

1952/35

COMMONWEALTH OF AUSTRALIA

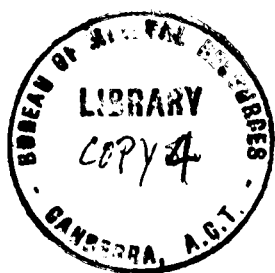
DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1952/35

PRELIMINARY REPORT ON SEISMIC REFLECTION SURVEY,

AVON AREA, GIPPSLAND, VICTORIA



by

K.R. Vale

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1. INTRODUCTION

During the early part of 1949 the Robert H. Ray Company conducted a gravity survey of the Gippsland Lakes district, Victoria, on behalf of Lakes Oil Ltd. Additional gravity work has since been done by the Bureau of Mineral Resources, Geology and Geophysics, which also covered the area with an airborne magnetometer survey during 1951. These surveys are part of the recent programme of oil exploration undertaken in that area by Lakes Oil Ltd and the Bureau. Reports covering the work of the Bureau are being prepared.

Both surveys showed an anomaly immediately to the north of Lake Wellington, the magnetic anomaly being a little displaced to the north-west of the gravity anomaly. The size and nature of the magnetic anomaly suggested that it might be due to rocks with higher than normal magnetic susceptibility in the basement complex. The gravity anomaly might be due to a buried hill in the Jurassic or basement, perhaps associated with the same feature which is responsible for the magnetic anomaly. Such a buried hill could result in a geological structure favourable to the accumulation of oil being present in the overlying Tertiary rocks, and in order to test whether or not a favourable structure existed a seismic reflection survey was undertaken by the Bureau.

This report deals with the results of the seismic survey. Two north-south traverses and one running east-west and crossing the other two were surveyed. Plate 1 shows the relation of the seismic traverses to the gravity and magnetic anomalies.

2. GEOLOGY

Rock outcrops in the area covered are few and the geology is best illustrated by the logs of the bores at Hollands Landing and Lake Kakydra at the eastern and western ends of Lake Wellington respectively (see Plate 1). These show marine Tertiary (Janjukian) clay and marl overlying freshwater Tertiary (Anglesean) lignitiferous sand and brown coal which, in turn, rest unconformably on Jurassic rocks, comprising feldspathic mudstone and sandstone. At Hollands Landing the depths below sea level to the top of the Anglesean and Jurassic respectively are approximately 3180 ft and 3940 ft, and at Lake Kakydra 3020 ft and 3510 ft. The southernmost shot-point is about 1 mile to the north of the straight line between these bores. The Jurassic rocks overlie a basement of metamorphic and igneous rock at an unknown but probably not very great depth. The oil prospects are confined to the Tertiary rocks.

3. ANALYSIS OF OPERATION

The seismic field party consisted of a party leader, one geophysical cadet, four University students (the survey was conducted during the University vacation), one driller, one drill assistant, one shooter, and two other field assistants. They used a 24-channel seismic recorder mounted on a truck, one truck-mounted drill, one shooting truck, two water tenders, and two other vehicles.

The party commenced operations on the 16th January 1952, and suspended operations on 28th February 1952. During the above period 40 shot-holes were drilled, each to a depth of 100 feet. All shot holes were fired and recordings were taken from each.

Shot holes were spaced at one-quarter mile intervals along the line of traverse. Geophones were spaced at 110 feet intervals between shot holes and each hole was shot with 12 geophones on each side.

4. DISCUSSION OF RESULTS

All reflections recorded have been plotted on cross-sections immediately under the shot point from which they have been recorded. Where possible, reflections have been correlated in time and carried continually along the section.

Only one band of reflections was continuous enough to give useful information. It has been possible to follow one particular reflection continuously over the whole area. The traverses do not form a closed loop to ensure against wrong correlation and there are some doubtful points. However, it is not considered likely that any of the errors due to such doubtful points could radically alter the interpretation.

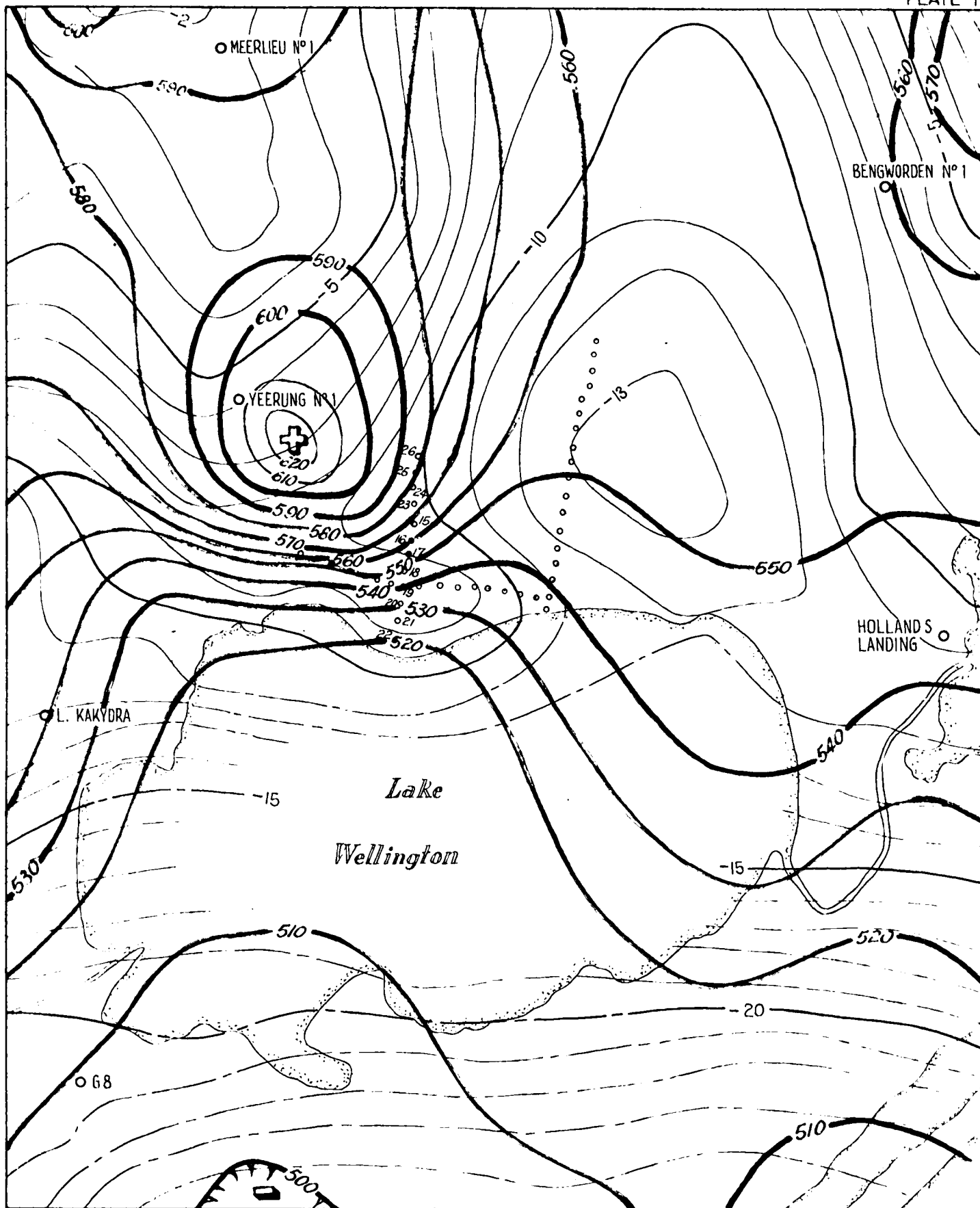
A contour map of the seismic horizon is shown in Plate 2. It shows a general southerly dip of 1 to 2 degrees over the whole area and, except for a slight flattening of the dip near the axis of the gravity anomaly, bears no direct relation to the gravity pattern. There is no dip reversal or hill-like feature revealed.

Depth of the horizon below sea level ranges from 2600 feet at shot-point 29 to 3260 feet at shot-point 21, although owing to the uncertainty in velocity of the seismic waves these figures may be as much as \pm 10 per cent in error.

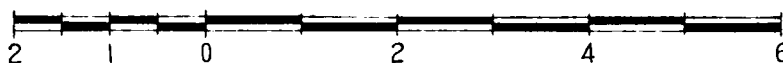
There is strong evidence that reflections that appear on the records later than the one contoured are multiple reflections due to the return energy from the reflector being again reflected at the surface and giving rise to duplicate series of reflections. This condition requires a very efficient reflector and since the geological section would suggest that only the Tertiary-Jurassic contact would provide the necessary density and elastic contrast for an efficient reflector, it can be taken as evidence that the seismic horizon is representative of the surface of the Jurassic. This, however, needs further corroboration before being accepted as definite. Correlation between Hollands Landing and Lake Kakydra bores suggests that the reflector could represent either the top of the Jurassic or the top of the Anglesean.

5. CONCLUSIONS

On the basis of the seismic results it is concluded that there is no favourable structure in the Tertiary rocks associated with the observed gravity and magnetic anomalies in the area tested. The gravity and magnetic anomalies are probably an expression only of a variation of rock type within the basement complex. Other gravity and magnetic anomalies disclosed by the surveys have yet to be tested by the seismic method. The results obtained on the area described above in no way detract from the possibility of finding suitable structures associated with other gravity and magnetic anomalies.



SCALE IN MILES



LEGEND

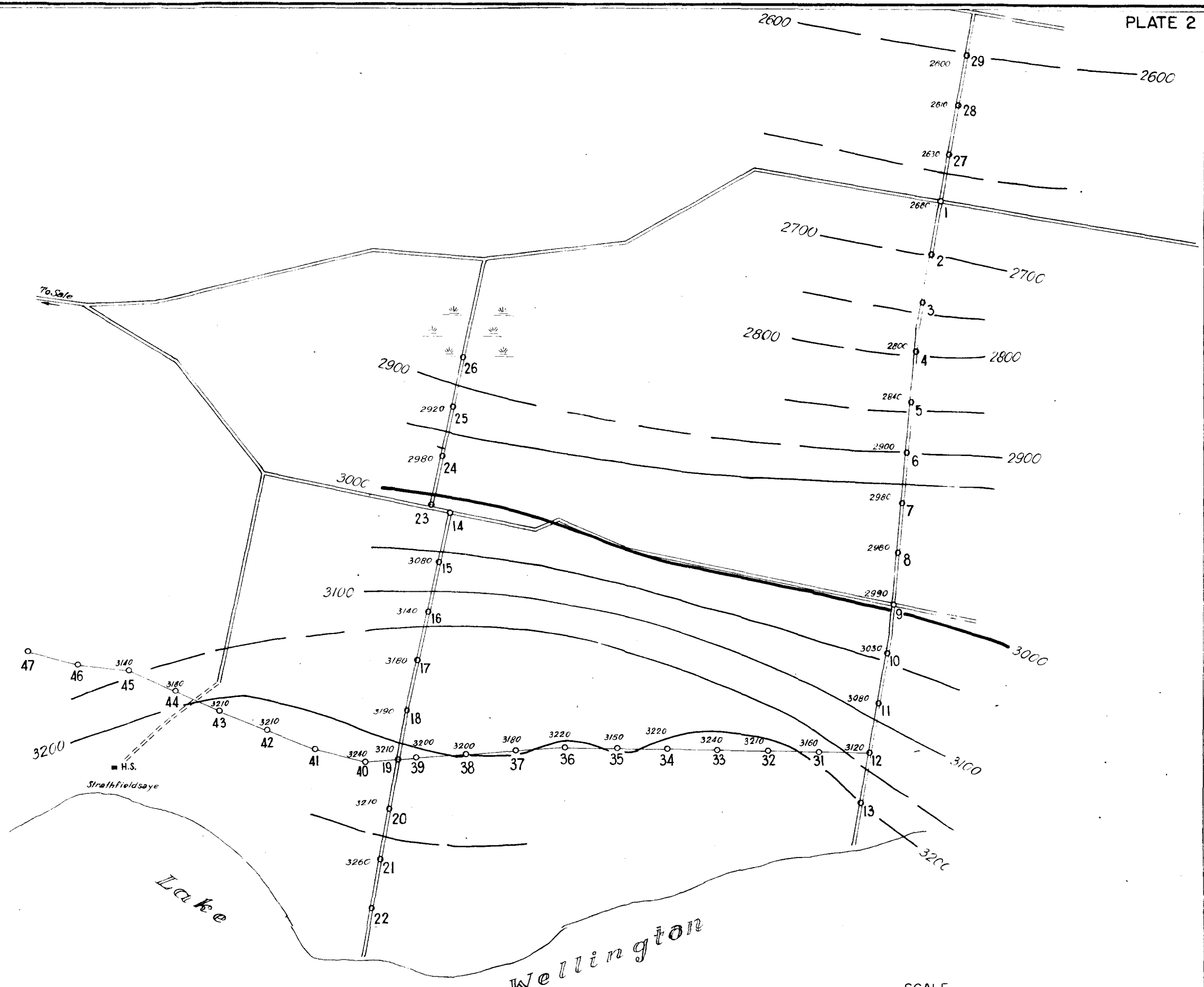
- SEISMIC SHOT-POINT
- BORE
- -15 GRAVITY CONTOURS
Contour Interval, 1 Milligal
- — — MAGNETIC CONTOURS
Contour Interval, 10 Gammas
- — — NEGATIVE MAGNETIC ANOMALY
- + POSITIVE MAGNETIC ANOMALY



GEOPHYSICAL SURVEY, AVON AREA, GIPPSLAND, VICTORIA

POSITION OF SEISMIC TRAVERSES IN RELATION TO MAGNETIC AND GRAVITY ANOMALIES

True North



GEOPHYSICAL SURVEY GIPPSLAND, VICTORIA
SEISMIC SURVEY AT AVON AREA
 CONTOURS OF A CONTINUOUS REFLECTING HORIZON
 IN DEPTHS BELOW SEA LEVEL
 MEAN DEPTH $\pm 10\%$ (ESTIMATED)
 MAX. AND MIN. RELATIVE DEPTHS $\pm 15\%$ (ESTIMATED)

PRELIMINARY MAP ONLY
 SUBJECT TO REVISION