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18. Oliver Hill gravity survey.

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Mineralisation has been suspected on the north-east flank of Oliver Hill south of Mt Claude for many years. There have been some minor attempts to work gold and tin in the area. Of greater interest has been the extensive ironstone 'gossan' which is spread across the upper slopes of the hill. A recent geochemical study (Baker, 1971) has shown very high concentrations of lead. The geological environment is also detailed by Baker (1971) and in simple terms consists of a thick sequence of Moina sandstone and quartzite which is intruded by quartz feldspar porphyry. The porphyry is restricted to a narrow zone which is also occupied by sheared mudstone indicating some faulting in the area.

Until recently Oliver Hill was covered by an exploration licence held by the Mt Lyell Mining and Railway Company. During the company's tenure of the licence, some geological mapping and geophysical surveys were undertaken by Compagnie Générale de Géophysique. Resistivity, IP, magnetic and self-potential methods were employed and although the survey could be criticised for using too broad an observation spacing in the 'anomalous' regions, little of note was found. There were narrow, but small and elongate, IP anomalies and two bore holes were drilled to test one such feature.

The drilling showed that over 150 m of quartzite and conglomerate overlie sheared Cambrian porphyry and slate. The log from one hole suggested that the 'gossan' zone extends to a depth of more than 30 m. Apart from demonstrating the presence of disseminated pyrite in the quartzite, no other mineralisation was seen. Certainly there was no trace of a massive lead ore. It was therefore concluded that the IP anomalies were related either to the disseminated pyrite (which is unlikely), or to a narrow shear zone. The magnetic survey was apparently non-informative although no details were reported. The self-potential anomalies also appear related to a possible shear zone near the 'gossan'. At this point the lease was relinquished and the Department of Mines decided to establish whether or not any ore was present.

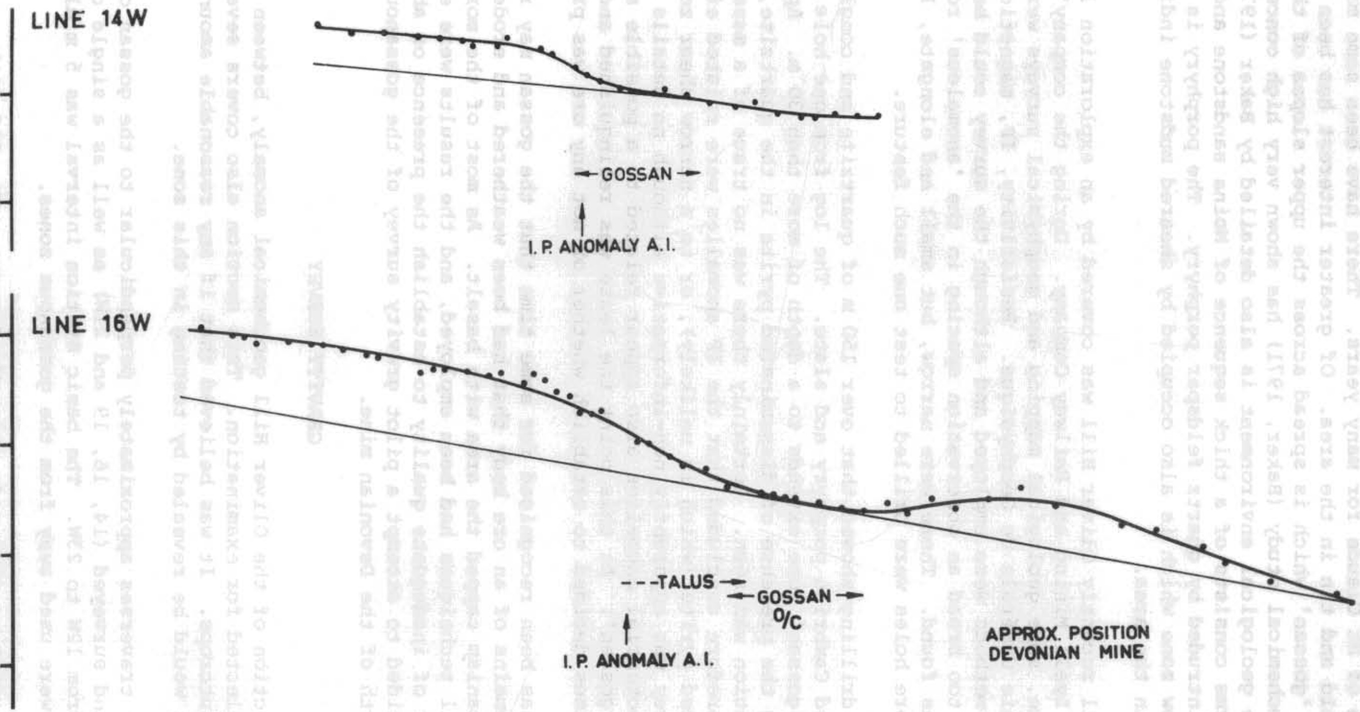
It has been recognised for some time that the gossan may represent the exhumed remains of an ore body that had been weathered and eroded before Tertiary volcanism capped the area with basalt. As most of the more obvious geophysical techniques had been employed, and the results were either indistinctive or of inadequate quality to establish the presence or absence of ore, it was decided to attempt a pilot gravity survey of the gossanous area immediately north of the Devonian mine.

GRAVITY SURVEY

A section of the Oliver Hill geochemical anomaly, between lines 14W and 21W was selected for examination. This section also covers several large 'gossan' outcrops. It was believed that if any reasonable amount of ore were present it would be revealed by testing in this zone.

Four traverses approximately perpendicular to the gossan outcrops were prepared and surveyed (14, 16, 19 and 21W) as well as a single centre line traverse from 12W to 23W. The basic station interval was 5 m although 10 m intervals were used away from the gossanous zones.

Observations were made using Worden meter No. 913 with a scale constant of 0.94 μgal/div. All stations were levelled to an accuracy better than 1 cm, and terrain corrected to a radius of 900 m. Corrections beyond this radius were common to all stations. Traverse lines were surveyed and positions were



LINE 14W
0
-10
μm/s²
GOSSAN
I. P. ANOMALY A. I.
LINE 16W
10
0
-10
-20
μm/s²
TALUS
GOSSAN
O/C
I. P. ANOMALY A. I.
APPROX. POSITION
DEVONIAN MINE

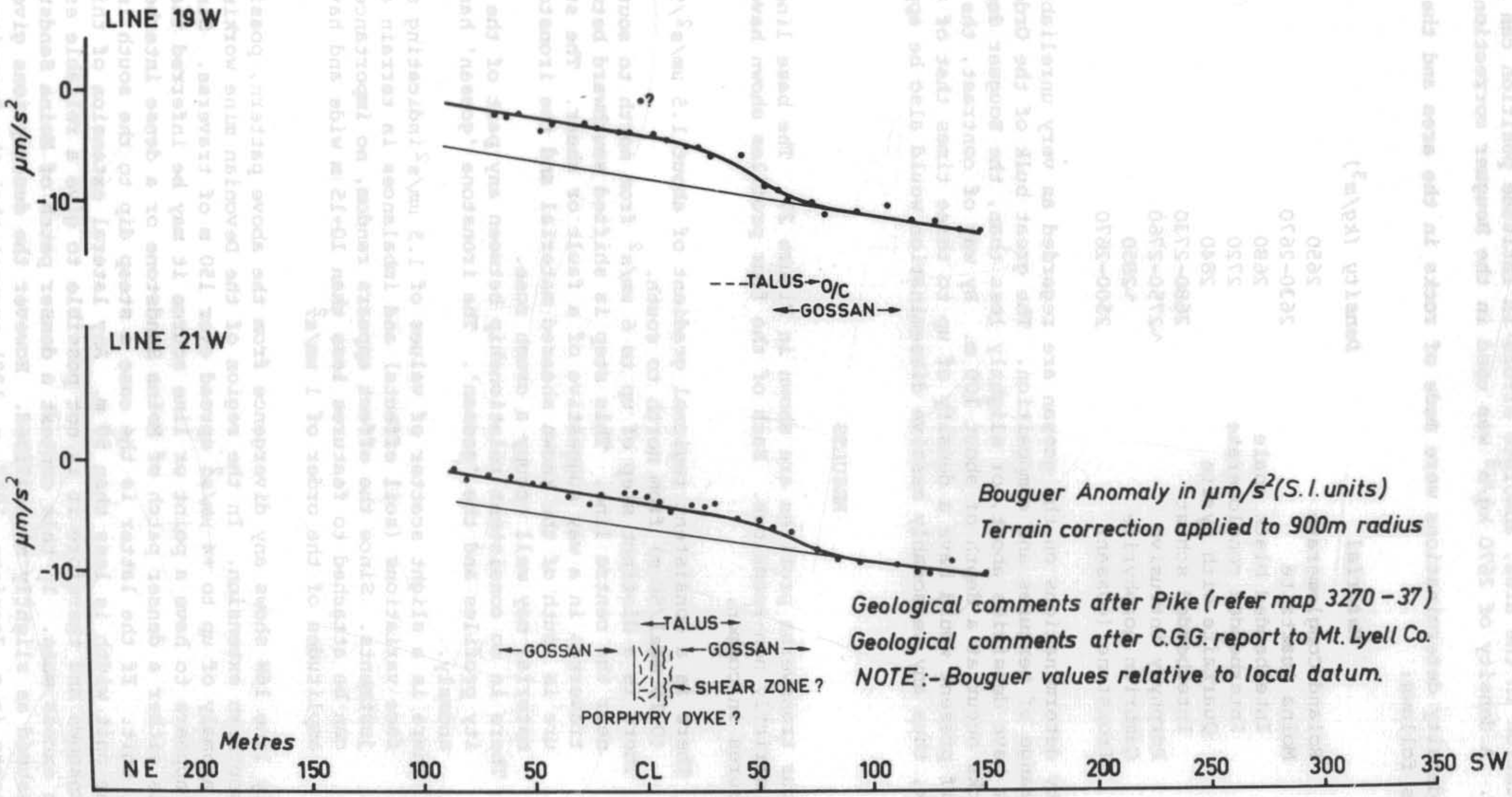


Figure 27. *Gravity profiles, Oliver Hill*

5 cm

accurate to better than one metre. Since the survey was corrected relative to a base station in the area, absolute errors in latitude position can be disregarded. A density of 2670 kg/m^3 was used in the Bouguer correction.

Some density determinations were made of rocks in the area and the results are as follows:

Material	*Density (kg/m^3)*
Roland Conglomerate	2650
Moina Quartzite	2630-2670
Interbedded black shale	2680
Interbedded conglomerate	2720
Quartzite with pyrite	2840
Interbedded schist	2680-2730
Porphyry intrusive	∿2750-2760
Cambrian porphyrite	∿2850
Ironstone (gossan)	2500-2670

Density determinations on the gossan are regarded as very unreliable due to the range of textures and composition. The great bulk of the Ordovician rocks have densities about, or slightly less than, the Bouguer density. Cambrian rocks occur at a depth of about 100 m. By way of contrast, the source ore if present would have a density of up to three times that of the country rock, thus any reasonably massive dissemination would also be apparent.

RESULTS

The four transverse profiles are shown in Figure 27. The base line traverse is strictly non-anomalous. Each of the four profiles shown have several features in common.

(1) There is a consistent regional gradient of about 1.5 $\mu m/s^2$/50 m (0.15 mgal/50 m) from north to south.

(2) There is a distinct step of up to 6 $\mu m/s^2$ from north to south near the centre line. This step is shifted southward between traverses in a way suggestive of a fault or shear. The structure is south of the known sheared material and the ironstone material may well occupy a crush zone.

(3) There is no consistent relationship between any part of the gravity profiles and the 'gossan'. The ironstone 'gossan' has no anomaly.

(4) There is a slight scatter of values of 1.5 $\mu m/s^2$ indicating surface variations (soil effects) and imbalances in terrain adjustments. Since the effect appears random, no importance can be attached to features less than 10-15 m wide and having amplitudes of the order of 1 $\mu m/s^2$.

Only line 16W shows any divergence from the above pattern, possibly due to its southern extension. In the region of the Devonian mine workings there is an anomaly of up to +4 $\mu m/s^2$, spread over 150 m of traverse. Since the anomaly appears to have a point or line source it may be inferred that the source is either a denser patch of Moina Sandstone or a dense interbedded lithological unit. If the latter is the case a steep dip to the south is implied and the unit width is less than 50 m. Any lateral extension of this feature is unknown and therefore it is not possible to give a reliable estimate of the excess mass. In this context a denser patch of Moina Sandstone could be presumed as slightly mineralised. However the descriptions given in previous reports (*e.g.* Jennings, 1963, p. 132) suggest that the Devonian mine type mineralisation would be insufficient to cause an anomaly of this scale.

CONCLUSIONS

The lack of anomalies correlatable with 'gossan' suggests that over much of the area the material either has a density equivalent to the surrounding quartzites or is only a surface covering. Certainly no dense orebody underlies 'gossan'.

If the step anomaly observed is due to simple faulting (north side up) of the Cambrian basement, then assuming a density contrast of 200 kg/m^3 the throw would be about 200 m. However the inflexion is too abrupt to be related to a fault of this throw, at the depth apparently indicated by drilling, unless the Cambrian rocks are very close to the surface north of the centre line and were angled steeply south-west. As a fault was encountered it appears possible that the throw is correct and that the Ordovician cover is thin to the north. Conglomerate was encountered in the upper part of the second hole at shallow depth supporting this assertion.

REFERENCES

BAKER, W.E. 1971. Geochemical investigations in the vicinity of Oliver Hill, north-west Tasmania. *Tech.Rep.Dep.Mines Tasm.* 14:158-183.

JENNINGS, I.B. 1963. One mile geological map series. K/55-6-45. Middlesex. *Explan.Rep.geol.Surv.Tasm.*