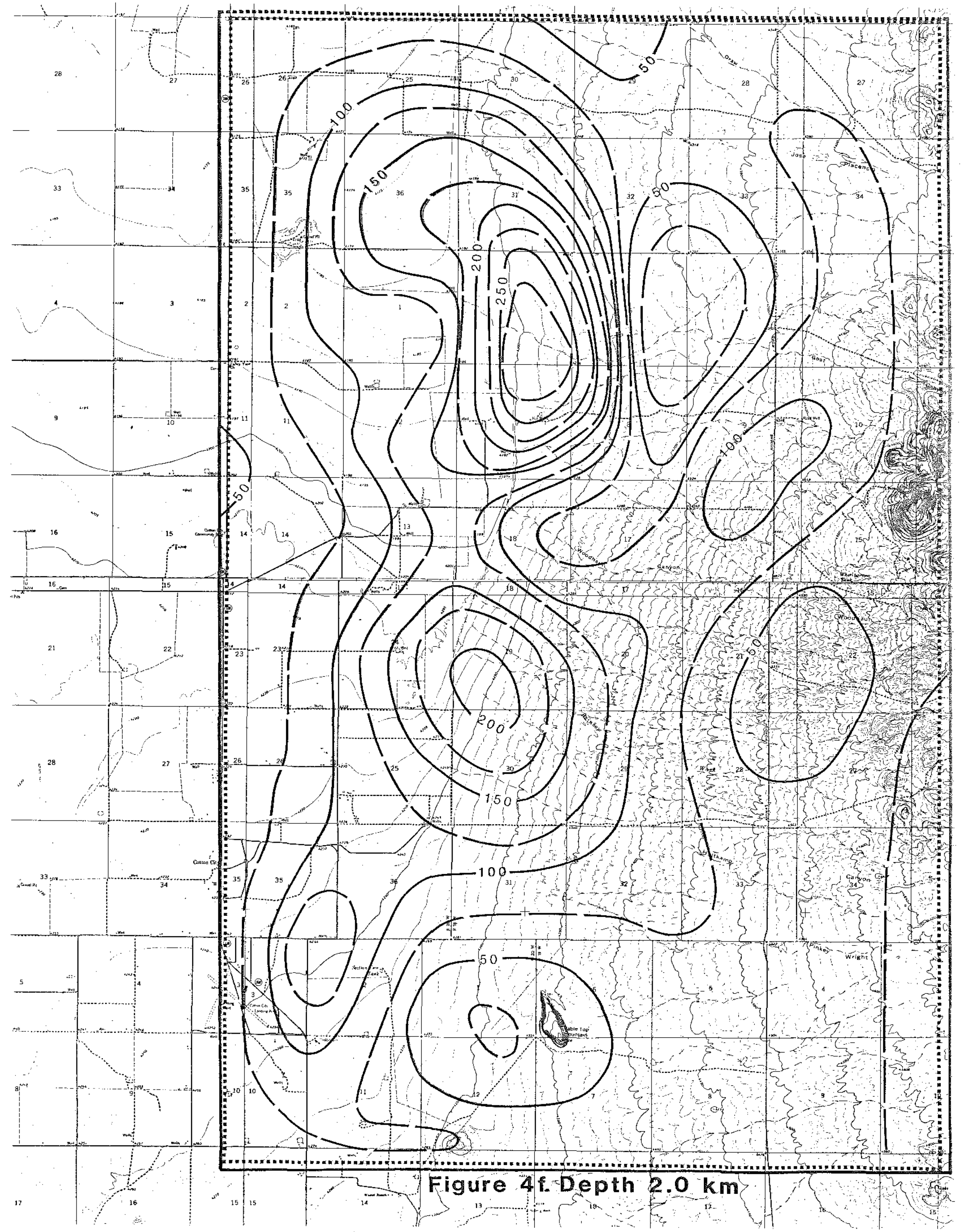

Figure 4f. Depth 2.0 km

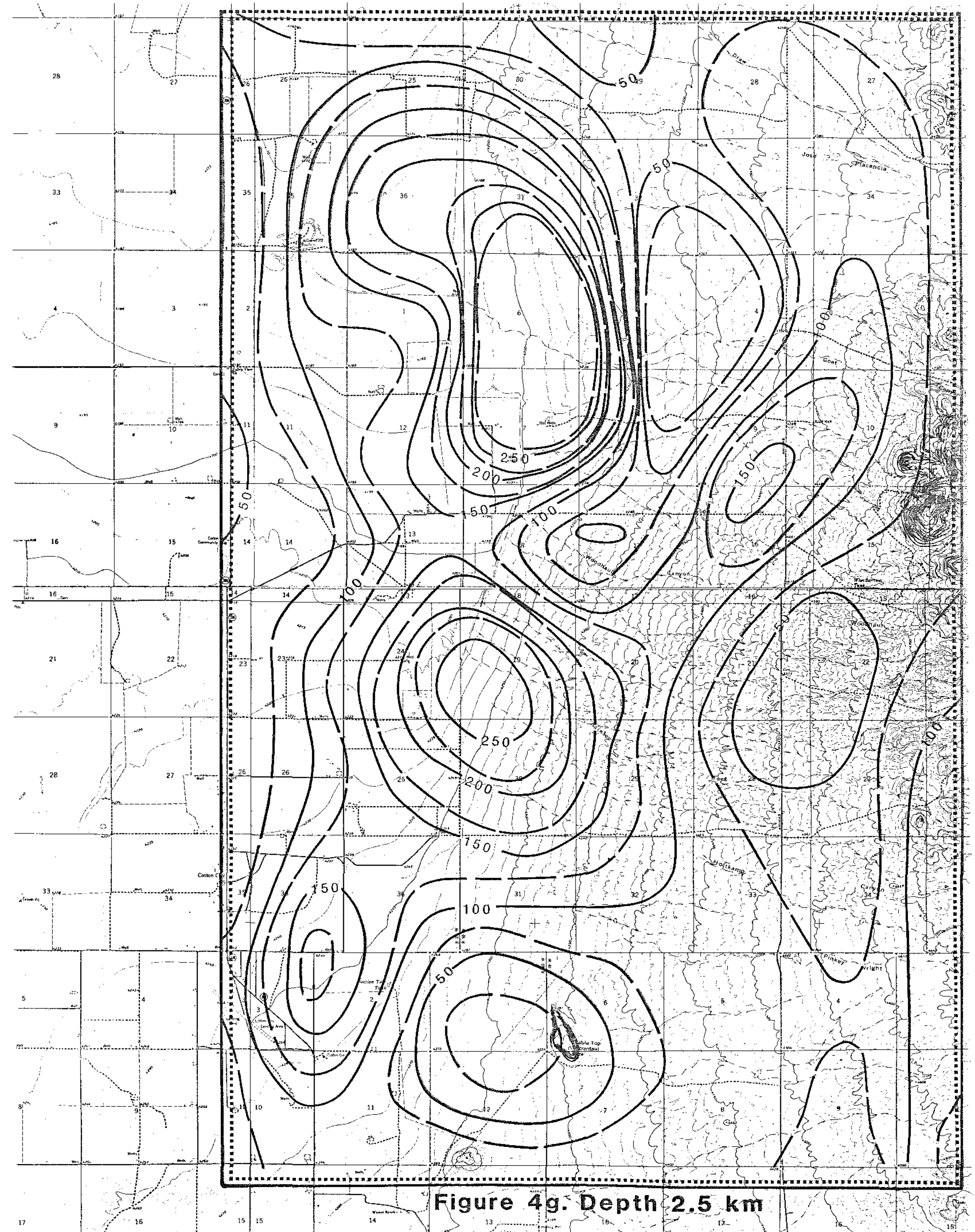

Figure 4g. Depth 2.5 km

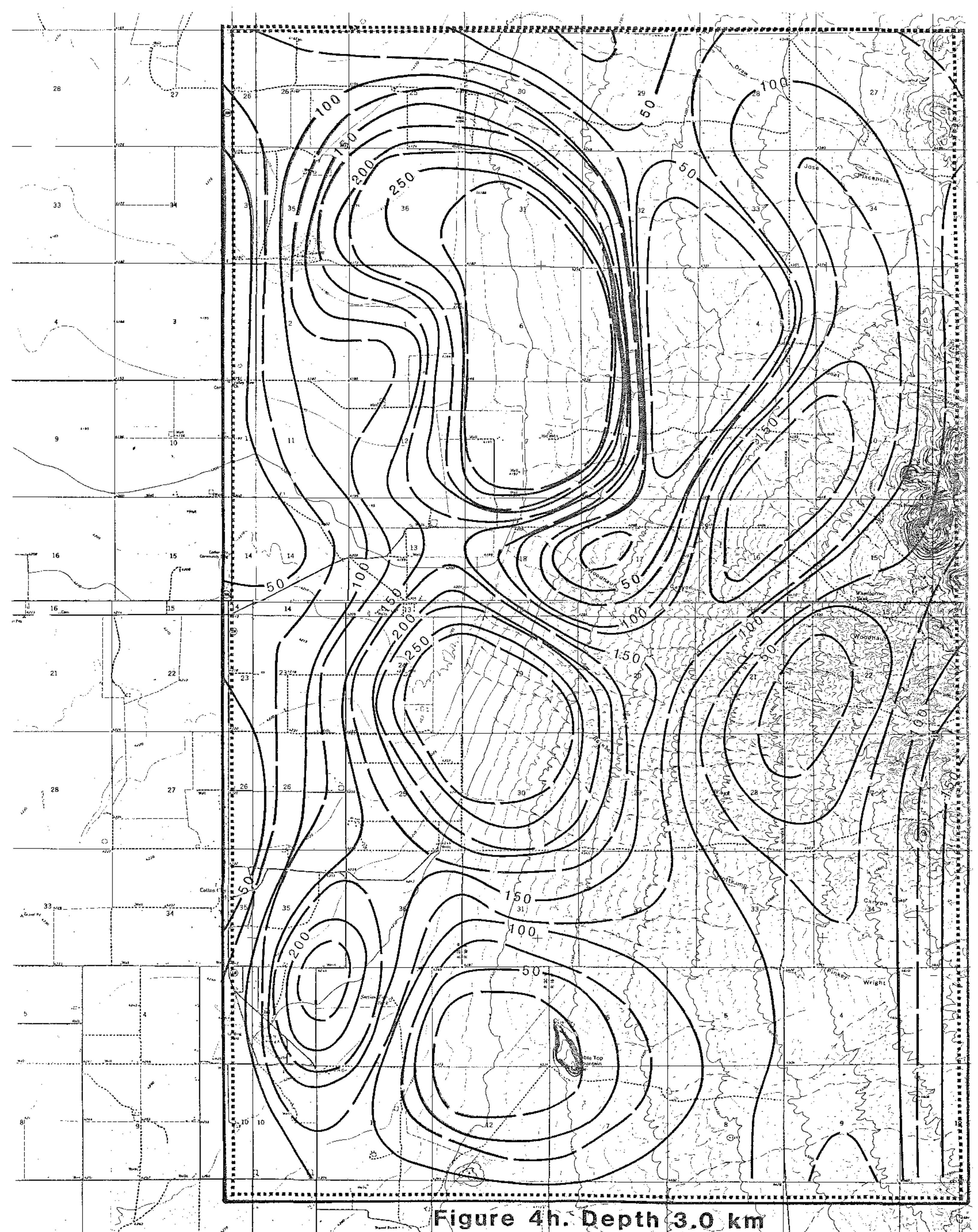

Figure 4h. Depth 3.0 km

FIGURES

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