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GRAVITY SURVEY
BURT RANGE BASIN
NORTHERN TERRITORY

By :

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GRAVITY SURVEY

BURT RANGE BASIN, NORTHERN TERRITORY.

METHOD AND ACCURACIES :

Seventy-one ^{gravity} stations were established along 35 miles of surveyed line in the Burt Range Basin.

The instrument used was a Worden Gravity Meter No. 216 with a scale constant of 0.09095 milligals and a reading accuracy of 0.1 scale divisions.

Repeat readings were taken within two hours to check for the drift of the meter, which, throughout the survey, did not exceed 3 scale divisions per hour.

A closure error of 0.14 milligals in the observed gravity values was found in the 22 mile traverse encircling the Central Burt Range. This error was distributed around the traverse, the necessary correction per half-mile-station being approximately 0.003 milligals. Corrections for latitude and elevation were applied to all observed gravity values. The combined Free-Air and Bouguer correction factor for elevation used was 0.06826 milligals per foot, corresponding to a density of 2.1 gms/cc. for the near-surface rocks.

The corrected gravity values were tied-in to the gravity values established by the Bureau of Mineral Resources, 1956, at stations S.P. 415 and SP. 448.

The accuracy of the survey can be determined by considering the respective accuracies of the gravity observation, and latitude and elevation corrections.

These have been estimated to be 0.02, 0.01 and 0.03 milligals respectively. These give a standard error of-

$$\left((0.02)^2 + (0.01)^2 + (0.03)^2 \right)^{\frac{1}{2}} = 0.04 \text{ milligals}$$

The Bouguer gravity values were plotted at a scale of 1" = $\frac{1}{2}$ mile and contoured at an interval of 1.0 milligals.

INTERPRETATION :

The contours indicate a deepening and broadening of the sedimentary trough south from Milligans Lagoon towards the Central Burt Range, where the deepest part of the trough occurs immediately to the west of the Amphitheatre Fault in the vicinity of gravity station R.37.

To the east of the axis of this trough a line of steep gravity gradient runs from pegs R.54 and R.55 in the north, through pegs R.1 and R.2, to pegs R.39 and R.40 in the south. This line of steep gravity gradient closely follows the line of the Cockatoo Fault and is considered to be an expression of this fault. The gradient across the fault varies - being approximately 5 milligals in half a mile in the north, and approximately 2 milligals in half a mile in the south. The steep gravity gradient observed in the north between pegs R.54 and R.55 is similar to that observed in the gravity traverse by the Bureau of Mineral Resources, in 1956, across the northern extension of the Cockatoo Fault, east of Spirit Hill.

The gravity profile over the Cockatoo Fault in the Amphitheatre area indicates the downthrown side of the fault to be to the west, while surface geology shows the Burt Range limestone, on the west, faulted against the Nigli Gap Sandstone, indicating the western side to be upthrown. It is considered that only minor movements of the fault, after deposition of the Nigli Gap sandstone, have brought about this phenomenon, the major movement of the fault having been prior to or during deposition of the Burt Range limestone, when the western side was strongly downthrown.

Graphical interpretation has shown that the displacement of the Cockatoo Fault in the Amphitheatre area would be in excess of 5,000 feet, while further north, east (...3/.)

of Milligans Lagoon and Spirit Hill, the steeper gravity gradient could indicate an even greater displacement. It is possible that along the northern extension of the Cockatoo Fault subsequent uplift of the western block after deposition of the Nigli Gap sandstone did not take place or that the movement was less than that on the Cockatoo Fault in the Amphitheatre area. Also in the north, low density Carboniferous sandstones are faulted against the Upper Proterozoic rocks, giving a large density break and hence a large effect on the gravity across the fault, while in the south, higher density Devonian limestone is faulted against Lower Proterozoic rocks, making the density break and hence the gravity effect smaller.

No other structural elements are expressed by the gravity in its present form. There appears to be no expression of the Amphitheatre Fault and no structural highs were delineated by the survey.

However, more detailed gravity work in the Amphitheatre area may delineate structural elements that cannot be resolved from the gravity map in its present form.

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