COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

RECORDS:

RESTRICTED

RECORD NO. 1968/39

Waldens Prospect Electromagnetic Survey, Northern Territory 1967

by

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SUMMARY

A Slingram survey was made at Waldens Prospect, near Pine Creek, Northern Territory to check the results of a dip-angle survey made earlier by United Uranium N.L. No electromagnetic anomaly was found.

1968/39

1. INTRODUCTION

Early in 1967 United Uranium N.L. made a dip-angle electromagnetic survey at their Waldens Prospect. Several of the traverses were repeated later and different results were obtained from the original results. United Uranium N.L. then approached the Darwin Uranium Group of the Bureau of Mineral Resources for technical advice. On December 20th 1967, a Slingram electromagnetic survey was made by the BMR at Waldens Prospect. United Uranium N.L. provided all facilities except the Slingram equipment and the observer. The Slingram survey showed that there is no detectable electromagnetic anomaly in the area surveyed.

Waldens Prospect covers the area of the old Waldens copper mine, about 30 miles east of Pine Creek, Northern Territory (Plate 1). Recorded production from Waldens mine is 1219 tons of ore between 1905 and 1919 (Walpole, 1962, Appendix 1). The lode dips steeply to the north-east and strikes north-west. It is in the Burrell Creek Formation near an outcrop of Cullen Granite. Walpole (1962, Table 1), describes the Burrell Creek Formation as Lower Proterozoic greywacke, siltstone, and greywacke-siltstone.

The baseline of the grid is along the lode and the traverses are at right angles to the lode (Plate 1).

2. DIP-ANGLE SURVEY

The dip-angle method employs portable vertical transmitting and receiving coils. A primary oscillating magnetic field is set up with the transmitting coil. This primary field is horizontal at the receiving coil. When a subsurface conductor is present the field is elliptically polarised. The receiver then measures the angle between the major axis of the ellipse of polarisation and the horizontal. This angle is known as the dip (or tilt) angle.

In the presence of a conductor, the magnitude of the dip-angle reaches a maximum when the receiver is on one side of the conductor, falls to zero (the 'crossover') approximately over the conductor, and then goes through a maximum of opposite sign on the other side of the conductor. The field always dips away from the conductor.

The dip-angle method can be used in a variety of ways. At Waldens Prospect the 'parallel line', or 'broadside tandem', method was used. The receiver and transmitter were moved on parallel traverses. The receiver-transmitter separation was 400 feet. Readings were made every 100 feet near the lode and every 200 feet away from the lode.

The interpretation of electromagnetic data is an exercise in curve fitting. Field results are compared with calculated or measured responses to conductors of various simple shapes, orientations, and conductivities. If the field results can be matched satisfactorily with one of the theoretical results, then the model used should resemble the geological conductor. If a fit cannot be obtained, then significant differences must exist between the model used and the geological conductor; these differences can sometimes be helpful in interpretation. A number of published sets of type curves for the parallel line dip-angle method are available (for instance: Ward, 1967).

One important feature of the parallel line dip-angle method is that the angle which the traverse makes with the strike of the conductor has a profound influence on the shape of the profile obtained. The strike direction must be determined before attempting to interpret a profile. This is generally done by correlating crossovers from one profile to the next.

At Waldens Prospect, traverses were at right angles to the lode (Plate 1) and interpretation of the dip-angle results should be straightforward. The results (Plate 2) show no correlation from traverse to traverse, indicating that there is no continuos conductor associated with the lode. None of the profiles can be interpreted as being caused by the lode.

In dip-angle surveys, spurious dip-angles can be caused by differences in elevations between coils, by errors in chaining, and by misorientation of coils. The dip-angles measured at Waldens Prospect are probably mainly spurious. The repeatability of the readings is poor. Random reading fluctuations of up to 3 degrees can be expected in dip-angle surveys. In the Waldens Prospect survey, fluctuations are considerably greater than 3 degrees. There appears to be a large amount of 'operator error' in the results; this suggests that more attention should have been paid to details of operation during the survey.

3. SLINGRAM SURVEY

In the Slingram survey, portable coplanar horizontal transmitting and receiving coils 200 feet apart were moved in tandem along each traverse. The receiver balances out the undisturbed primary field and measures the intensities of the real (i.e. in phase) and imaginary (i.e. out of phase) components of the secondary field as percentages of the undisturbed primary field strength at the receiver. The system requires a cable between receiver and transmitter to obtain a reference signal from the transmitter for the phase measurements. Conductors are indicated by 'lows' in the real and imaginary components.

Results of the Slingram survey are shown in Plate 2. Readings were made at 50-ft intervals, which were measured by pacing between pegs. Distance between coils was kept at 200 feet by using the reference signal cable.

No Slingram anomaly was found at the Waldens Prospect.

4. CONCLUSIONS

There is no detectable conductor associated with the lode at Waldens Prospect, within the exploration depth range (100 to 150 feet) of the systems used.

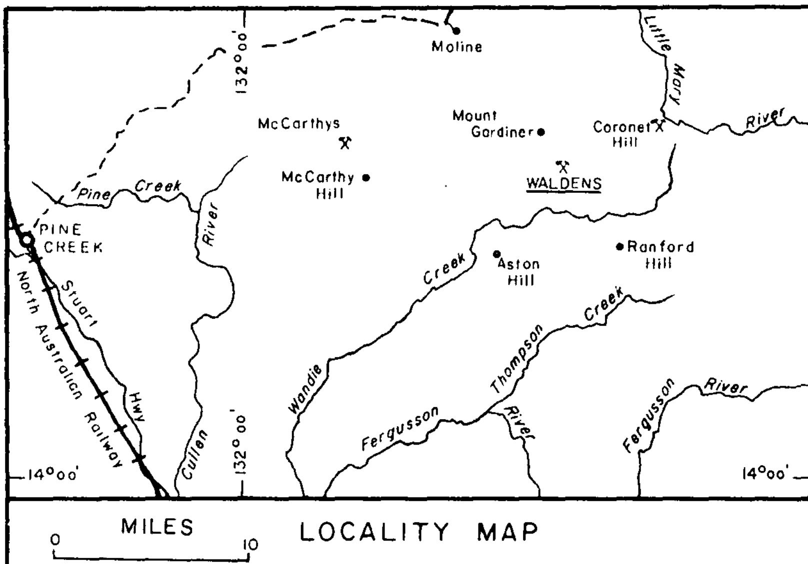
The object of the dip-angle survey was to help in the selection of diamond-drill hole sites. However, the results obtained are not interpretable because of the large random fluctuations, which have apparently obscured the fact that no detectable conductor was present. More care should have been taken in pegging the grid and taking the dip-angle readings. United Uranium N.L. have since attached level bubbles to the coils of their dip-angle equipment to make accurate orientation of the coils possible. This should reduce operator error to a minimum in future surveys.

5. REFERENCES

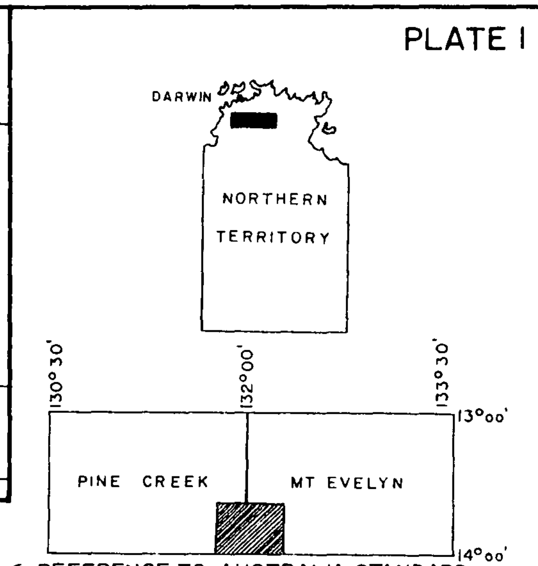
WALPOLE, B.P. 1962 Mount Evelyn, NT. Bureau of Mineral Resources, Australia, 1:250,000 geological series explanatory notes.

WARD, S.H. 1967 The electromagnetic method. In MINING GEOPHYSICS, Vol. 2. Society of Exploration Geophysicists, Tulsa, Oklahoma.

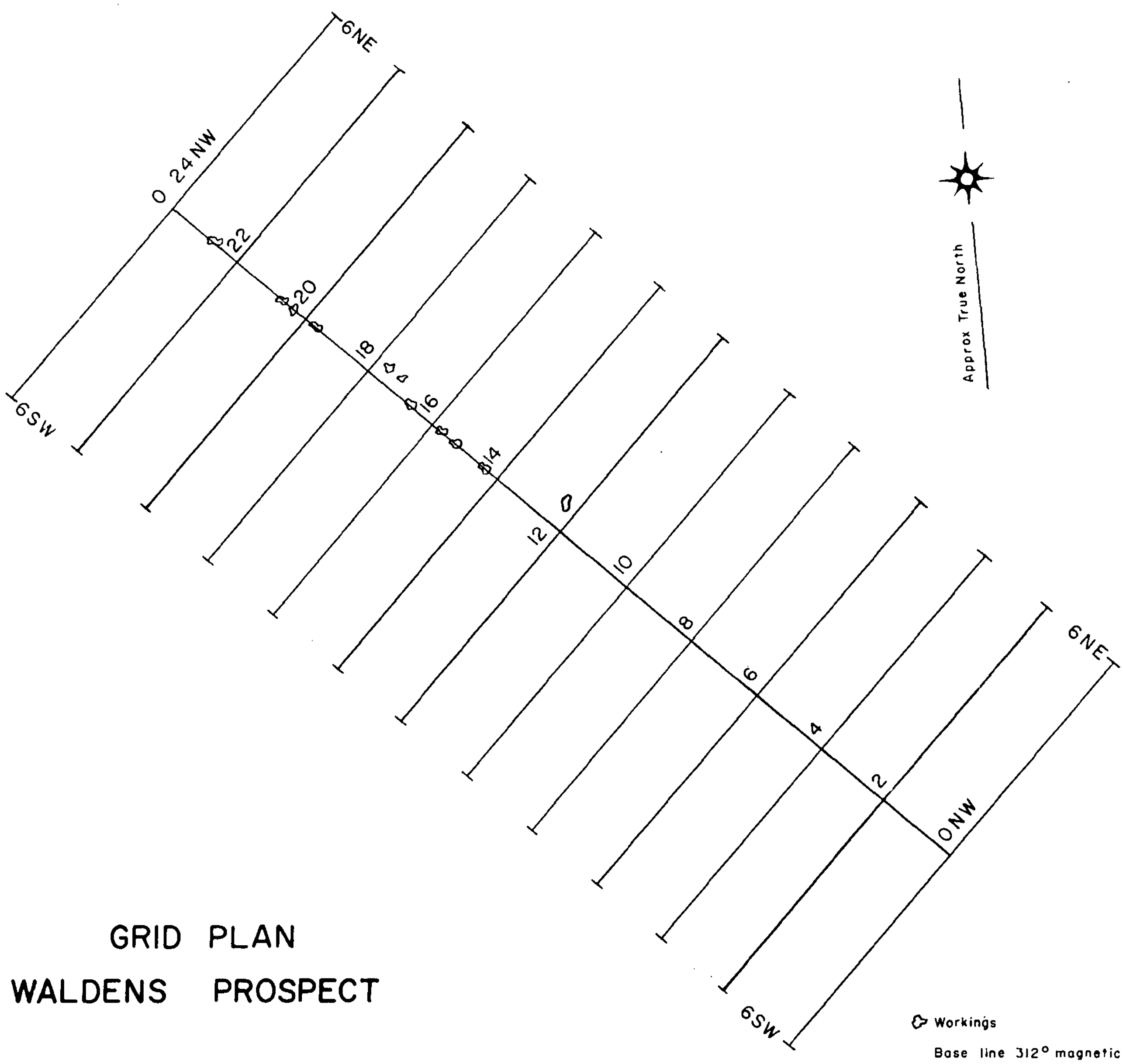
PLATE I



LOCALITY MAP

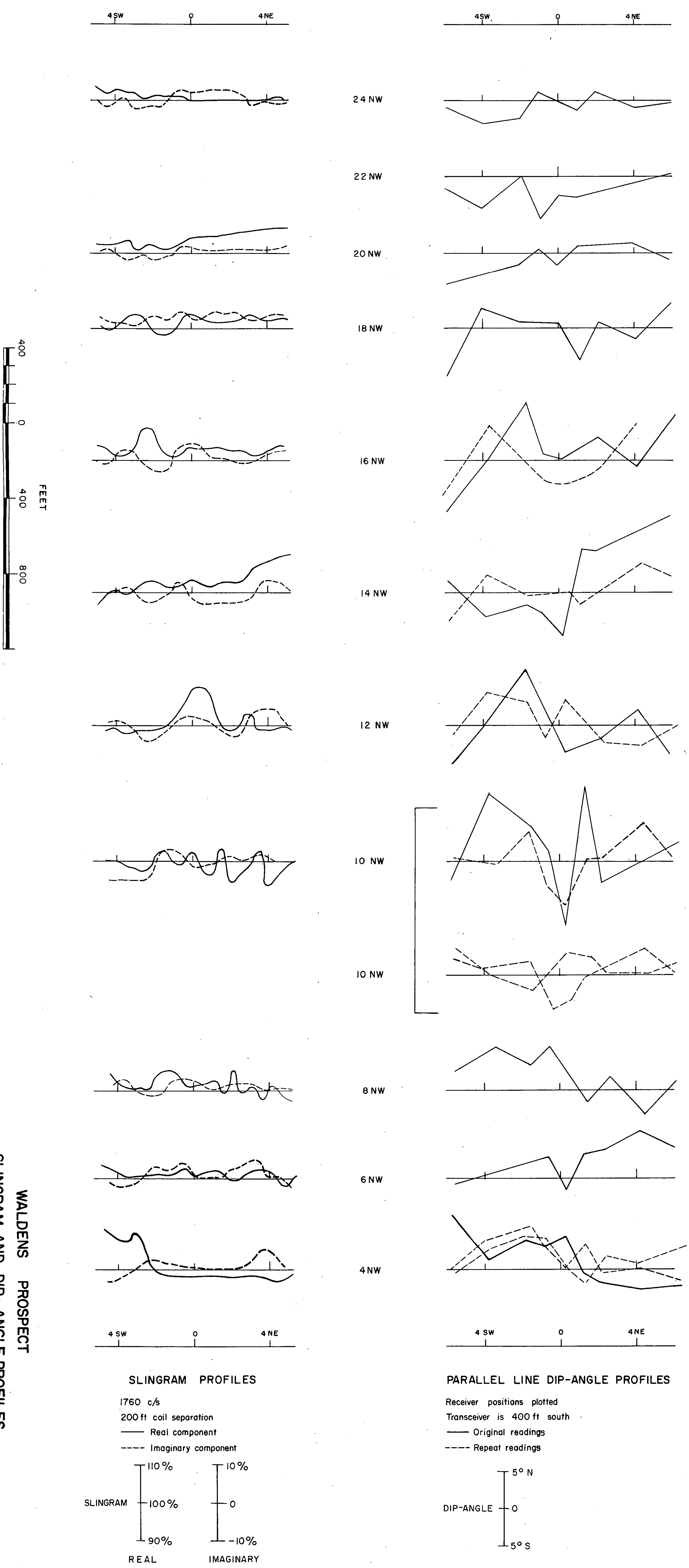


REFERENCE TO AUSTRALIA STANDARD 1:250,000 MAP SERIES: PINE CREEK AND MT. EVELYN



GRID PLAN
WALDENS PROSPECT

WALDENS PROSPECT
SLINGRAM AND DIP-ANGLE PROFILES



TO ACCOMPANY RECORD No 1968/39

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PLATE 2