COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record No. 1970/105

Afmag Field Tests, Captain's Flat, N.S.W., 1969

by

B. B. Farrow

1970/105

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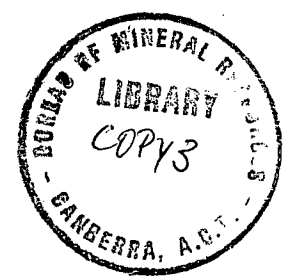

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ILLUSTRATIONS

SUMMARY

Several traverses in the Captains Flat area were read with the McPhar ground AFMAG unit. The results demonstrate the limitations of the method, but also that good results can be obtained and repeated.

1. INTRODUCTION

Selected traverses near Captains Flat, N.S.W., were surveyed using the McPhar AFMAG unit, type A652, in the period January to March, 1969, as part of the programme conducted by the Bureau of Mineral Resources to test the capabilities of the method. The fieldwork was supervised by B.B. Farrow (geophysicist), who was assisted by I. Godfrey, P. Pollard (Vacation Students), and G. Blincoe (Field Hand). The location of the area and traverses is shown in Plate 1. A lease over the area is held by the Electrolytic Zinc Co. of Australasia Ltd, whose cooperation is gratefully acknowledged.

2. METHOD

The AFMAG method is described in detail by Ward (1967), and is summarized by Farrow (1969). The method comprises an electromagnetic technique using natural audio-frequency magnetic fields as energy source. The McPhar dip angle instrument is designed to locate the preferred direction of the magnetic component of the field over a period, the instantaneous direction of which is almost random. This preferred direction is normally horizontal but is disturbed by conducting geological bodies. Readings are taken at two frequencies, 140 and 470 Hz, termed low and high respectively.

The results are displayed as vector plots (after Hallof & Sutherland, 1962) comprising an arrow with its base at the point of observation and drawn in the azimuth of the field with its length proportional to the dip angle.

3. GEOLOGY

The Captains Flat Area is set in undulating country, precipitous in places. The geology is summarized by Sedmik (1965) and comprises sediments, shale and sandstone, metamorphosed to slates, schists etc., probably of Silurian age, with minor conglomerate and limestone. Volcanics,

mainly tuffs, occur lower in the sequence. The structure involves shearing and folding along northerly axes superimposed on a broad north-trending syncline. A major north to south fault, the Narongo Fault, lies towards the western edge of the area (Plate 1). Other faults trend NE and SE.

4. RESULTS

Gourlay - Hickey and Golf Course Area.

Traverse 95,000N (Plate 2). Four sets of readings were taken on this traverse on different days. The readings taken on January 24th gave high dip angles and irregular azimuths, whereas readings on the other three days give reasonably consistent values. The poor results on the one day are attributed to bad AFMAG field conditions. A telephone line at 99,050 E could have affected the readings but is unlikely to have done so on only one day. The Narongo Fault is located at about 98,000E on this traverse and both frequencies show a well-defined anomaly at about 98,300E, although that measured at the low frequency on February 4th is located at 97,900E, a displacement of 400 ft.

To the east of about 99,500E consistently high dip angles were observed at both frequencies. Variations in the dip angles such as around 101,800E and 102,200E on both high and low frequencies may be anomalies superimposed on a uniformly dipping primary field.

Traverse 95,500N (Plate 2). The readings on this traverse appear regular and reliable, with anomalies located at 98,400E on the low frequency and at 98,700E on the high frequency, both in the vicinity of the Narongo Fault.

Traverse 100,000N (Plate 2). A well-defined anomaly occurs over the Narongo Fault at 98,250E at both frequencies. A strong Turam anomaly is located at 98,450, 200 ft east of the Narongo Fault (Sedmik, 1965), but the AFMAG anomaly is more likely to be associated with the extensive fault than the local conductor indicated by the Turam results.

Traverses 101,000E and 101,200E (Plate 3). These two long traverses were surveyed between January 10th and January 15th, with part of traverse 101,200E surveyed twice. Repeated readings show gross discrepancies between the two days and results cannot be considered reliable. If, however, the results are taken at face value, anomalies are located on traverse 101,000E at 99,100N and possibly 99,800N on both frequencies and at 97,100N on the high frequency, and on traverse 101,200E at 99,900N 97,900N and 96,400N.

Keatings Area

Traverses 106,000N and 106,250N (Plate 4). Both traverses show high irregular dips with a fairly constant azimuth. It can be seen in Plate 1 that this area is close to Captains Flat township and the readings are probably affected by main power lines in the vicinity.

Tiger Cat Area

Traverse 119,000N (Plate 4) is a short traverse across the Tiger Cat Fault. The results show a well-defined anomaly in both frequencies at 100,650E.

Bollard Area

Traverse 1000S. The section of the traverse between 00E and 1700E was read twice with reasonable agreement. West of 1400E dip angles are high at the higher frequency, but reflect the same anomalies as those seen more normally at the low frequency at 750E and 1550E.

5. DISCUSSION

The results on the repeated sections of traverses 101,000E and 101,200E clearly show that gross changes in the readings can occur from day to day; this is also shown, though less forcibly, by the different positions, 400 feet apart, of the low frequency anomalies on traverse 95,000N. This shows the difficulty of obtaining reliable AFMAG measurements but the problem can be overcome to a certain extent by rereading sections of a traverse or reading a number of adjacent traverses, with a consequent increase in field work.

Another undesirable feature of the method is the amount of time lost during a survey because of unfavourable AFMAG field conditions. Weak fields around mid-day, irregular fields caused by local thunderstorm activity, and day-to-day variations in field strength due to causes which are not fully understood can all produce periods when it is very difficult or impossible to obtain readings, or when readings will be false.

In spite of the above limitations some of the traverses apparently show interpretable results, notably traverses 95,000N, 95,500N and 100,000N in the Gourlay-Hickey and Golf Course Area and traverse 119,000N in the Tiger Cat Areas. In these instances the results give regular profiles with well defined anomalies. The repeated readings on the east-west traverses in the Gourlay-Hickey and Golf Course Area and the repeated traverse in the Bollard Area show that reliable results

can be obtained. These traverses also show sections of traverse over which the dip angle has a uniformly high value, though in the Bollard Area this occurs in the high frequency only. There is no apparent explanation for this effect, and in the case of the Bollard traverse, it does not appear to affect the location of anomalies.

6. REFERENCES

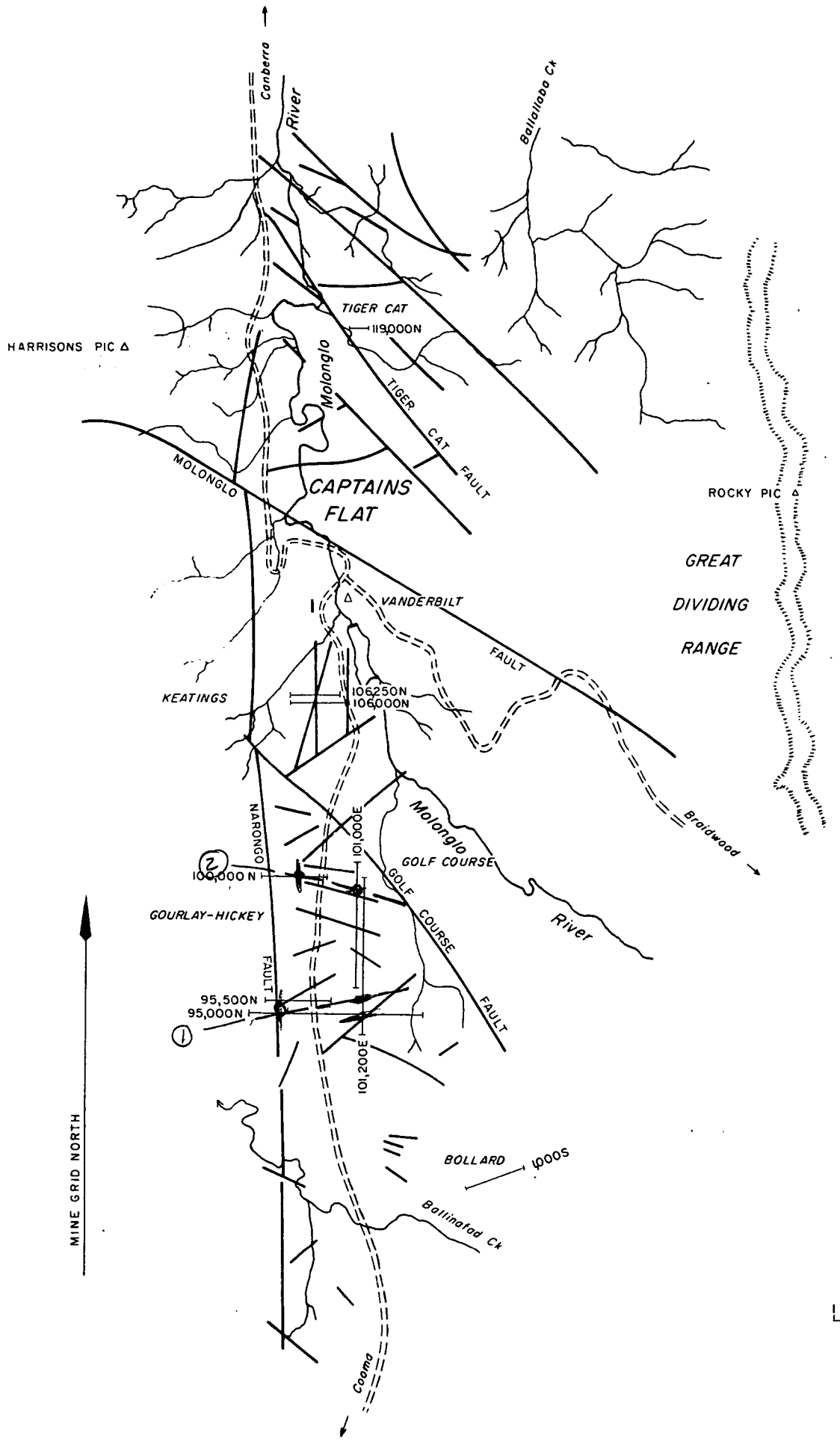
FARROW, B.B., 1969 - AFMAG test survey, Rum Jungle, N.T. 1968. Bur. Miner. Resour. Aust. Rec. 1969/72 (unpubl.).

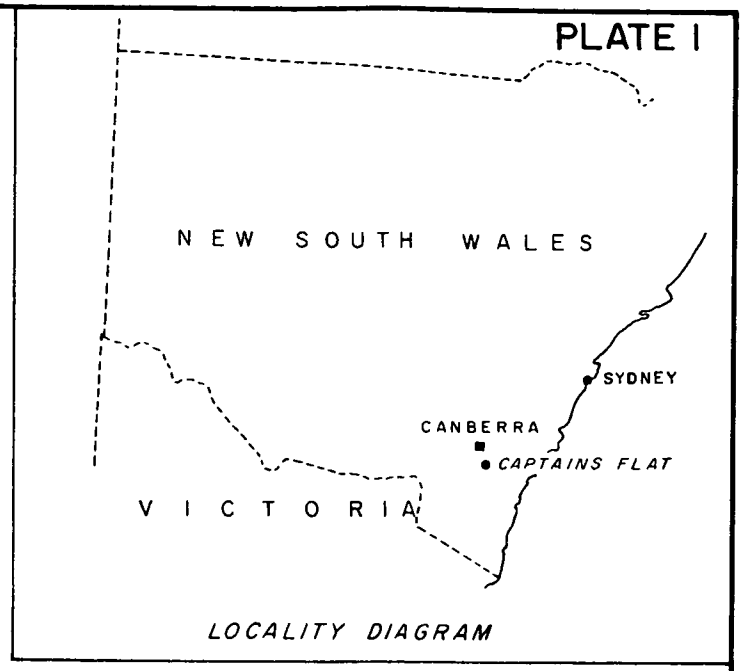
HALLOF, P.G. and SUTHERLAND, D.B., 1962 - The vector method of plotting AFMAG results. McPhar Geophysics Publ.

SEDMIK, E.C.E., 1965 - Captains Flat metalliferous geophysical survey, N.S.W., 1960. Bur. Miner. Resour. Aust. Rep. 96.

WARD, S.H., 1967 - In: MINING GEOPHYSICS, Vol. 2, 249-74. Soc. Explor. Geophys.

PLATE I





LOCALITY DIAGRAM

LEGEND

- Faults and shears
- Roads
- Streams
- Triangulation station
- Traverse

CAPTAINS FLAT NSW, 1968

AFMAG TESTS

LOCALITY MAP AND TRAVERSE PLAN

MILES 0 2 3

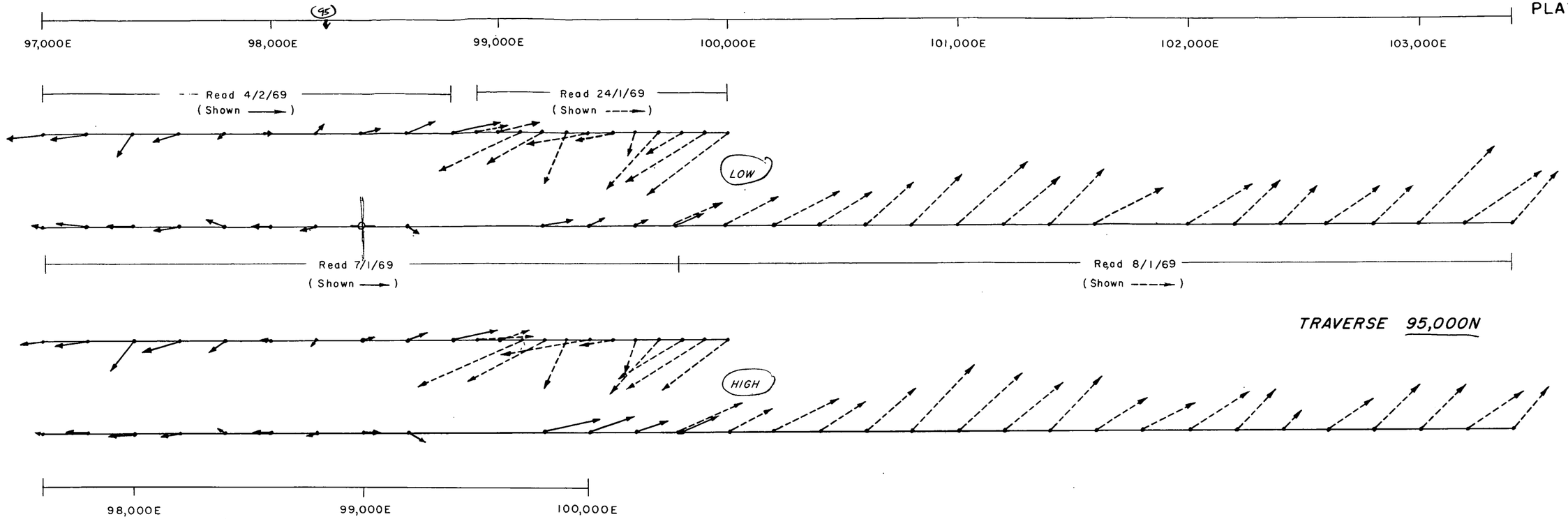
METRES 0 2 3 4

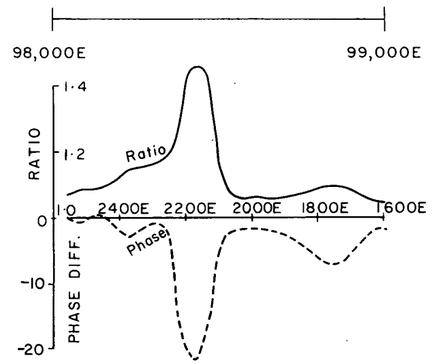
TO ACCOMPANY RECORD 1970/105

(Based on 155/B0-39)

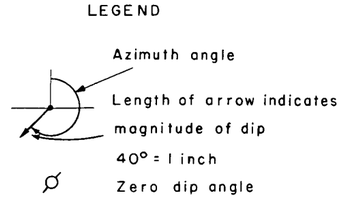
155/B7-69

PLATE 2





[FROM TURAM TRAVERSE 12200S (Sedmik 1965)]



GOURLAY – HICKEY AND GOLF COURSE AREA

AFMAG TESTS 1969

HORIZONTAL SCALE

400 0 400 800 FEET

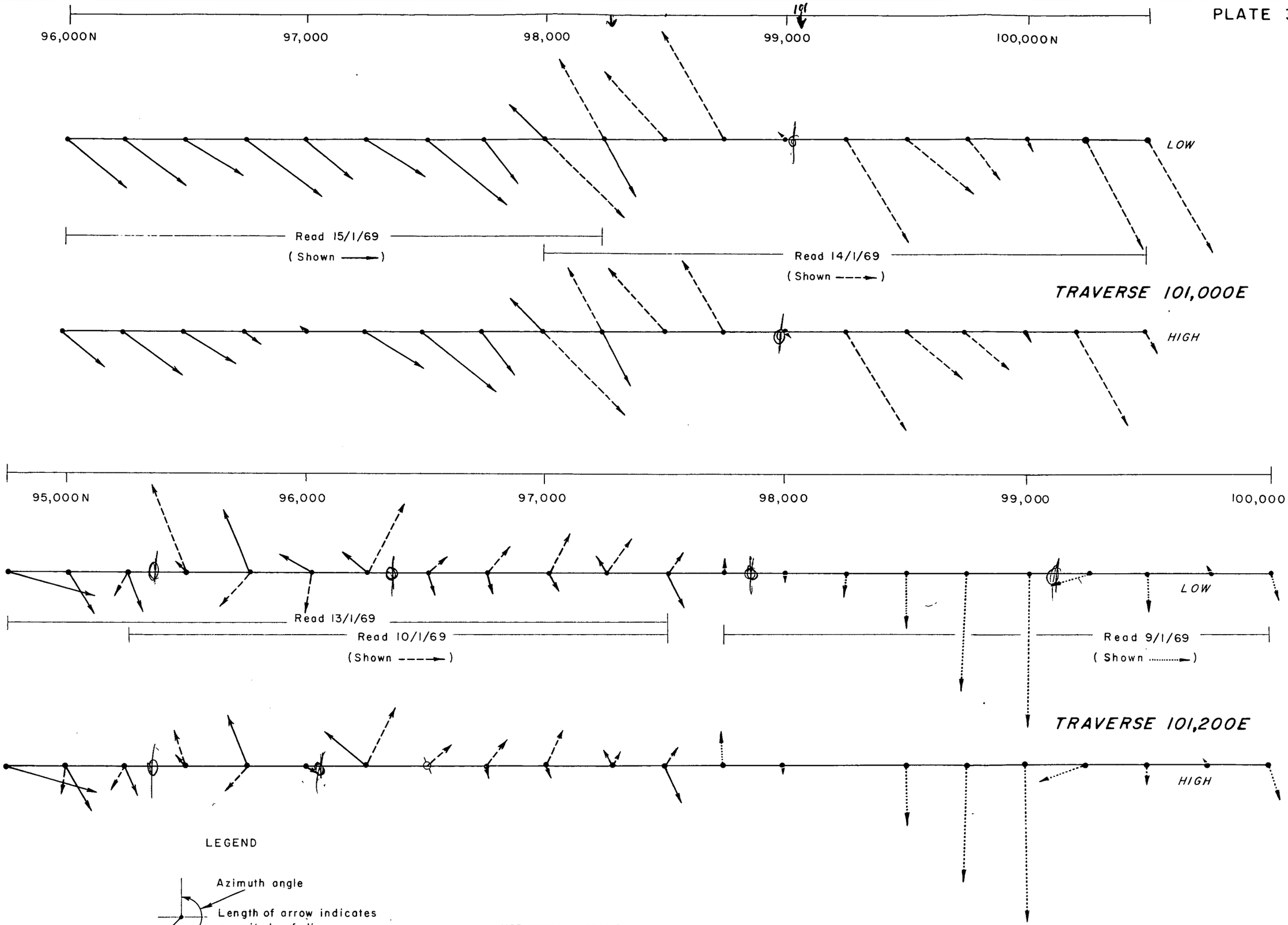
100 0 100 200 METRES

AFMAG Vector scale 40°=1 inch

TO ACCOMPANY RECORD 1970 / 105

I 55/B7–70

PLATE 3



LEGEND

Azimuth angle

Length of arrow indicates magnitude of dip
40° = 1 inch

Zero dip angle

HORIZONTAL SCALE

400 0 400 800 FEET

100 0 100 200 METRES

GOURLAY–HICKEY AND GOLF COURSE AREA

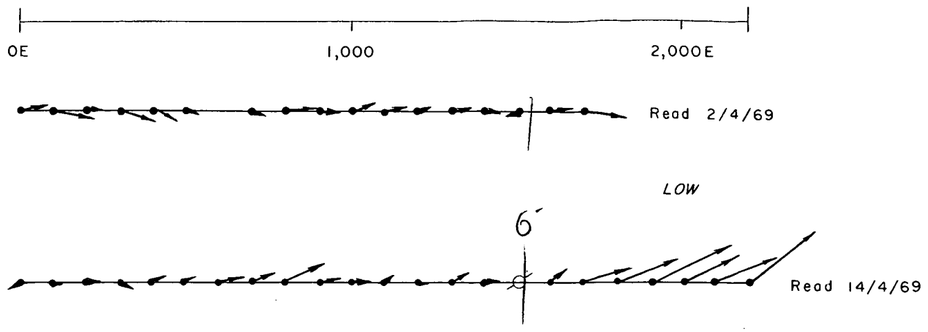
AFMAG TESTS 1969

TO ACCOMPANY RECORD 1970/105

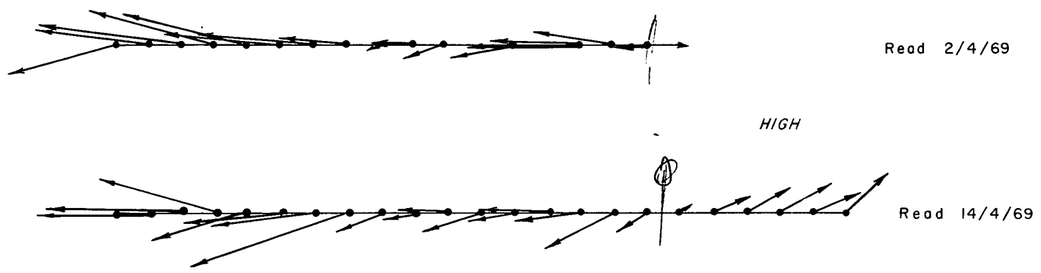
AFMAG Vector scale 40° = 1 inch

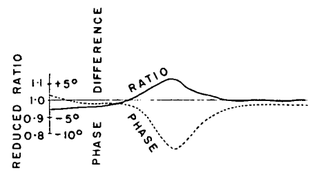
I 55/B7–71

PLATE 4



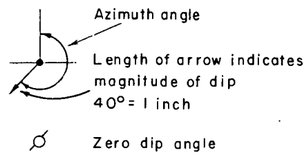
BOLLARD TRAVERSE 1000S

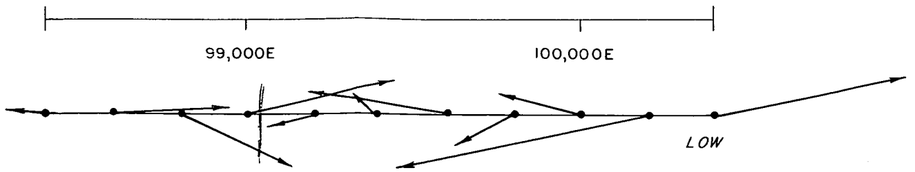




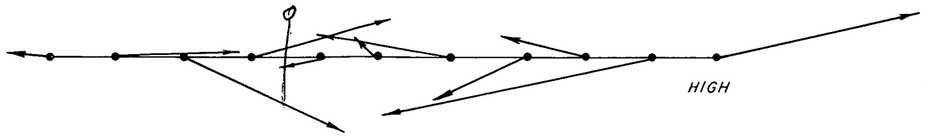
TURAM RESULTS (Sedmik 1965)

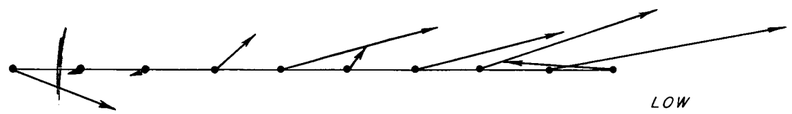
LEGEND



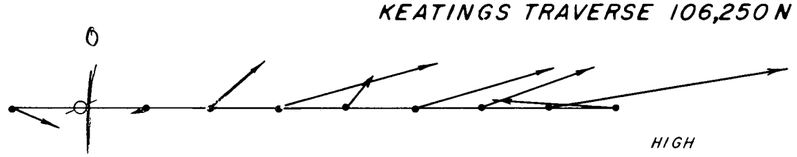


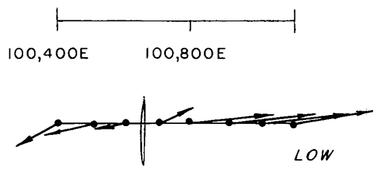
KEATINGS TRAVERSE 106,000N



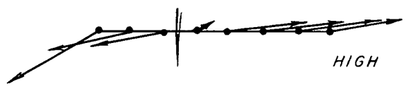


KEATINGS TRAVERSE 106,250N

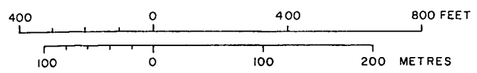




0 TIGER CAT TRAVERSE 119,000N



HORIZONTAL SCALE



CAPTAINS FLAT

AFMAG TESTS 1969

TO ACCOMPANY RECORD 1970/105

AFMAG Vector scale 40° = 1 inch

I55/B7-72