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BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1962/186

EMMAVILLE (WEBBS CONSOLS MINE) GEOPHYSICAL SURVEY, NSW 1953

by

K.H. Tate

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CONTENTS

ILLUSTRATIONS

SUMMARY

A geophysical survey, using the self-potential method, was conducted in the Webbs Consols mine area near Emmaville, New South Wales. In this area, small deposits containing arsenopyrite, galena, and sphalerite have been mined, and the purpose of the geophysical survey was to investigate for the possible occurrence of further similar deposits.

The self-potential results revealed a well-defined anomaly associated with a known arsenopyrite deposit, and many relatively weak anomalies, of which three are associated with known mineralisation and one, only, can be recommended for testing.

FOREWORD

The survey described in this Record was made in 1953. Although a draft report was written not long afterwards, for various reasons it was never issued. However, the report is now issued, with minor alterations, to place the findings of the survey permanently on record.

1. INTRODUCTION

The Webbs Consols Mine, which is about eleven miles south-west of Emmaville, has been producing a lead concentrate from limited reserves of a silver-lead-zinc-copper ore. In 1952, a request was received by the Bureau from New England Zinc and Lead, N.L., for a geophysical survey to be made over the leases held by that company. Preliminary examination of the area by Dr J. Horvath, a senior geophysicist of the Bureau, indicated that electrical prospecting methods might be tried.

The survey was made during September, October, and November 1953, by a field party consisting of K.H. Tate (party leader) and M.J. O'Connor.

2. GEOLOGY

The best geological map available of the Emmaville (or Vegetable Creek) district is that contained in the report by Carne (1911), and which is reproduced in part as Plate 1. Unfortunately this map does not completely cover the Webbs Consols leases. It is clear, however, that near the mine the chief formation is a group of quartz-porphyries and metamorphic porphyroids. An island of coarse-grained granite occurs to the immediate north-east of the mine, but the map does not show whether this persists south of the Severn River, i.e. across the area occupied by the leases. Observations by the geophysical party showed that in the area covered by the geophysical grid there is a contact between a coarse, acid granite and a series of quartz-porphyries.

The limited geological information available indicates that the granite is most probably the parent body of the ores. The ore-bodies lie along fissures within the granite, but outcrops as mapped by Coldham (1952) extend into the quartz porphyry. It is difficult to compare Coldham's map with that on Plate 1, as there is a certain amount of contradiction between the mining leases and surface information; e.g. the Webbs Consols shaft is in ML1015 (Plate 1) but on Coldham's map it is shown in ML1012.

Mineralisation is likely to be found in both granite and quartz-porphyry. The granite (known as 'acid granite') is a coarse porphyritic type, which is very resistant to erosion and in many places is prominent as hills with bare outcrops and little soil cover. The rock appears to be non-porous, as in many places there are pools of water in depressions on the bare outcrops. The porphyries, on the other hand, have better soil cover, but there are many steep slopes with a stony talus deposit. The formation appears to be well jointed and should allow circulation of ground water.

Pittman (1901) describes three lodes on ML1015, ML1018, and ML1019 (see Plate 1), the first of these being the principal one, with a direction of strike 010°. The gangue consists of quartz and felspathic material containing bunches, veins, and impregnations of galena, mispickel, copper pyrites, and zinc-blende. The main shaft is at present 209 ft deep and at the 75-ft level a drive was put in to the north to communicate with another shaft 75 ft distant. Total production, as stated by Pittman, was not above a few thousand tons of ore. Each of the other two lodes was tested by shafts about 100 ft deep - shafts 18 and 19 on Plate 2. No galena was discovered in either of these lodes, 'which appear to be of considerable width and to consist of felspathic material impregnated with considerable quantities of mispickel and a small percentage of copper pyrites'.

Referring to two 100-ft shafts in ML1012, Pittman states, 'In the southern of these (Plate 2, Shaft 9), the only ore obtained was mispickel, but in the northern shaft (Plate 2, Shaft 12) some very large bunches of galena were met with ..... the mine was finally abandoned because the bunches of galena gave out, leaving nothing but mispickel'. The workings in ML1013 referred to by Pittman as Barton's Quarry, and by Coldham as the Castlereagh Workings, were reported to have yielded small bunches of galena with mispickel.

Although Pittman's description of the area was written in 1901, it is still applicable, as it appears that the mine has been abandoned until recently and no further significant development has occurred, other than the discovery of a body of compact sphalerite at the 200-ft level and the mining by underhand stoping of a shoot of lead ore. In 1953 a small flotation plant was set up and a lead concentrate produced. In the first part of the programme, zinc, arsenic, and copper were being discarded.

It appears that arsenical pyrites is the most widely distributed mineral, with occasional bunches of galena or sphalerite or both.

3. SELECTION AND APPLICABILITY OF GEOPHYSICAL METHODS

Although available reports on the mine describe mainly the mining operations without giving a detailed geological study of the area, all investigators have agreed that other lead, zinc, or arsenic deposits, similar to the known deposits, might exist. Sulphide mineralisation is normally detectable by electrical prospecting methods, and in particular by the self-potential method. Because most of the known deposits in the New England district are small and irregular in shape, close spacing of observation points on the grid system is essential. The known orebodies are located in fissures in the granite, but the fissures appear to be much smaller in length and depth extent than those at Conrad (Inverell) and Butler (Torrington). The geophysical survey consisted mainly of self-potential measurements. The electromagnetic method could not be tested as suitable equipment was not available at the time. Although no marked variations in the magnetic properties of the ores and enclosing rocks were evident it was considered desirable to make brief magnetic tests.

4. SELF-POTENTIAL SURVEY

Field work

Although the self-potential method, which depends on the electrochemical effects produced by sulphide bodies undergoing oxidation, is applicable to the area, the following difficulties were encountered:

(a) Ground contact conditions in the area are bad, because neither the porphyry nor the granite produces good soil cover. There are many large areas of broken rock fragments on the quartz-porphyry slopes and several large bare granite outcrops.

(b) During the period of the survey, variable weather resulted in alternately wet and dry ground, and the accuracy of the results varied accordingly.

(c) Oxidation of sulphide deposits is likely to be more active in the quartz-porphyry than in the granite, because the structure of the former is more suitable for ground-water circulation.

The areas in the immediate vicinity of the Webbs Consols and Mount Galena mines, where either mining or prospecting has been done, were covered by a grid system of traverses striking roughly east-west, observation points being pegged every 25 ft. Distances between the traverses ranged from 50 to 100 ft (Plate 2). Wherever necessary, the grid was extended to follow up a self-potential anomaly. It was not possible to examine all the mine openings in the granite/porphyry contact zone, the extent of which is about three miles.

Readings were taken at most stations on the grid, the potential at each station being measured with reference to a fixed rear station. Two observations were made at each point in order to eliminate purely surface effects as much as possible. By choosing appropriate times for the work it was unnecessary to water each observation point.

Results

The self-potential profiles along each traverse are shown on Plate 3 and a self-potential contour map on Plate 4, which also includes the major surface features and geological boundaries. The profiles are very irregular, especially over the granite areas and the porphyry talus slopes. Self-potential anomalies of both positive and negative sign were recorded, and the principal ones are distributed in three roughly parallel lines. These are discussed below as Lines A, B, and C.

Line A. This line of anomalies has an average strike of 027° magnetic and extends from about 250W/1900N to 75E/3200N (Plate 4). The anomaly is weak and narrow at its southern end, but in the north it is much stronger and broader. Two minor negative centres occur at 200W/2080N and 100W/2400N and a major negative centre at 50E/2903N.

The major centre has a maximum value of minus 180 millivolts and the shape of the anomaly is disturbed by a small trough striking south-east from 150E/2903N to shaft No. 16 at 268E/2780N. Plate 4 shows that the anomaly occurs on the granite/porphyry contact in an area where the boundary between the two rock masses is disturbed. A well-developed gossan is present along the whole length of the anomaly. The geological references show that shaft No. 17 (Plate 2), which is favourably situated to have properly tested the deposit, located mineralisation consisting mainly of arsenical pyrites but no lead. Shallow pits have tested the anomaly farther south. It appears, therefore, that the self-potential results may be a guide to the development of the deposit for arsenic. It is likely to consist of two zones of mineralisation intersecting at an angle of about 60° at, or near, the point 75E/2980N.

Shaft No.18 at 185E/2318N does not appear to be connected with this line of mineralisation. The fact that no anomaly occurs near the shaft, although it is evident that copper sulphides and other mineralisation have been located there, could be explained by assuming that conditions are such that no oxidation is taking place. This shaft, which is reported to be about 100 ft deep, was filled with water to within about 20 ft of the collar, and it is likely that the level of the water-table is such that electrochemical activity within the body has been cut off.

Line B. This line of small negative anomalies extends from 750E/100N to 900E/1500N. The average strike of the line is about 015° magnetic, but the individual anomalies have widely different strikes. Negative centres occur at 735E/200N, 700E/500N, 730E/900N, 640E/1100N and 795E/1390N (Plate 4). These anomalies occur in an area well covered by talus deposits from the nearby porphyry ridge, and the most northerly centre is just south of the treatment plant.

The negative anomaly centred at 795E/1390N extends north-east to about 850E/1450N and is associated with a positive centre at 900E/1450N. It is possible that these two features are caused by the mineralisation at Webbs Consols Shaft. However, their small size and the difficulty of taking measurements in the area immediately around the mine and dumps do not permit reliable interpretation.

The remaining anomalies on Line B are in areas that have not been prospected. The anomalies are very weak and do not suggest any appreciable mineralisation.

Line C. Some anomalies occur along a line which passes through the Castlereagh workings and the Mount Galena shafts. Two directions of strike are evident, namely 020° magnetic in the Castlereagh area and 310° magnetic in the Mount Galena area. The line comprises an elongated anomaly in the south, passing through 1270E/150N, 1270E/200N, 1280E/300N, 1300E/500N and 1280E/600N, and two anomalies farther north, centred at 1190E/1050N and 1175E/1340N.

The negative centre at 1270E/200N is associated with a positive centre at 1325E/100N, these two features being directly related to the Castlereagh workings. Sulphide mineralisation is exposed in the open-cut and an anomaly would be expected under such conditions.

The anomaly at 1190E/1050N is situated near the two Mount Galena shafts, 11 and 12, (Plate 4) but this cannot be correlated with the mineralisation there, as no information is available regarding the extent of the underground work. This anomaly has a strike parallel to those of the anomalies at 150E/2903N (Line A), 640E/1100N (Line B) and 1175E/1340N. Although these are small and poorly defined anomalies (as is usual in the granite areas) the parallelism of strike may have some significance in studies of the method of ore deposition.

5. MAGNETIC SURVEY

Magnetic measurements were made with a vertical force variometer along traverses 1100N, 1200N, 1600N and 1700N. It was not possible to take readings near the known deposit because of the presence of mine buildings, engines, etc. No anomalies of possible geological significance were obtained.

6. CONCLUSIONS AND RECOMMENDATIONS

It is not possible to draw any firm conclusions from the geophysical survey. Only the self-potential results warrant consideration and these are not very reliable for a number of reasons, the principal of which is that mineralisation in the granite does not produce self-potential effects as strong as those produced by mineralisation in the quartz-porphyry. In addition, it is possible that mineralisation in the quartz-porphyry is more easily detected than that in the granite, partly because of its different structural environment and partly because of its higher content of arsenopyrite.

The well-defined anomaly associated with a long gossan in the northern part of the area is mainly in the quartz-porphyry, but is actually strongest at the granite/porphyry contact. It is considered that this anomaly is caused by the arsenic lode located in shaft No. 17 at 000/2898N.

The less well-defined line of anomalies in the western part of the area is possibly associated with mineralisation at the Webbs Consols shaft.

A series of weak anomalies in the eastern part of the area may indicate a line of mineralisation connecting the Castlereagh and Mount Galena workings.

Recommendations are limited to the testing of the Line A anomaly by trenching across it at the points 100W/2400N and 200W/2070N, and the carrying out of a detailed geological examination of the whole granite/porphyry contact zone shown in this area on Plate 1.

In the south-eastern part of the area further attention should be paid to the Castlereagh mine and its northern extension. Webbs Consols mine appears to be at the junction of two lines of faulting, both discernible on Plate 4, one running roughly north-east and the other north-west.

7. REFERENCES

CARNE, J.E.,	1911	The tin mining industry and the distribution of tin ores in NSW, Miner. Resour. N.S.W. 14.
COLDHAM, J.C.,	1952	Webbs Consols Mine (Unpublished report).
PITTMAN, E.F.,	1901	The mineral resources of NSW. Geol. Surv. of NSW.

ARVID
STRATHBOGIE
NORTH
BUNDAR
TENT HILL
ASTLEY
HAMILTON
GRAVEYARD
VEGETABLE CREEK
EMMAVILLE
TENT HILL
To DEEPWATER
STRATHBOGIE
CREEK
STRATHBOGIE
BLLOONBAH
APPROX. POSITION OF ROAD
SCONE
OLD WORKINGS
SEVERN
RIVER
WEBBS CONSOLS MINE
M.L. 1015
OLD WORKINGS
OLD WORKINGS
To WELLINGROVE
GORDON
FLADBURY
DOTTED LINE REPRESENTS GRANITE/PORPHYRY CONTACT SKETCHED FROM AERIAL PHOTOS.
T.N.
M.N.
10½°

LEGEND

- SEDIMENTS
- COARSE GRAINED ACID GRANITE
- QUARTZ PORPHYRIES AND PORPHYROIDS
- PORPHYRITE
- "BLUE" GRANITE
- RIVER
- CREEK
- FENCED ROAD
- PARISH BOUNDARY

QUEENSLAND
BRISBANE
GOONDIWINDI
INVERELL
GLEN INNES
ARMIDALE
NEW SOUTH WALES
SYDNEY
VICTORIA
MELBOURNE

POSITION OF AREA AND REFERENCE TO AUSTRALIAN 4 MILE SERIES.

Scale of Miles
100 50 0 100 200 300

GEOPHYSICAL SURVEY AT WEBBS CONSOLS MINE EMMAVILLE NSW

LOCALITY MAP

SHOWING GENERALISED GEOLOGICAL BOUNDARIES AND FORMER LEASES AFTER GEOLOGICAL MAP BY CARNE 1911

MILES 0 1 2 3
YARDS 1000 0 1000 2000 3000 4000 5000

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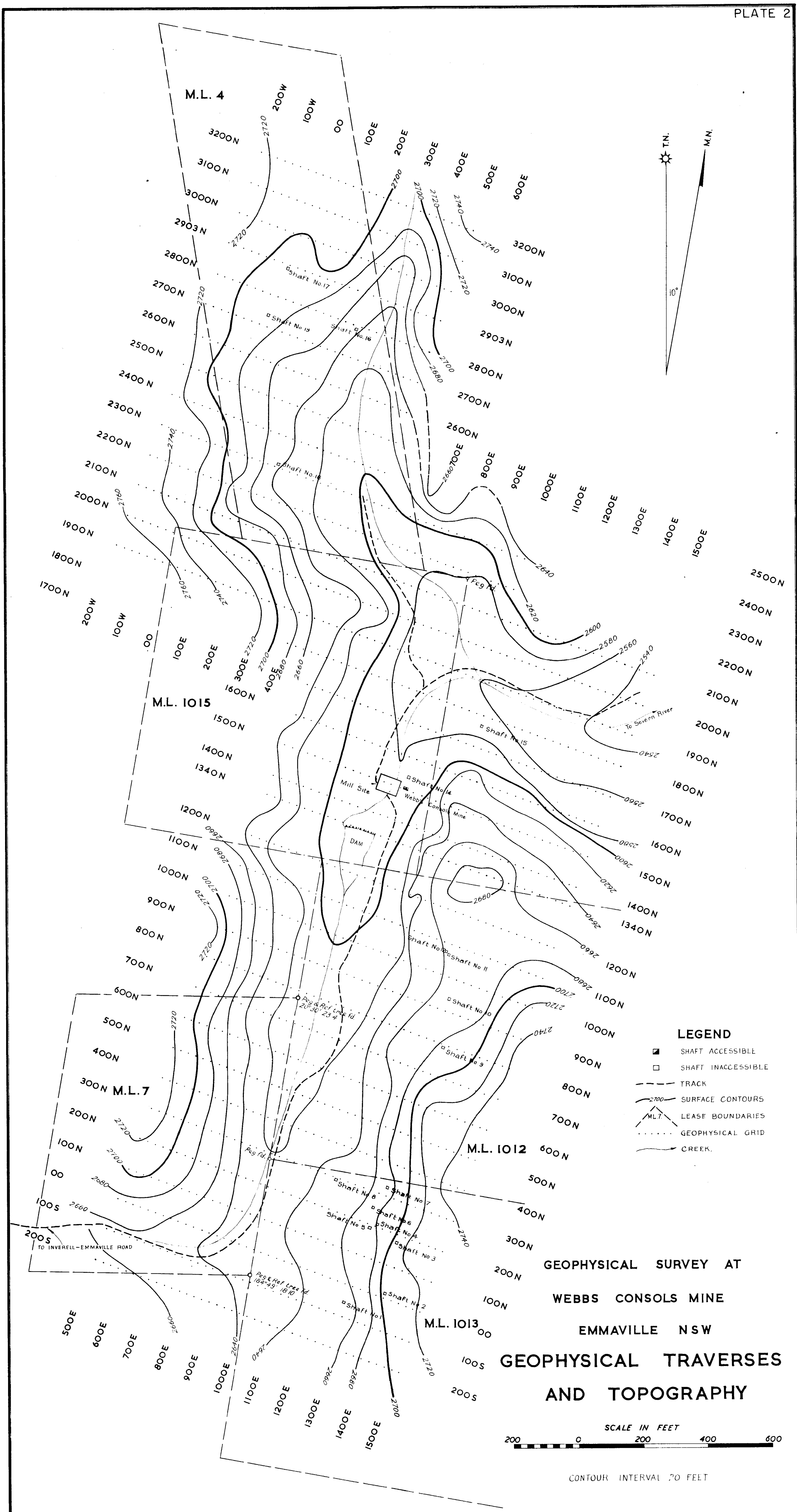

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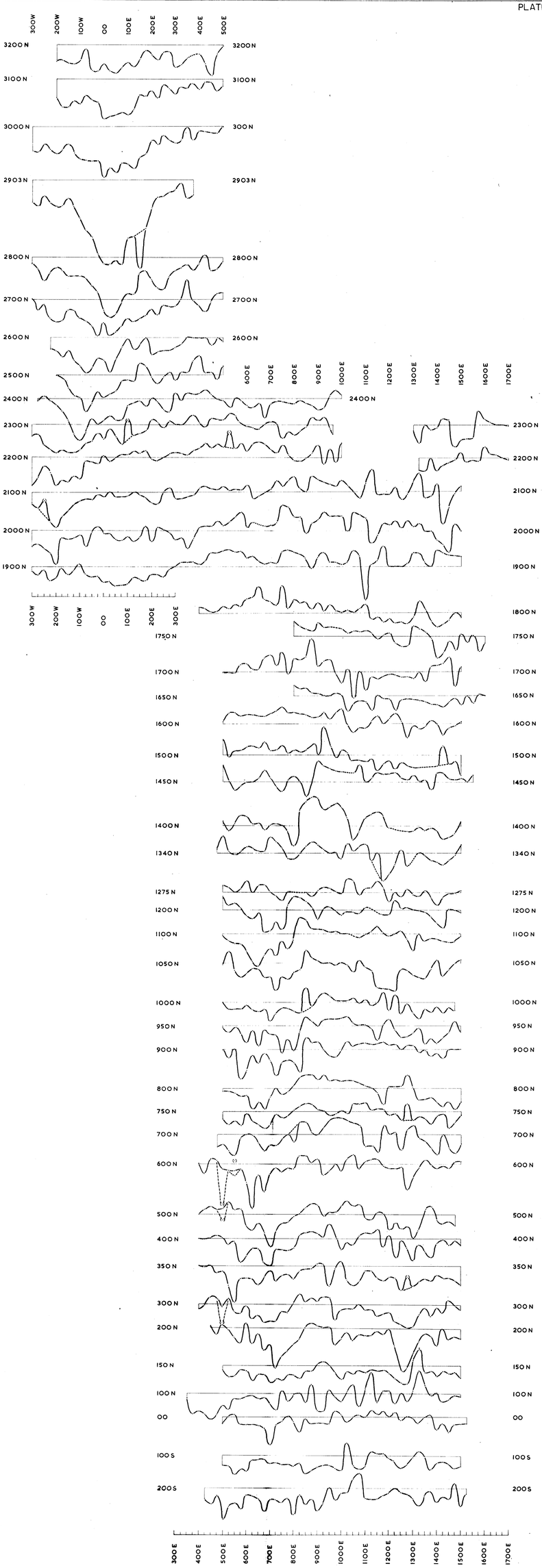

GEOPHYSICAL SURVEY AT

WEBBS CONSOLS MINE EMMAVILLE N S W

SELF – POTENTIAL PROFILES

VERTICAL SCALE 100 MILLIVOLTS = 1 INCH

NOTE: SPACING BETWEEN PROFILE IS NOT NECESSARILY TO SCALE

200 0 200 400 600

SCALE IN FEET

H 56/B7-3

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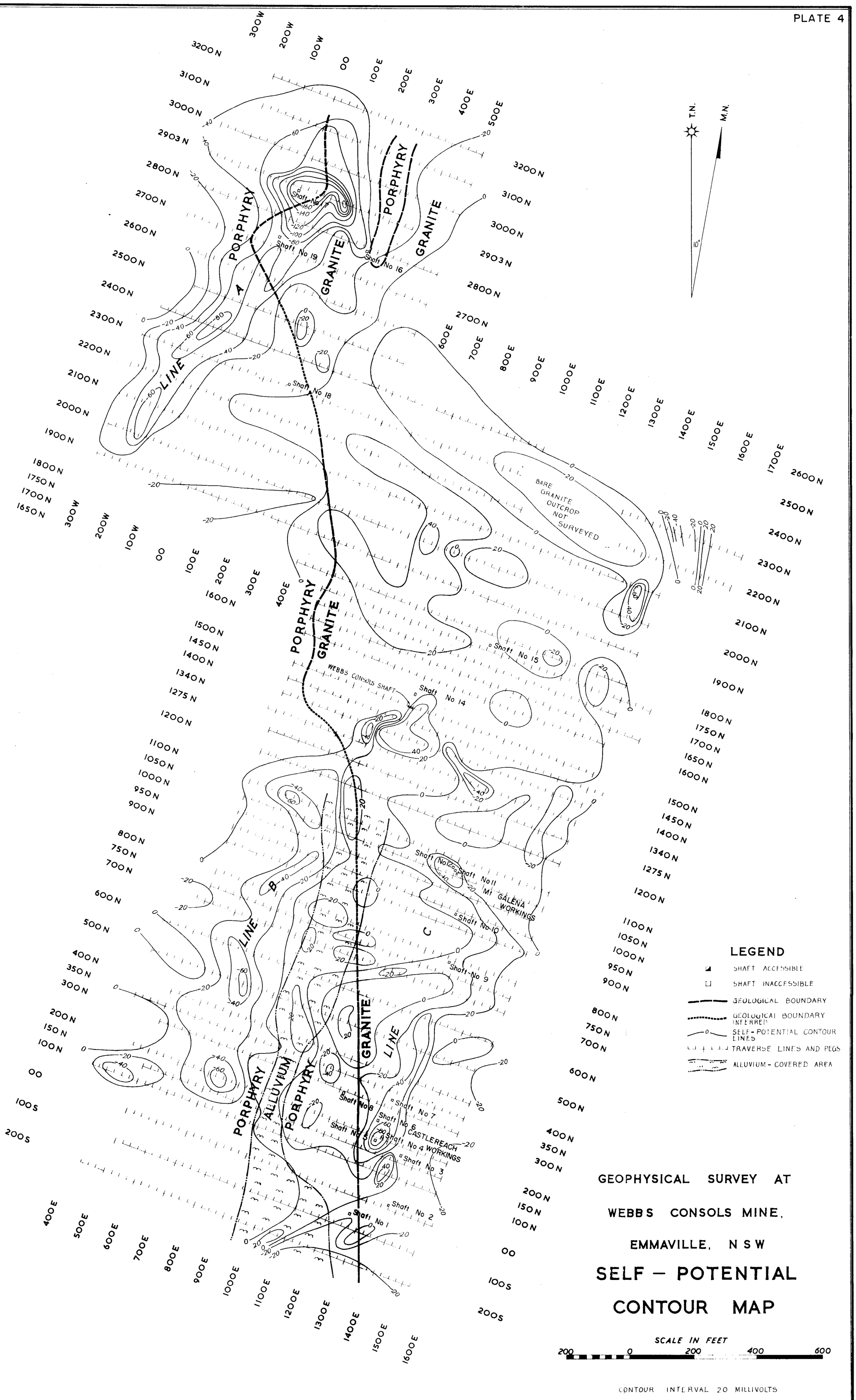

GEOPHYSICAL SURVEY AT WEBBS CONSOLS MINE, EMMAVILLE, N S W

SELF – POTENTIAL CONTOUR MAP

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