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# A SUMMARY REPORT ON THE 1982 GEOPHYSICAL SURVEYS OVER THE LAUREL CREEK GRIDS, EL 17/77

for

RENISON LTD.

by



Dr. J.R. BISHOP



RN/MG82/14
October, 1982

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ABSTRACT

The Laurel Creek East and West grids cover part of the Meredith Granite where it intrudes paleozoic sediments. Magnetic and gradient array IP surveys were conducted over the grids in early 1982: no significant responses were detected by the IP, but the magnetics has outlined several probable skarn deposits around the granite boundary. Two of these are of particular interest: one on the eastern boundary of the Laurel Creek East grid (labelled no. 9 in Figure 2) has a maximum amplitude of more than 13,000 gammas and a strike length in excess of 1300m., however the associated soil tin geochemistry is poor. Better geochemical results were obtained over anomaly 2, on the Western side of the Laurel Creek West grid but this has a lower amplitude (of 7000 gammas) and a smaller tonnage is indicated. A higher priority is given to both of these anomalies than to any of the responses on the nearby Little Wilson River grid which covered a similar geologic setting.

Completion of the magnetic survey (along line LCE 1200N) and some detailing of anomalies 5, 7 and 8, as well as 9 and 2, with intermediate lines is recommended. Partial completion of the IP survey is suggested; namely over anomalies 7 and 8.

## INTRODUCTION

The Laurel Creek East and West grids cover part of the contact zone around the Devonian, tin-bearing Meredith Granite in the north-eastern corner of EL 17/77, where the granite intrudes Cambrian, Ordovician and Silurian sediments (Figure 1). The grids were recommended by the project geologist L. Martin, on geological grounds, from results of a regional stream sediment survey and from anomalies defined by an airborne EM-Magnetic survey (Martin, 1981).

This report evaluates the results of magnetic and IP surveys carried out in early 1982.

## EXPLORATION TARGET AND GEOLOGIC SETTING

A tin or tin-tungsten skarn deposit is the expected style of mineralisation and the favoured hosts for these deposits are the carbonate beds of the Gordon Limestone which have been mapped around the granite contact on both grids.

Whilst a sulphide-rich, Renison style replacement deposit would be the preferred type of ore body, mineralisation in such close proximity to its source would probably be oxide-rich and sulphide poor (Kwak and Askins, 1982). Hence magnetics, over the iron-poor limestones, should be a diagnostic method, whereas IP and base metal soil geochemistry may not be.

The limestone has been mapped as a north-north-west striking, 200m. to 300m. wide unit on the Laurel Creek East (L.C.E.) grid which is truncated against the Meredith Granite. And as a pod, again against the granite, on the eastern side of the Laurel Creek West (L.C.W.) grid. Both occurrences are largely covered by alluvium. Other areas of limestone may occur around the granite's edge (Roberts, pers. comm.) and this possibility is further reviewed in the light of the geophysical results, later in this report.

## PREVIOUS GEOPHYSICS

There were no ground geophysical surveys conducted by Renison prior to 1982. In 1978 an Input (airborne EM and magnetic) survey was flown (Butt, 1978). This survey defined three magnetic anomalies (with amplitudes between 50 and 150 gammas from altitudes in excess of 200m.) in the area covered by the Laurel Creek grids. EM responses were associated with two of these anomalies, but these were interpreted by Butt as being part of zones of responses which were due to the weakly conducting sediments (in comparison to the resistive granite, the boundary of which was locally well mapped by the Input survey). The magnetic anomalies were located by the ground magnetic surveys (see below), thus confirming, at least locally, the Input results and location recovery.

## 1982 GRADIENT ARRAY IP SURVEY

Scintrex carried out a gradient array IP survey over all ten lines of the L.C.W. grid and over part of the four northernmost lines of the nine-line L.C.E. grid in February and March, 1982. (Coverage of the whole L.C.E. grid had been hoped for, but the survey, which was helicopter-supported, was terminated at the end of the helicopter hire period.) The line spacing was 200m. and the station interval was 25m. using a 25m. dipole. The results have been plotted on to Renison's composite profiles at 1:5000 scale and have been presented as contour plans by Howland-Rose (1982) who gives a detailed description of the data.

The survey defined no strong chargeability anomalies (only two separate readings above 20mV/V were recorded), but some responses of 15+ mV/V were recorded on backgrounds of less than 10mV/V: these presumably represent very weak disseminations of sulphides. (The lack of any strong IP effects reinforces Butt's (1978) interpretation that the Input EM responses were not due to massive sulphides.)

The resistivities were mostly between 1000 and 2000 ohm-m, with several zones of less than 500 ohm-m. Those zones on the eastern end of the L.C.W. grid may be due to the underlying alluvium, while the rest may reflect differential weathering and/or alteration within the Crotty Quartzite. None of the zones coincide with other geophysical or tin geochemical anomalies (Figure 2) and they are unliekly to be associated with any mineralisation.

The various lithologies are not readily discernible from the chargeabilities or resistivities, however the results of the latter have been used to assist the geophysical interpretation of the granite boundary (see Figure 3).

## 1982 MAGNETICS SURVEY

The magnetics were recorded using a 12.5m. station spacing: line 1200N of the L.C.W. grid was not read. The results have been presented on Renison's 1:5000 scale composite profiles and in Howland-Rose (1982) as a contour plan, again at 1:5000.

Several anomalies were defined, some with amplitudes of several thousands of gammas (assuming a background of about 62,300 gammas). Those with absolute values greater than 63,000 gammas or, for weaker responses 62,500 gammas are shown in the anomaly compilation figure (Figure 2). An evaluation of these anomalies is given in the Discussion below.

## DISCUSSION

It was stated above that magnetics should be the most diagnostic tool for target detection in the Laurel Creek area and a description of the nine anomalies defined by the survey is given below. The anomalies have been numbered geographically from west to east.

1. This 'anomaly' occurs over granite on the western end of L.C.W. 400N. Although shown as a high on both the contour and profile presentations, the anomaly is false and is due to a misreading of the last value on the data sheet (i.e. the recorded value is 62273 gammas and not 62573 gammas).

2. This anomaly consists of two separate responses which together form a long narrow linear zone closely parallelling the granite contact on the

western side of the L.C.W. grid between 800N and 1600N. The zone has a maximum amplitude of nearly 7000 gammas developed on line 1600N. There is a near-coincident geochemical zone of 100+ ppm Sn (on a background of less than 10 ppm) and a near-coincident weak chargeability zone of 15+ mV/V which suggests some disseminated sulphides. There are also some associated anomalous base metal soil geochemical values.

A shallow and narrow skarn zone of up to 1000m. strike length is indicated by this anomaly and thus follow-up is warranted: this should include extension of the existing grid lines to the west as well as intermediate lines to properly define the magnetic and geochemical responses. Rough modelling of the existing data on line 1000N suggests a tabular body of 10m. width at a depth of 10m. and with a susceptibility of .022 cgs units. To fit this model to the data, an (unlikely) westerly dip of 70$^{\circ}$ was required: this suggests (as suspected) that remanence is important and that it needs to be included for proper interpretation. For this reason, and also because of the poorly sampled nature of the anomaly, no great reliance should be placed on any of the above parameters. Nevertheless, a significant resource is indicated, given a sufficient tin grade (about three million tonnes for a vertical extent of 100m. and assuming a strike length of 800m.).

3. and 4. Although skarn mineralisation has been mapped in the vicinity of these anomalies, they have limited economic potential. Anomaly 3 is a relatively weak (400 to 500 gamma) anomaly, while 4, although of a higher amplitude ( 1700 gammas), is a very narrow anomaly. Neither has any associated geochemical response and both are restricted to line L.C.W. 1800N. Thus the anomalies appear to be too small (spatially and in magnitude) to be of interest.

5. This anomaly is a very narrow (single reading) 500 gamma anomaly with a negative response of about 3500 gammas immediately to the west. (It has been noted elsewhere, e.g. at Mt. Lindsay, that a negative magnetic remanence may indicate skarn mineralisation.) The response was recorded only on L.C.W. 1400N, although the low probably extends to 1000N. The anomaly is apparently immediately next to the granite

and it has an associated (single reading) geochemical anomaly of 80 ppm Sn. Although a limited resource is indicated, the results are probably sufficiently encouraging to suggest magnetic surveying and geochemical sampling of intermediate lines.

6. This anomaly on LCW 1000N is of limited interest since there are no associated geochemical responses and the amplitude was only 300 gammas. However it is open to the south and should perhaps be followed up if more detailed mapping indicated favourable host rocks.

7. This 2500 gamma anomaly was recorded on LCE 1600N. If surveying on LCW 1200N confirms its northern extent, then a significant anomaly is indicated. Although there is no associated tin geochemical response, better definition of the magnetic anomaly is recommended to determine if a deep source of potentially economic tonnage is indicated. Also, although the IP on the LCW grid showed no response, an IP survey over the area on the LCE grid is suggested.

8. This anomaly which is centred on LCE 1400N near 7W is very similar to 7: there is no associated tin geochemistry (and nor has it been covered by IP) but a strong anomaly (of about 1100 gammas), of potentially economic proportions may have been detected. More detailed work may be warranted to define the full extent of the anomaly.

9. This is by far the best anomaly recorded on either of the Laurel Creek grids (or on the nearby Little Wilson River Grid). It is located in the north eastern sector of the LCE grid and has a strike length of about 1300m. (as defined by the 63,000 gamma contour). A maximum amplitude of about 13,500 gammas above background was recorded on LCE 800N. The zone has relatively weak geochemical responses (40 ppm, 80 ppm Sn) at the northern end and there is no IP coverage south of LCE 800N (but only a small 15+ mV/V chargeability response was recorded coincident with the anomaly north of 800N; on line 1400N).

The anomaly is inadequately defined near its most intense development and LCE 1000N could be extended further to the east. Also, intermediate lines, read at 5m. intervals, should be surveyed to confirm the zone's continuity and better define its shape. Whilst a better interpretation should result from such a survey, some approximate parameters can be calculated from the present data. A depth of less than 10m. is indicated at 1000N with a width of the order of 10m. The zone possibly deepens a little to the north and certainly broadens to the south. Using a constant width of 10m., a minimum size of 5 million tonnes is indicated (assuming vertical extent of 100m.*) and a much larger figure seems likely.

The above list includes all of the magnetic anomalies on the Laurel Creek grids and it is unlikely that any significant mineralisation will be found which is not associated with one of these anomalies. Figure 2 shows some tin geochemical responses with no associated magnetic anomalies, but these do not appear to be of interest (for example, the responses around 5E on lines LCW 1000N and 1400N are probably over transported soils (Quaternary alluvium)).

The interpretive mapping of the geology is, in places, at variance with the geophysical results (e.g., the granite contact passing through magnetic anomaly no. 8). In Figure 3, some changes to the position of the granite boundary have been suggested based on either the magnetic or resistivity results. There do not appear to be any significant differences in magnetic, resistivity or chargeability responses between the Cambrian (not tested by IP), Ordovician or Silurian sediments on the Laurel Creek grids and the geophysics does not confirm or deny the (verbal) suggestion by Roberts that the Gordon Limestone may be more extensive than is indicated on Figure 3, and may occur beneath magnetic anomalies 2 and 5.

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*The magnetic model of a tabular body assumes an infinite depth extent: this may be approximated by a body depth extent to depth of burial ratio of 10. Obviously a greater depth extent is possible.

CONCLUSIONS AND RECOMMENDATIONS

Significant magnetic anomalies have been defined close to the granite boundary over either mapped carbonate rocks or possible carbonate rocks (Roberts, pers. comm.). Two of these (9 and 2) are of particular interest: the former indicates a very large tonnage, although the soil tin geochemistry is not particularly encouraging. A much smaller size is indicated for anomaly 2, but the higher and coincident tin values are more encouraging. Both zones would benefit from magnetic surveying (and ? geochemical sampling) of intermediate lines read at a 5m. or closer spacing over the anomalous sections to better define and confirm the extent of the anomalies. Such detailing would also permit a limited drilling program to be concentrated with more certainty, on the most prospective sites.

Magnetic surveying of infill lines (and line LCW 1200N) are also recommended for anomalies 5, 7 and 8 since more detailed data may indicate anomalies of sufficient size and magnitude to warrant further investigation.

The IP survey over the grids detected little sulphide and completion of the IP survey over the southern part of the LCE grid is not recommended since only magnetic anomaly 9 occurs in this area and the northern and most intense part of this anomaly has been covered by IP, with no response. However IP could usefully be done in the north west corner of the grid to test anomalies 7 and 8.

Some parameter 'guesstimates' have been given in this report for anomalies 9 and 2: much more meaningful values can be obtained when the magnetic properties of the mineralisation is known. To do this, all samples (i.e. drill core) must be oriented. Interpretation of detailed data, using measured susceptibilities and remanence properties would give useful estimates of the resources' size, shape and possibly grade.

J.R. Bishop

J.R. Bishop
October, 1982

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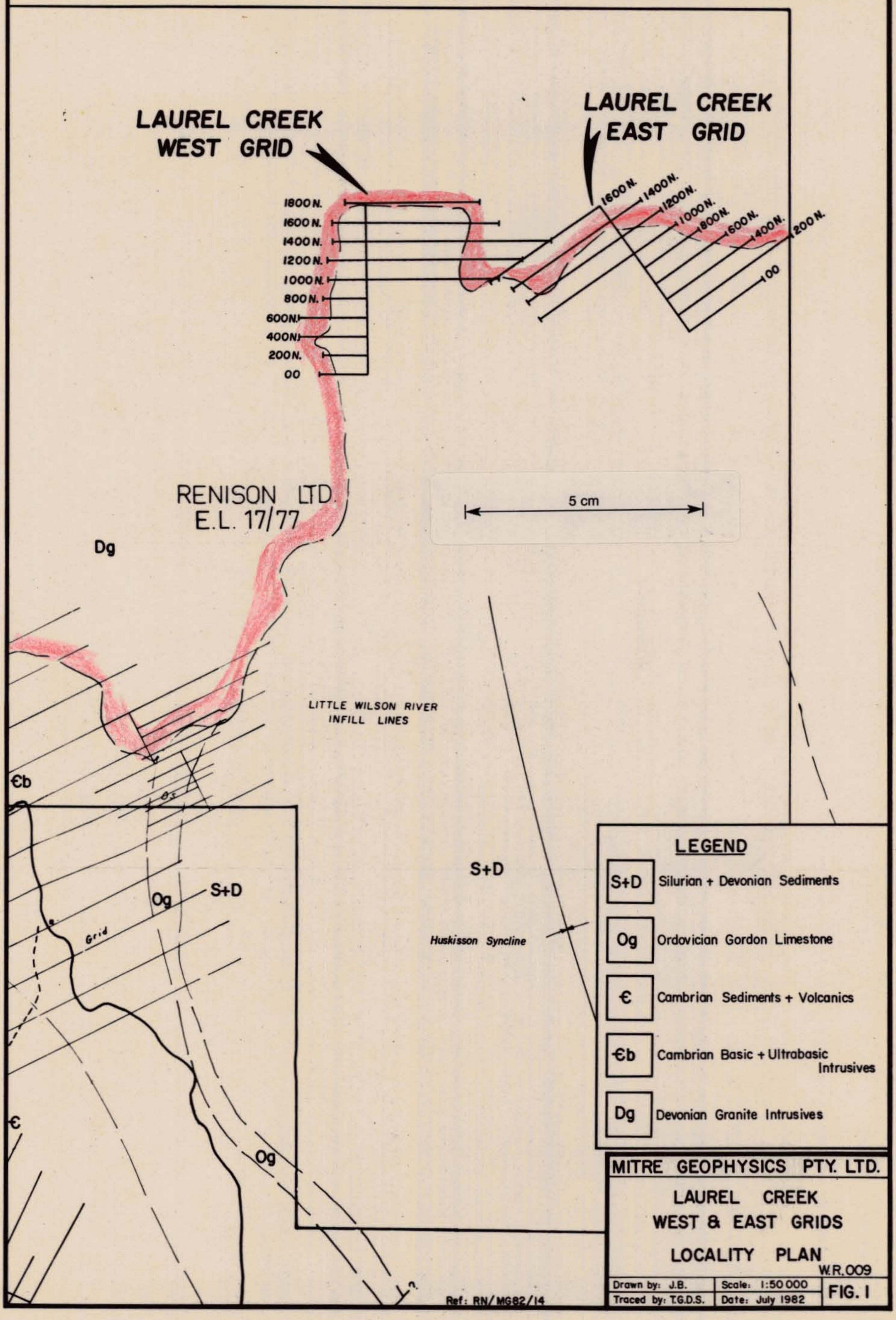


MITRE GEOPHYSICS PTY. LTD.

LAUREL CREEK
WEST & EAST GRIDS
LOCALITY PLAN

W.R.009

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|---|---|---|
| Drawn by: J.B. | Scale: 1:50 000 | FIG. 1 |
| Traced by: T.G.D.S. | Date: July 1982 | |

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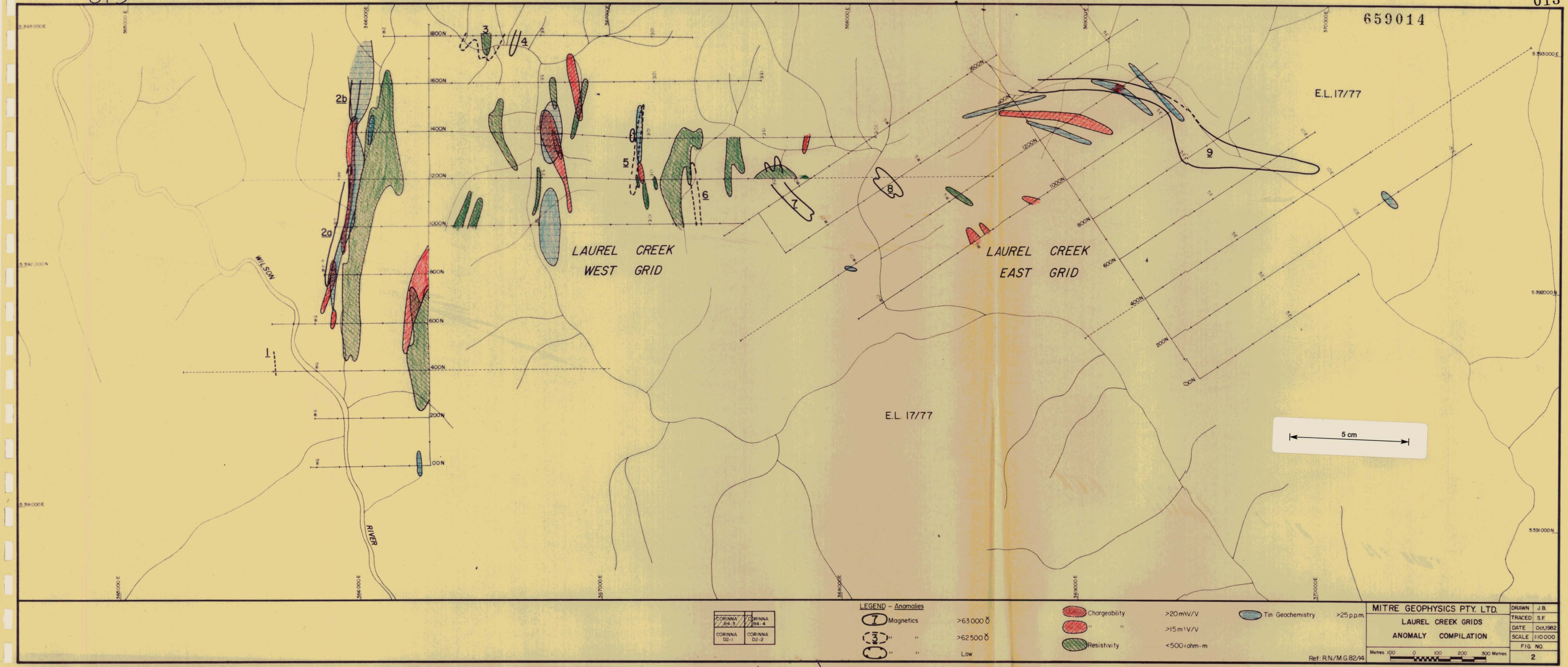
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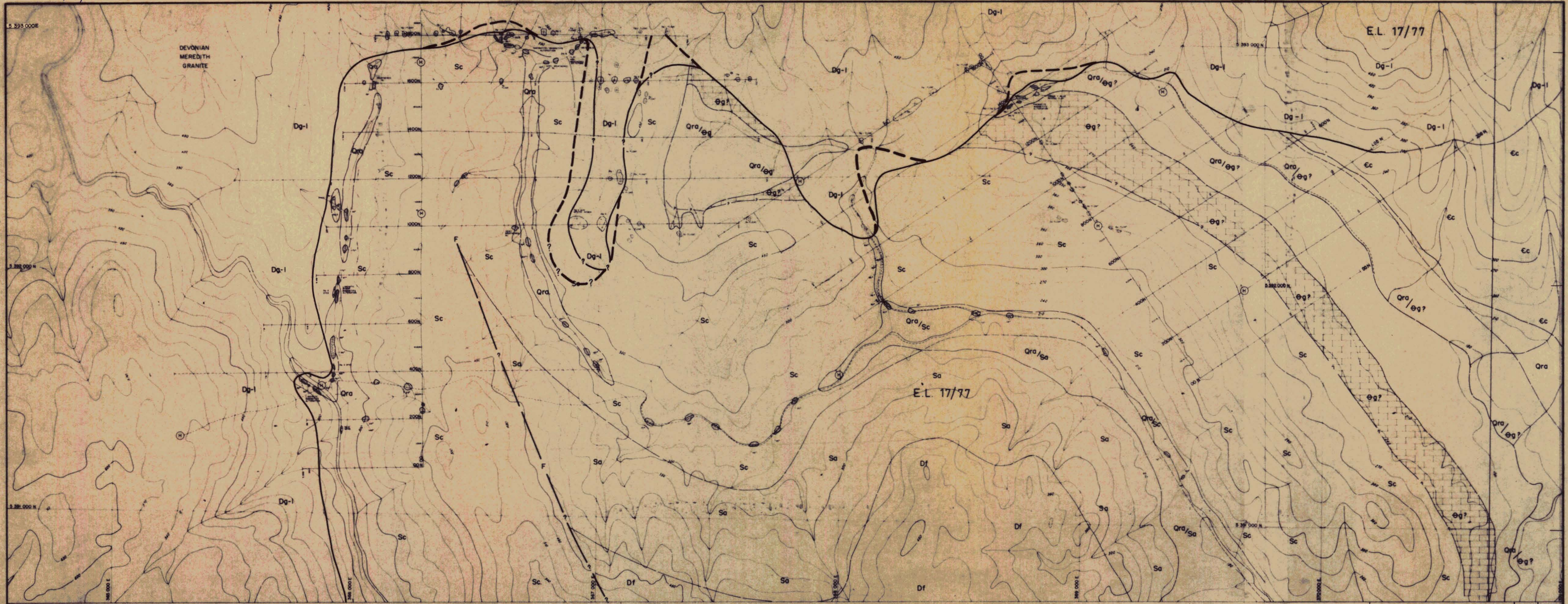
E.L. 17/77
LAUREL CREEK
WEST GRID
LAUREL CREEK
EAST GRID
E.L. 17/77
WILSON
RIVER
5 cm
366000 E
367000 E
368000 E
369000 E
370000 E
5 392 000 N
5 391 000 N
LEGEND - Anomalies
Magnetics >63 000 γ
" " >62 500 γ
" " Low
Chargeability >20 mV/V
" " >15 mV/V
Resistivity <500 ohm-m
Tin Geochemistry >25 p.p.m.
CORINNA B4-3
CORINNA B4-4
CORINNA D2-1
CORINNA D2-2
MITRE GEOPHYSICS PTY. LTD.
LAUREL CREEK GRIDS
ANOMALY COMPILATION
DRAWN J.B.
TRACED S.F.
DATE Oct.1982
SCALE 1:10 000
FIG. NO. 2
Metres 100 0 100 200 300 Metres
Ref: R.N./M.G. 82/14




SEDIMENTARY ROCKS

IGNEOUS ROCKS

SYMBOLS

DATA SOURCE

659015

Geophysical interpretation of Geological boundary.

Ref: R.N./M.G.82/14

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|---|---|
| RENISON LIMITED | DRAWN L.MARTIN |
| LAUREL CREEK GRID | TRACED T.G.D.S. |
| INTEPRETATIVE & FACTUAL | DATE JULY,1982 |
| GEOLOGY PLAN | SCALE 1:10000 |
| Metres 100 0 100 200 300 Metres | DRAWING NO. FIG. 3 |

5 cm