Natural Environment Research Council

Institute of Geological Sciences

Mineral Reconnaissance Programme Report

A report prepared for the Department of Industry

No. 6

Report on geophysical surveys at Struy, Inverness-shire

This report relates to work carried out by the Institute of Geological Sciences on behalf of the Department of Industry. The information contained herein must not be published without reference to the Director, Institute of Geological Sciences.

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A. J. Burley, BSc

A report prepared for the Department of Industry

London: 1976

The Institute of Geological Sciences was formed by the incorporation of the Geological Survey of Great Britain and the Museum of Practical Geology with Overseas Geological Surveys and is a constituent body of the Natural Environment Research Council.

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Summary

In 1974 a limited geophysical survey was carried out over two veins containing lead and zinc mineralisation in Strath Glass, Inverness-shire. These veins were mined on a small scale in the 19th century and a further appraisal was undertaken in 1942-3. The aim of the geophysical survey was to discover whether the mineralisation could be detected by these methods and if so to determine the extent of the veins. The results showed that resistivity lows coincided with both veins and also that the adits were probably located in the areas of most concentrated mineralisation. There was an indication that one of the veins may extend further uphill but the size and ore content of the exposed deposits is insufficient to make them of economic importance.

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INTRODUCTION

Three veins carrying lead and zinc occur on the west side of Strath Glass 3-5km south-south-west of Struy Bridge (Fig.1). The veins were mined on a small scale during the first half of the 19th century and although no output figures are available, the following assays have survived:

Locality	% Lead	Ozs silver per ton of ore	Date of assay
A	75	4.25	1838
C	37.5	7	1844
C	62	22.10 dwt	1845
C	62	22.10 dwt	1867

A further appraisal undertaken in 1942-43 concluded that vein A (Fig. 2) was the most important prospect, having an average 4.24% zinc and 2.52% lead in a mineralised zone measuring 36 cms. However, taking into account the extremely irregular distribution of the minerals within the veins, averages of 3.24% zinc and 1.52% lead in a mineralised zone not exceeding 30 cms in thickness are considered more realistic estimates.

In 1974 advantage was taken of the presence in the neighbourhood of Struy of members of the Applied Geophysics Unit of IGS to carry out a limited geophysical survey over the mining area. The purpose of this survey was to find out whether the mineralisation could be detected by geophysical methods and if so to determine the extent of veins A and B, with the main effort being concentrated on vein A.

Geology

The Struy mining district lies within the boundaries of one-inch Geological Sheet 83. The sites of the old workings are shown at A, B and C on the accompanying sketch map (Fig. 2) which also indicates the general character and disposition of the rocks in the district. The country rock in each case consists of flaggy micaceous schists and quartz granulites (Moine Schists) striking NE - SW and dipping at 45° to 60° to the SE. Approximately concordant lenses and lenticles of hornblende-schist and pegmatite are also common. The mineralised veins are associated with lines of crush, running approximately E - W.

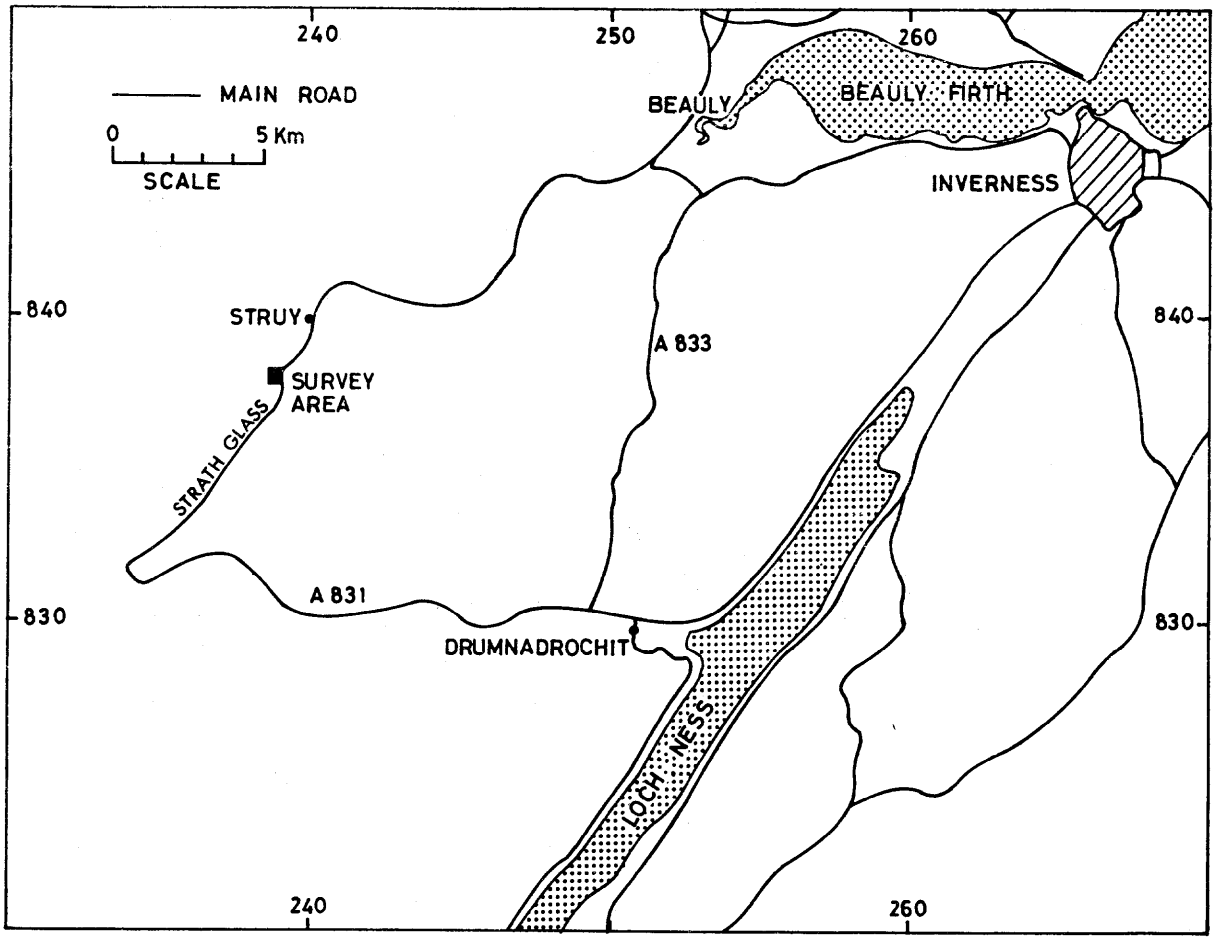

Fig. 1. Locality Map

Locality A

The vein is first seen at the base of the steep hill-slope about 80 metres west of the road. At this point, where two small streams unite, there is a dump of moderate size consisting mainly of country rock (see above) but containing also a fairly high proportion of barytes carrying zinc blende and a little galena. From there the vein can be followed up the hill-slope along the course of the more northerly of the two streams for a distance of about 135 m to the mouth of an old level. Above the level, the vein can be traced for another 55 to 65 m. The mouth of the level lies at a height of about 120 m OD, or about 70m above the road. Below the level, down to the dump, the vein has been worked open-cast.

The vein is a partially mineralised crush zone, running approximately W 30° S and hading steeply to the south. It varies in width from 30 cm or so up to about 2 m and consists of brecciated country rock and pegmatite, with irregular strings of barytes, up to 60 cm wide, carrying considerable quantities of galena and zinc blende. There is also a little calcite and quartz in the vein material. The average total width of ore-bearing rock along the length of the vein would, however, probably not exceed 30 cm. There is no apparent reason to suppose that the vein deteriorates either in depth or along the strike.

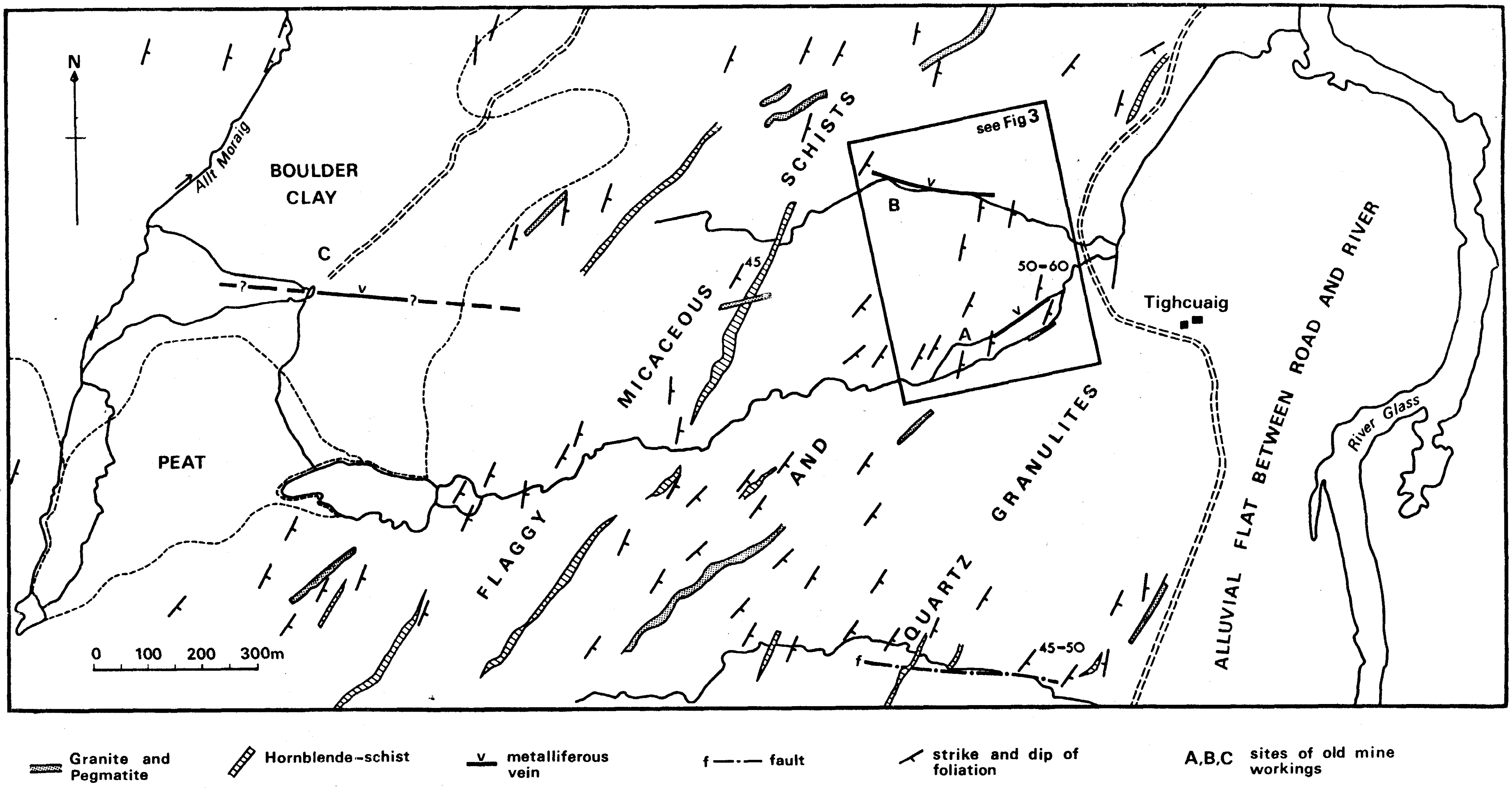

Fig 2 Geology and location of geophysical survey

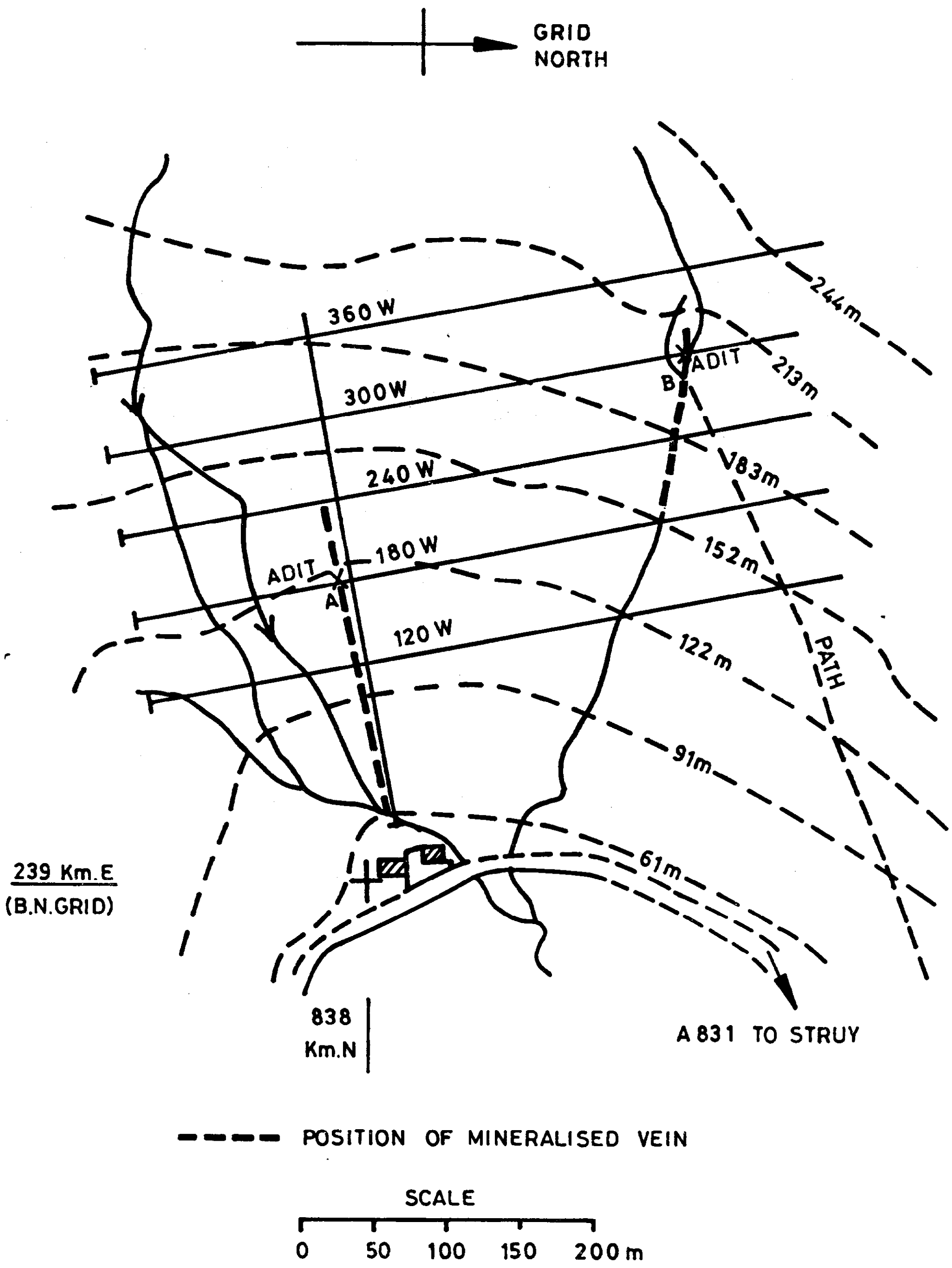

Fig. 3. Map showing geophysical survey lines

Locality B

This vein also follows the course of a small stream about 400 m north of A. It trends slightly N of W. The mouth of a level, driven along the course of the vein, lies at a height of about 230 m, or about 175 m above the road in Strath Glass, from which it is distant about 335 m. The mineralisation occurs along a crush zone, about 60 cm wide, which hades steeply to the south and consists mainly of brecciated Moine Schists and pegmatite with thin strings of calcite and barytes carrying a little galena and blende.

Locality C

The vein that was worked here cannot now be seen. All that can be examined are the old dumps, which are of considerable size. They consist largely of country rock but contain also a fair amount of barytes with a little galena, a very little blende and traces of pyromorphite. As only the galena was of importance at the time of the workings, most of the blende encountered would have been discarded and it may therefore be assumed that the small amount of blende on the dumps indicates a very low proportion of this mineral in the vein.

GEOPHYSICAL INVESTIGATIONS

Measurements of total magnetic field, resistivity and chargeability (IP effect) were measured along the lines shown in Fig. 3. Attempts to obtain EM measurements, which would have been more suitable for the purpose, had to be abandoned because of the lack of working equipment at the time of the survey. For the resistivity and IP measurements the 'dipole-dipole' array was used with dipole lengths of 30 m. Lead sulphide (but not zinc sulphide) is a good conductor and can give rise to anomalously low resistivity if present in sufficient quantity.

The magnetic field over the whole area is virtually undisturbed, the variation in field being no greater than 30 gamma (nT): there can be no significant quantities of magnetic minerals present in the veins. Chargeabilities are generally low (less than 10 ms) and resistivities high (several thousand ohm metres). Both veins coincide with resistivity lows; this is illustrated by the map in Fig. 4 which shows the resistivities measured at one particular dipole separation viz, 90 metres. In uniform homogeneous ground, dipole separation is an indication of depth of penetration, though it is likely to be an overestimate. The maximum separation used in this survey was 150 metres.

Vein A is most prominent on line 180 W, close to the adit. A plot of the resistivity results as a vertical 'pseudo-section' of the ground shows the anomaly extending to the greatest depth investigated. A similar section plotted for line 240 shows only a slight resistivity contrast along the strike of vein A, and this only at the smaller dipole separations (corresponding to shallower depths). Vein B is most prominent in the pseudo-section plots on line 300 W where it extends to depth, again close to the adit. On the lines down the hill, to the east of 300 W

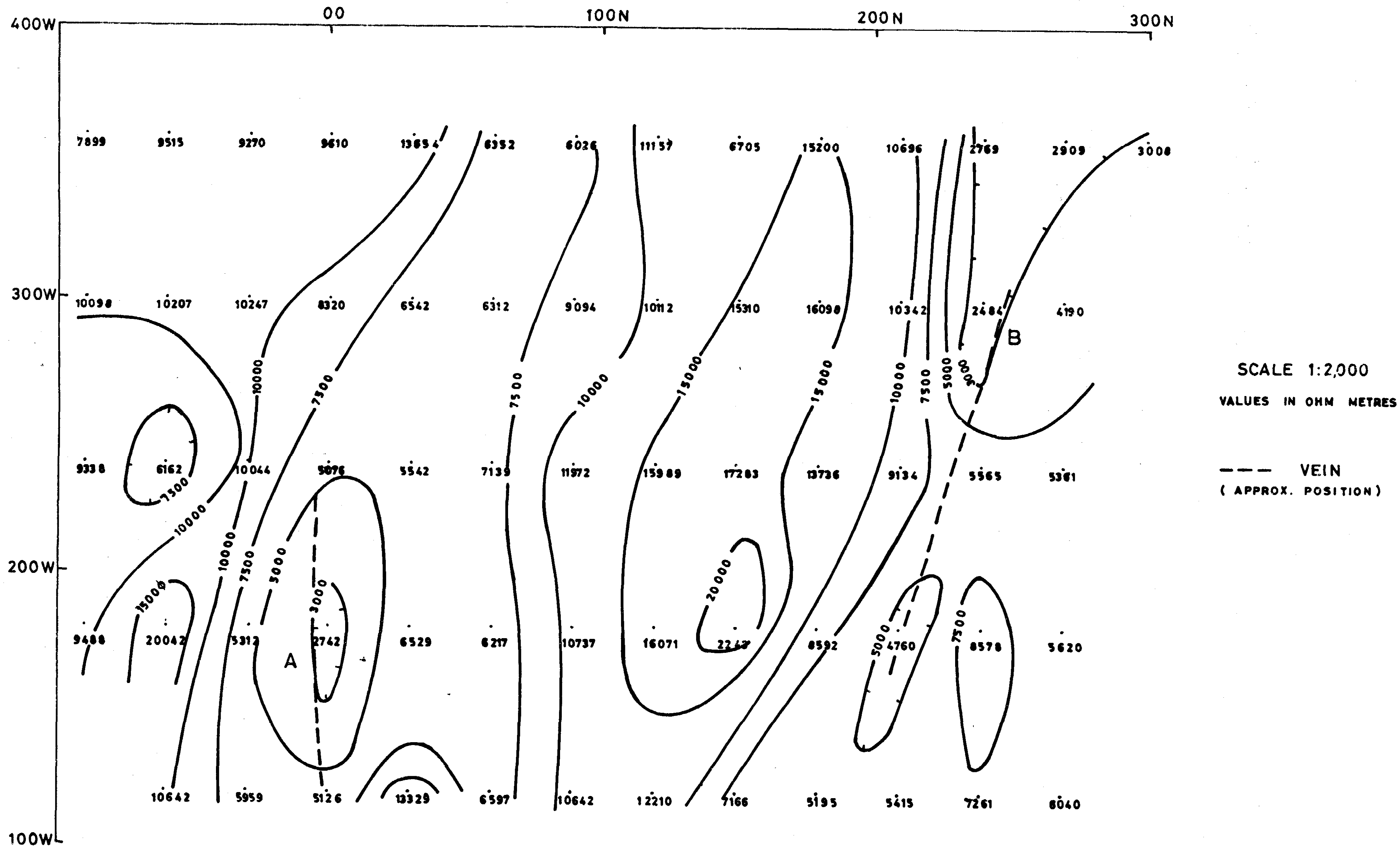

Fig. 4. Resistivity map for dipole separation 90 metres (30 metre dipoles)

the low resistivity occurs only at the smallest dipole separations. The resistivity anomaly is more prominent and extensive up the hill, on the line 360 W, as indicated on Fig. 4 but does not show the same extension to depth as is observed on line 300 W.

Chargeabilities are marginally higher than background over the two veins but higher values (up to 14 ms) were measured in a wide band lying between the veins. This coincides with the zone of higher resistivities shown in Fig. 4 and probably corresponds to a change in rock type rather than to any increase in sulphide mineralisation.

CONCLUSIONS

The fact that resistivity 'lows' occur over both veins implies that these anomalies are caused by the conductive mineralisation in them (lead sulphide). In each case the most prominent resistivity anomaly occurs on a line which passes close to the adit suggesting that the adits are located in the areas of most concentrated mineralisation extending to greatest depth. There is no indication of any extension of vein A beyond 240 W. The measurements on line 360 W show that vein B may extend further up the hill but probably contains less conductive mineralisation at depth than it does near the adit. Any more geophysical measurements to investigate the area further to the west would be best confined to the EM and resistivity methods.

The size and ore content of the exposed deposits is such that they are not likely to be of economic importance in the foreseeable future. Since the geophysical survey has shown that there is little likelihood of a width-depth increase in ore content it is not anticipated that this project will be extended.