CONTENTS ENVELOPE 134

TENEMENT: Not Related

TENEMENT HOLDER: Santos Ltd.

REPORT:

NO PLANS

GEOSURVEYS OF AUSTRALIA LIMITED
GEOLOGICAL & GEOPHYSICAL CONSULTANTS
Managing Director: R. C. SPRIGG, M.Sc.
A.M.Aus.I.M.M., M.Am.A.P.G., M.G.S.Am.

Laboratories—
57 Todville Street
Woodville West
Telephone Nos.—
Registered Office LA 2886
Depot & Laboratories M 7609
Telegrams—
"Geosurveys" Adelaide
Secretary—
Rennie F. Middleton,
A.A.S.A., A.C.A.A, J.P.

27-28 NATIONAL MUTUAL BUILDINGS
91 KING WILLIAM STREET
ADELAIDE
SOUTH AUSTRALIA

G.P.O. Box 1479L

0003

To Mr. R.C. SPRIGG.

Progress Report

Gravity and Magnetic Survey. North East of South Australia.

A gravity and magnetic survey traverse has been made from Beltana (the northmost point of the Parachilna survey) to Maree and from there along the Birdsville track. It was hoped to make cross traverses from this line at intervals but it was found that the nature of the ground (sandhills separated generally by flooded claypans) made this generally impossible at present. A coverage was made in the Cowane area where a number of tracks were traversed but further north the tracks deteriorated to such an extent that it was only possible to go from Clifton Hills to Birdsville by deviating some 30 to 40 miles to the east in country where the gravity traverse is made almost meaningless by uncertainty in the latitudes of the stations.

It is proposed to make a traverse south from Birdsville along the main track towards Goyders Lagoon (where the road is at present impassible) and from there to Alton Downs. After this a tie will be made (if possible) to Cordillo Downs to relate this work to the previous geophysical work, done by Frome Broken Hill Co.

This work will more or less complete the work it is possible to do here at present without detailed optical survey. I anticipate that the survey will finish in the Cordillo Downs Area. From here it would be difficult and if the Cooper comes down impossible to return to Maree. It is impossible at present as the Diamentina system (including the Warburton and Kallakoopah) are in flood to go to Oodnadatta. From Cordillo we would either directly if the Cooper is crossable at Innaminka (which is very doubtful) go to Broken Hill as always from this area get out by going through Windorah where we can cross the Cooper.

This would make a long journey to Adelaide with no prospect of leaving the vehicles (as suggested in your memo) and flying to Adelaide.

As conditions are at present in this area I would suggest that the best and most efficient way to work here would be to leave it alone for a few months.

If you have any idea of doing geophysical work in the Bowen basin we have the vehicles and equipment here at present and could after computing our results in Adelaide go from here to Bowen with no trouble and work here in a few months time.

I have outlined what we propose to do for the next month or so. After that it would be best to return to Adelaide to compute the results. As far as the vehicles are concerned I would like to have advice as to what it is best to do with them in view of the difficulties in travelling in this area at present.

David M. PEGUM.

P.S. It may be possible in returning from Innaminka to Adelaide to make a gravity tie from the south end of Frome Broken Hills survey at Moolorwortina to Maree but this is very doubtful at present. I would appreciate an idea of what you would like us to do after reaching Cordillo Downs.

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REGIONAL GRAVITY AND MAGNETIC SURVEY.

GREAT ARTESIAN BASIN (SOUTH.AUST.).

INTRODUCTION.

Reconnaissance gravity and magnetic observations have been made during June and July 1956 in the area between Birdsville and Marree and also north of Cordillo Downs in north-eastern South Australia.

Contour maps of the Bouguer Gravity Anomaly and Vertical Magnetic Intensity have been prepared.

PREVIOUS GEOPHYSICAL WORK.

A reconnaissance gravity and magnetic survey was made in 1947/48 by FROBILCO over about 15000 square miles of country to the south east of the area of the present survey.

A regional gravity traverse was made in 1951 by Marshall and Narain for the University of Sydney along the Central Australian railway.

Gravity observations have been made in 1955 by Geosurveys in the Oodnadatta area.

GEOLOGY.

The area is almost completely covered by alluvium and desert deposits underlain by the Cretaceous rocks of the Great Artesian Basin near Marree Proterozoic basement rocks outcrop.

METHODS USED.

Gravity and magnetic stations were located by speedometer mileages on the roads and tracks. The latitudes were determined from the 8 mile to 1 inch military sheets of the area. Heights were obtained by barometric levelling from bores and points of known height. A height correction of 0.63 gravity units per foot was used as determined in the Oodnadatta area. The absolute value of gravity was determined from a tie traverse to a station previously established at Beltana.

The magnetic values were corrected for latitude and longitude using the Carregie Institution tables of values. The absolute value of the vertical magnetic intensity was determined by tying to the FROBILCO survey which reoccupied some magntic stations, established by the Commonwealth Government. Results are presented in the form of contour maps of the Bouguer anomaly and vertical magnetic intensity and also a set of profiles from Marree to Goyders Lagoon and a geological section on the same line.

INTERPRETATION OF GRAVITY RESULTS.

The main features of the gravity results are as follows.
The gravity anomaly decreases rapidly from - 35 mg, near Farina to -5 mg. some 10 miles north of Marree. This anomaly over Proterozoic areas is considered to be a reflection of the thickening of the sialic layer associated with the Adelaide geosyncline in this area. Some 100 miles east of Marree a basement outcrops of granite at Moolawatana is reflected as a considerable increase in gravity.

From north of Marree to Mungeranie the absolute value of the anomaly corresponds closely to the depths of the basin allowing a density contrast of 0.4 (the value determined by FROBILCO) between the basin and basement and hence a basin depth of 200 feet per milligal anomaly.

Between Mungeranie and Mirra Mitta there is a gravity trough with anomaly -40 mg. A similar trough or possibly a continuation of the same trough some 100 miles east (the Innamincka Gravity low) was interpreted by FROBILCO to be an area of deep basin with some 9000 feet of sediment. However the Mungeranie Gravity Low corresponds broadly to an uplift of 150 feet in the level of the base of the Rolling Downs formation (lpwer Cretaceous) which does not seem to fit this interpretation.

North of Mirra Mitta the gravity anomaly becomes more positive while the depth of the basin indicated by the bores increases until at Goyders Lagoon the anomaly would indicate a basin depth of 2900 feet while the bore reached 4850 feet in basin desiments.

This result would suggest that possibly the Innamincka and Mungeranie gravity lows may not represent deep troughs but rather a major structural discontinuity of the area over which and north of which the simple relation between Bouguer anomaly and basement depth does not apply.

North of Goyders Lagoon and Cordillo Downs the anomaly is rather variable with anomalies showing a reasonable correlation between the two traverses.

To the west of Birdsville the anomaly becomes steeply more positive rising to a value of 5 mg. This anomaly is very similar to the anomaly on the margin of the basin, at Moolawatana and may represent the margin of the basin or of a major basement high.

INTERPRETATION OF MAGNETIC RESULTS.

The vertical intensity measured in the area shows no direct relationship to the depth of the basin to the horizontal gradient of the gravity anomaly. From this and the correlation observed between the horizontal magnetic gradient and the Bouguer anomaly in the area surveyed by FROBILCO it has been concluded by Kanfmann and MacPhail (Co-ordination of Geological and Geophysical data from Southwestern Portion of the Great Artesian Basin. 1948 unpublished) that the magnetic intensity pattern is due to remnant and not induced magnetisation of the basement. Estimates of basement depth can be made but may be expected to be less accurate than those derived from the gravity because of the random magnetisation of the basement and may be regarded as a conformation of depth determinations from the Bouguer anomaly.

The depth of the basin was determined from the horizontal gradient of the magnetic intensity along the profile from Marree to Goyders Lagoon. The result agrees with the values obtained from the bores but only gives a broad indication of basin depths.

CONCLUSION.

The variable gravity anomaly found between Marree and Coopers Creek would suggest that a more detailed gravity survey in this and adjacent areas could lead to the discovery of structural highs in this part of the margin of the Great Artesian Basin.

D.M. PEGUM
Geophysicist.