TANAMI JOINT VENTURE

ZAPOPAN N.L.
KUMAGAI GUMI CO. LTD.
KINTARO METALS PTY. LTD.

EXPLORATION LICENCE 6340

TANAMI DOWNS
GRANITES-TANAMI AREA
NORTHERN TERRITORY

FINAL REPORT

THE GRANITES 1:250,000 SHEET

APRIL 1990

C O N T E N T S

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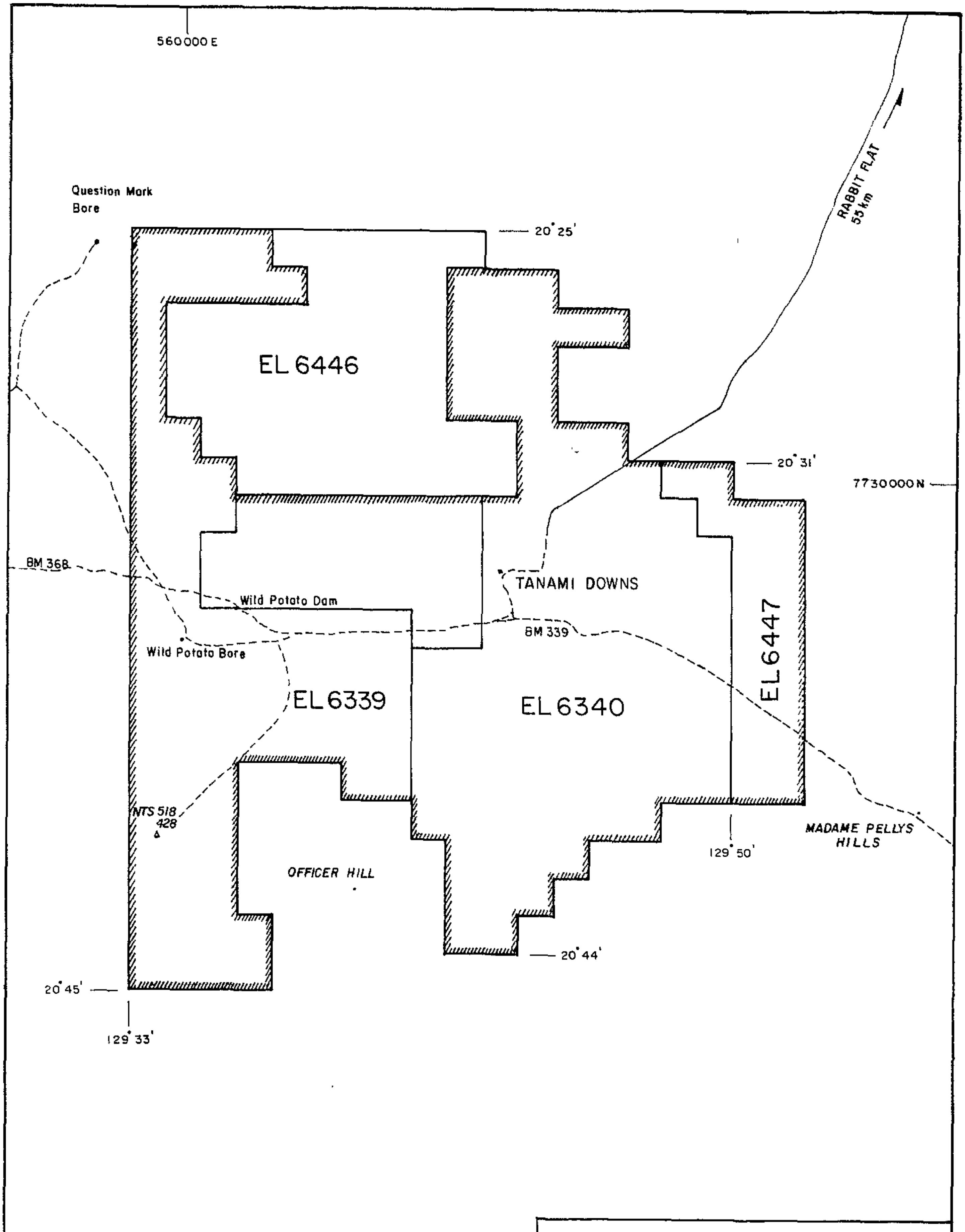
FIGURES



TANAMI JOINT VENTURE	
SCALE. 1 : 250000	COMPILED: DRAWN: DATE:
TANAMI DOWNS EL 6339, 6340, 6446, 6447	

560000 E

3. PREVIOUS WORK

Previous geological work carried out in the area is summarized as follows:-

1962 BMR carried out an airborne magnetic and radiometric survey of Tanami and The Granites Sheet area (Spence, 1964; BMR, 1965a, 1965b).

1967 BMR carried out a reconnaissance gravity survey of The Granites Sheet area (Whitworth, 1970).

1972 BMR geologically mapped the area as part of a larger mapping programme covering the Granites - Tanami block. (Blake et al, 1973; Hodgson, 1976; Blake et al 1979). At the same time as the geological mapping, a programme of shallow stratigraphic drilling was carried out by BMR drilling crews (Blake, 1974).

1985 - 1989 North Flinders Mines Limited explored EL2368. This work consisted of base map preparation, aerial photography, an airborne geophysical survey, interpretation and reconnaissance follow-up, percussion and diamond drilling. (Chadwick, 1987 and 1988)

4. GEOLOGY

The following geological units have been recognized in the licence area and immediate environs:

Lower Proterozoic Tanami Complex

This unit consists of folded and cleaved rocks of greenschist and amphibolite metamorphic facies. Lithologies include banded chert, silicified siltstone, quartzite, phyllitic sandstone, schistose greywacke, amphibolite, jaspilite, gossanous ironstone and acid porphyry. These rocks are not known to crop out within the EL.

The Tanami Complex is of economic interest, as it is host for known gold deposits at Tanami, The Granites and Dead Bullock Soak.

No sequence has been established in the Tanami Complex because of tight folding, probable complex faulting and relatively poor exposures.

Upper Proterozoic (Adelaidian)

Shallow-dipping (3^{o}-45^{o}) arenites of the Muriel Range Sandstone (Redcliff Pound Group) are mapped as cropping out in the southern part of the licence area 10km south-east of the Tanami Downs homestead. The same sandstone also forms the two prominent ridges to the south of the EL known as the Inningarra Ridge and Murdoch Cliffs where dips are from 5-10^{o} to the south.

Cambrian

Low rises capped by laterite obscure areas of Antrim Plateau Volcanics north-west of the homestead. This unit generally is comprised of unaltered and unmetamorphosed basalt which infil valleys or grabens in the Proterozoic surface.

Permian

Permian sandstones are not known to crop out in the licence area, however, they form extensive flat-lying area in the eastern part of Tanami Downs Station. Some of the laterized areas in EL6340 may be underlain by Permian.

Cainozoic

Much of the area is covered by Cainozoic superficial deposits. Laterite cappings and laterite surficial lag is widespread across the area. The cappings are remnants of a very extensive flat to gently undulating former land surface, much of which has been removed by erosion. In the licence area, the laterite is present on Tanami Complex, Muriel Range Sandstone, Antrim Plateau Volcanics and possible Permian sandstones.

Calcrete forms low rises and mounds in broad depressions that mark past and present drainage channels and is a chemical deposit formed by evaporation of groundwater. One prominent calcrete rise runs southwards through the area of the Tanami Downs Station homestead and is 5km wide. Tertiary alluvium of variable thickness is associated with the palaeochannels.

Aeolian sand of Quaternary age forms extensive sand plains in the area.

5. EXPLORATION COMPLETED

5.1 Literature search

Research was completed to locate all previous geological work in the licence area. Data from BMR reports, open file company reports in the NT Department of Mines and Energy, and water bore logs from the NT Water Resources Division were collated.

5.2 Geophyics

The open-file airborne magnetic data for the 1:100,000 scale Inningarra and Frankenia sheets were purchased and interpreted as part of a regional study. The specifications for that survey are as follows:

COMPANY	GEOTERREX PTY LTD 1988
AIRCRAFT	ROCKWELL SHRIKE COMMANDER
MAGNETOMETER	GESIUM VAPOUR OPTICAL ABSORPTION
	RESOLUTION 0.01 nanoTesla
	CYCLE RATE 0.5 second
	SAMPLE INTERVAL 30 metres
SPECTROMETER	NUCLEAR DATA 256 CHANNEL ADC
	TOTAL COUNT 0.40 - 3.00 MeV
	$K_4 0$ 1.36 - 1.56 MeV
	Bi^{214} 1.66 - 1.86 MeV
	Tl^{208} 2.42 - 2.82 MeV
	VOLUME 33.5 litres
	CYCLE RATE 1.0 second
	SAMPLE INTERVAL 60 metres
DATA ACQUISITION	GEOTERREX MADACS ACQUISITION SYSTEM
	DIGITAL TO MAGNETIC TAPE
FLIGHT LINE SPACING	TRAVERSE LINES 500 metres
	TIE LINES 5000 metres
FLIGHT LINE DIRECTION	TRAVERSE LINES 180-360 degrees
	TIE LINES 090-270 degrees
SURVEY HEIGHT	90 metres MEAN TERRAIN CLEARANCE
FLIGHT PATH NAVIGATION	SYLEDIS STR4 RADIO NAVIGATION SYSTEM
FLIGHT PATH RECORD	REAL TIME CALCULATION OF AMG COORDINATES
	FROM THE SYLEDIS STR4 NAVIGATION SYSTEM

Tanami Joint Venture's airborne magnetic data and the N.T.D.M.E. open-file data were image processed by Geoimage Pty Ltd. The report is appended (Appendix I).

An interpretation of the magnetic data shows that beneath the calcrete, laterite, ? Antrim Plateau Volcanics and Upper Protcrozoic sediments, most of the EL is underlain by granite, apart from a narrow strip along the central western margin near Tanami Downs homestead. This area is probably underlain by magnetic sediments of the Tanami Complex at depths in excess of 150m. A Tertiary palaeochannel also is present in this area and thus EL6340 does not offer a viable exploration target in the short-medium term.

A 1:100,000 scale copy of the airborne magnetic data is attached. (Figure 2).

5.3 Aerial Photography

Colour aerial photography at 1:50,000 scale was flown by Airesearch Mapping Pty Ltd, over the Tanami Downs Station area, on the 18 August 1989. An interpretation onto transparent overlays was completed over the area.

5.4 Reconnaissance Mapping

A geological reconnaissance of the licence area was completed to confirm the accuracy of the BMR mapping. The photos were sufficient for location purposes along fence lines and tracks, although the monotonous country and large scale prevented detailed location in most areas. The reconnaissance was mainly achieved by traversing along the station access tracks. No major inconsistencies with the BMR mapping were found.

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<u>A P P E N D I X I</u>

Processing of Airborne Geophysics

of the

Granites - Tanami area

for the

Tanami Joint Venture

by

GEOIMAGE PTY LTD

GEOIMAGE
SPECIALISTS IN IMAGE PROCESSING AND REMOTE SENSING APPLICATIONS

PROCESSING

of

AIRBORNE GEOPHYSICS

of the

GRANITES-TANAMI AREA

for the

TANAMI JOINT VENTURE

R N Walker

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SEPTEMBER 1989

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INTRODUCTION

Under instructions from Mr P. Nicholson of Eupene Exploration Enterprises, airborne geophysical surveys over the Granites-Tanami area covering exploration areas held by the Tanami Joint Venture have been processed. The work involved-

- reading data off a number of located data tapes
- gridding the data at 20 metres cell size over the Tanami mine area and 50 metres cell size over the full area for the following parameters
  - magnetics
  - vertical derivative
  - vertical derivative with automatic gain (mine area only)
  - radiometrics
- processing and photography of the above files

PROCESSING (ctd)

Tanami Regional Data

Flight line data from several surveys flown for various companies including the NT Geological Survey, BHP, North Flinders and the Tanami JV, were processed. Other than a constant flight line spacing of 500 metres, the specifications for these surveys varied. The North Flinders surveys on the Frankenia and Ptilotus 1:100 000 sheets were flown E-W whereas the remaining areas were flown N-S.

Two major problems were encountered with the gridding-

1. Individual surveys had completely different radiometric responses and this problem was overcome as much as possible by gridding the individual surveys and matching the statistics either over the overlap areas or over the full area.

2. In the case of the vertical derivative (VD), problems were encountered because the original flight lines were separated into individual 1:100 000 sheets. Because of the technique used to calculate VD's, the responses at the end of the lines differed and resulted in apparent E-W discontinuities where survey or line segments met.

The final grids for the area were

BLHC	498 000 E, 7 691 800 N
Samples	5492
Lines	3140
Sample size	50 metres

for magnetics, vertical derivative (VD) and radiometrics. The VD image file was then used to derive shade images at various sun azimuth angles.

PROCESSING (ctd)

Appendix 1 contains output from runs converting the real grid files to byte files.

The magnetics, VD and VDG data were gridded using a minimum curvature algorithm, whereas the radiometrics were gridded using a bicubic spline algorithm.

The VD and VDG were processed on the flight line data using an along line 31 point FFT derived filter. A description of the methodology is attached as Appendix 2.

LIST OF SLIDES

TANAMI REGIONAL DATA - FULL AREA

1. Greyscale magnetics.

2. Rainbow pseudocoloured magnetics multiplied by a vertical illumination.

3. Greyscale vertical derivative.

4. Rainbow pseudocoloured vertical derivative multiplied by a vertical illumination on the vertical derivative.

5. Greyscale 00 azimuth 26 degree altitude shade illumination on the magnetics.

6. Rainbow pseudocoloured magnetics multiplied by a 00 azimuth 26 degree altitude shade illumination on the vertical derivative.

7. Greyscale 45 azimuth 26 degree altitude shade illumination on the magnetics.

8. Rainbow pseudocoloured magnetics multiplied by a 45 azimuth 26 degree altitude shade illumination on the vertical derivative.

9. Greyscale 90 azimuth 26 degree altitude shade illumination on the magnetics.

10. Rainbow pseudocoloured magnetics multiplied by a 90 azimuth 26 degree altitude shade illumination on the vertical derivative.

11. Greyscale 135 azimuth 26 degree altitude shade illumination on the magnetics.

12. Rainbow pseudocoloured magnetics multiplied by a 135 azimuth 26 degree altitude shade illumination on the vertical derivative.

13. Radiometric colour composite.
    Potassium in red, thorium in green, uranium in blue.

14. Greyscale potassium / thorium ratio.

LIST OF SLIDES

TANAMI REGIONAL DATA - SW CORNER

TSW1. Greyscale magnetics.

TSW2. Rainbow pseudocoloured magnetics multiplied by a vertical illumination.

TSW3. Greyscale vertical derivative.

TSW4. Rainbow pseudocoloured vertical derivative multiplied by a vertical illumination on the vertical derivative.

TSW5. Greyscale 00 azimuth 26 degree altitude shade illumination on the magnetics.

TSW6. Rainbow pseudocoloured magnetics multiplied by a 00 azimuth 26 degree altitude shade illumination on the vertical derivative.

TSW7. Greyscale 45 azimuth 26 degree altitude shade illumination on the magnetics.

TSW8. Rainbow pseudocoloured magnetics multiplied by a 45 azimuth 26 degree altitude shade illumination on the vertical derivative.

TSW9. Greyscale 90 azimuth 26 degree altitude shade illumination on the magnetics.

TSW10. Rainbow pseudocoloured magnetics multiplied by a 90 azimuth 26 degree altitude shade illumination on the vertical derivative.

TSW11. Greyscale 135 azimuth 26 degree altitude shade illumination on the magnetics.

TSW12. Rainbow pseudocoloured magnetics multiplied by a 135 azimuth 26 degree altitude shade illumination on the vertical derivative.

TSW13. Radiometric colour composite.
Potassium in red, thorium in green, uranium in blue.

TSW14. Greyscale potassium / thorium ratio.

TSW15. Radiometric colour composite with gradient defined by 0 azimuth 26 altitude shade on the magnetics.

APPENDIX 1 - REAL TO BYTE CONVERSION RUNS (ctd)

Tanami Regional Data - Full Area
Magnetics

BYTE VALUE	REAL VALUES
1	723.69
16	1203.37
32	1357.29
48	1419.76
64	1457.71
80	1488.85
96	1523.53
112	1571.46
128	1625.21
144	1681.62
160	1743.96
176	1818.22
192	1915.36
208	2044.61
224	2261.82
240	2492.07
256	4183.97

Tanami Regional Data - Full Area
Radiometrics (TC, K, U, Th)

BYTE VALUE	REAL VALUES			
1	-19.26	-0.37	-0.51	12.57
16	217.55	12.78	7.21	22.08
32	352.87	19.68	10.77	26.89
48	445.75	25.70	13.56	31.03
64	513.73	31.54	16.27	35.04
80	597.03	37.07	18.85	39.05
96	763.31	42.78	21.41	43.06
112	1018.64	48.73	23.95	47.51
128	1175.35	55.19	26.55	52.74
144	1299.50	62.51	29.20	58.91
160	1454.61	70.96	32.03	66.71
176	1654.08	81.09	35.09	76.92
192	1891.86	93.20	38.40	90.29
208	2154.84	107.02	41.90	105.55
224	2426.77	122.12	45.55	122.86
240	2688.36	139.49	48.96	139.12
256	5795.80	229.87	75.86	302.07

APPENDIX 1 - REAL TO BYTE CONVERSION RUNS (ctd)

Tanami Regional Data - Full Area
Potassium / Thorium Ratio

BYTE VALUE	REAL VALUES
1	-0.13
16	1.43
32	3.09
48	4.75
64	6.41
80	8.08
96	9.74
112	11.40
128	13.06
144	14.73
160	16.39
176	18.05
192	19.71
208	21.38
224	23.04
240	31.66
256	1610.00

APPENDIX 2 - VERTICAL DERIVATIVES

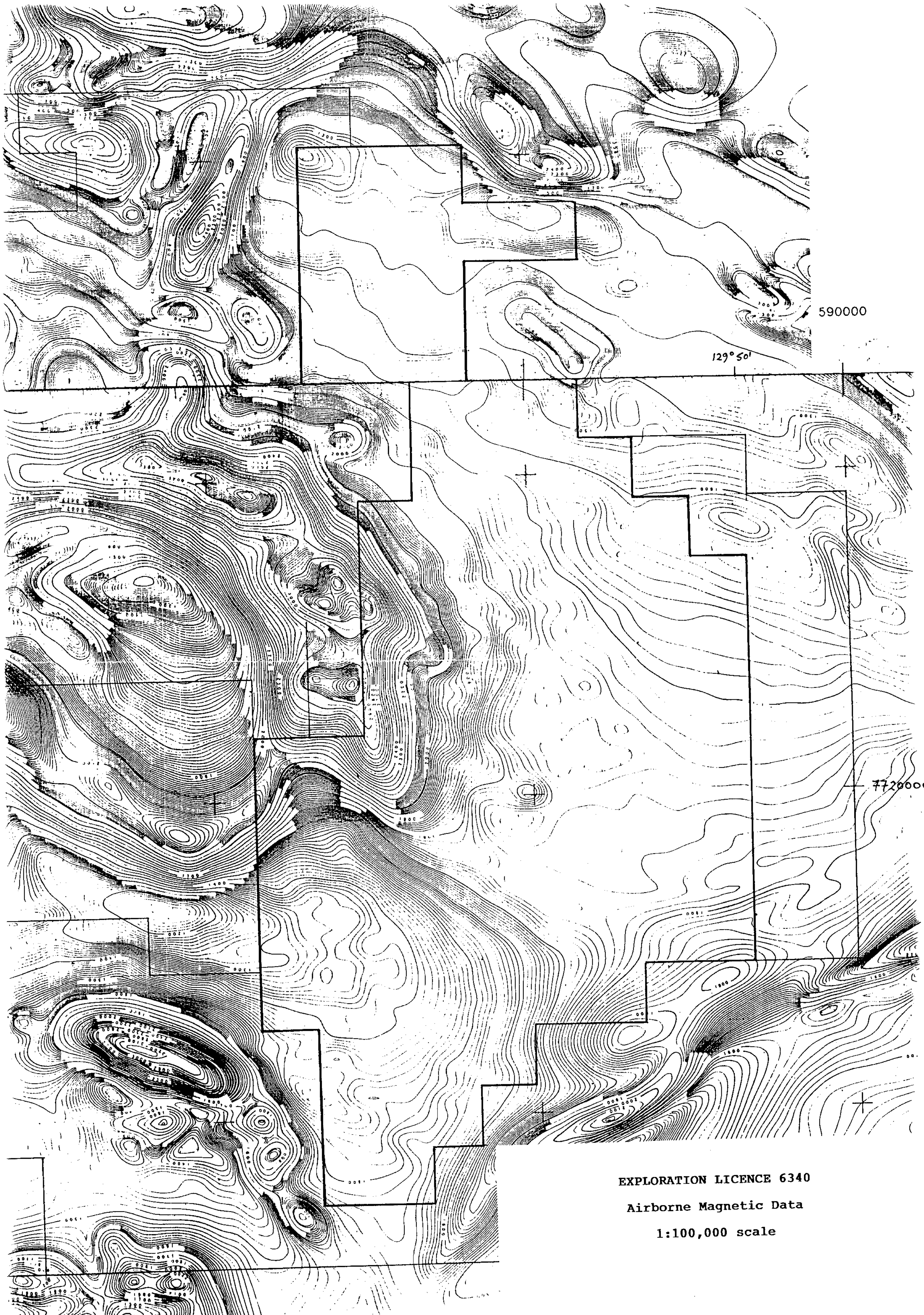
Vertical derivatives are used to improve the resolution of small scale anomalies caused by near surface magnetic sources, and to suppress the longer wavelength anomalies resulting from deeper sources. Derivatives can be calculated using a one dimensional operator and this is usually done on the original flight line data prior to gridding, or using a two dimensional operator on the grid file.

One dimensional operators tend to suppress local anomaly trends which parallel or near-parallel the flight line direction. This however can also be an advantage of the one-dimensional operator in that on poorly levelled data it will suppress or even remove artefacts caused by poor levelling.

In image products produced from vertical derivative grids, the usual distribution of data is such that the major anomalies will be very obvious however the weaker trends in the less magnetic units will tend to fall around a greyscale value of 127 and be difficult to see. This can be overcome using the technique of "Automatic Gain Control" (AGC) as suggested by S. Rajagoplan (Conference Volume, 5th ASEG Conference, 1987). In this technique, the vertical derivative is calculated along the flight line and the relative amplitude of each data point is adjusted by dividing by the gain in a window around the data point. The gain is defined as the inverse of the root mean square of the original data values in the window.

The result of the vertical derivative with AGC is to emphasise small anomalies in low gradient areas while suppressing high amplitude anomalies in high gradient areas.

Geoimage routinely carries out vertical derivative and vertical derivative with AGC operations on the original flight line data prior to gridding.



EXPLORATION LICENCE 6340

Airborne Magnetic Data

1:100,000 scale