Geophysics

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-Gravity

Great South Land
Minerals Limited

Gridding of Gravity Data

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Contents

Introduction

A combined GPS and gravity survey was carried out during April and early May 2007 in the Tasmanian Central Highlands, principally around the Lake Echo region. The survey was conducted by Brian Rau and assistants of Solo Geophysics & Co (Solo Geophysics 2007), supervised by Leaman Geophysics, on behalf of Great South Land Minerals.

Existing gravity measurements in the area were unfortunately limited and insufficient for the gravity data to be usefully integrated with seismic acquisition data collected by GSLM in the same area. The purpose of the survey was to remedy this situation. Unfortunately, due to the nature of the terrain and the survey equipment used, a regular grid of sample points was not possible. Measurements were mainly made on existing tracks, causing the final data to contain some gaps.

Final data from the survey was supplied to Dr. David Leaman of Leaman Geophysics and Dr. Bob Richardson of Mineral Resources Tasmania.

Dr David Leaman supplied GSLM with a Completion Report and interpreted gravity maps for the Central Highlands region, based on both Bouguer Anomaly and Residual Bouguer Anomaly measurements and illuminated from the north-east (Leaman 2007).

MRT provided GSLM with gravity measurement points (Bouguer Anomaly and Residual Bouguer Anomaly) from the State Gravity Database (incorporating the 2007 Solo Geophysics data), limited, of course, to the data which GSLM is entitled to access.

It was then necessary for GSLM to create gravity maps from the state-wide point datasets supplied by MRT.

Methodology

The following methodology was applied for both the Bouguer Anomaly and Residual Bouguer Anomaly gravity datasets:

The XYZ (Easting, Northing, Gravity) data obtained from MRT was plotted and used to interpolate a gravity surface. SURFER software was used. A Kriging algorithm with a specified cell size of 100m and the other default parameters was used for the interpolation.

The resulting grid was exported from SURFER in ASCII XYZ format.

The grid was imported into ER Mapper. A 'spectrum' colour range was applied - (ranging from hot pink at the lower end of the scale, through blue, green, yellow and red at the high end). The colour inflection (or change) points were defined by a 'histogram equalise' algorithm which caused a similar number of cells to be assigned each colour.

It was necessary to define a subset of the original grid (trimming off the edges) before it was coloured, since artificially high or low values at the edges tended to skew the results.

Sun shading was applied to the coloured surface. A vertical sun angle of 45 degrees was used and four datasets were produced with illumination from the north-east, north-west, south-east and south-west respectively.

Datasets were then exported from ER Mapper in ECW format, so they could be opened in both MapInfo (GIS software) and Kingdom Suite (seismic interpretation software) and overlaid with other data such as seismic acquisition data points, geology, topography and potential drill sites. See Results section, Figures 1- 12.

Results

See following pages.

Figure 1. Residual Bouger Anomaly - Tasmania - (Illuminated from the northeast)
with Tasmanian towns, GSLM seismic lines and GSLM proposed drill sites

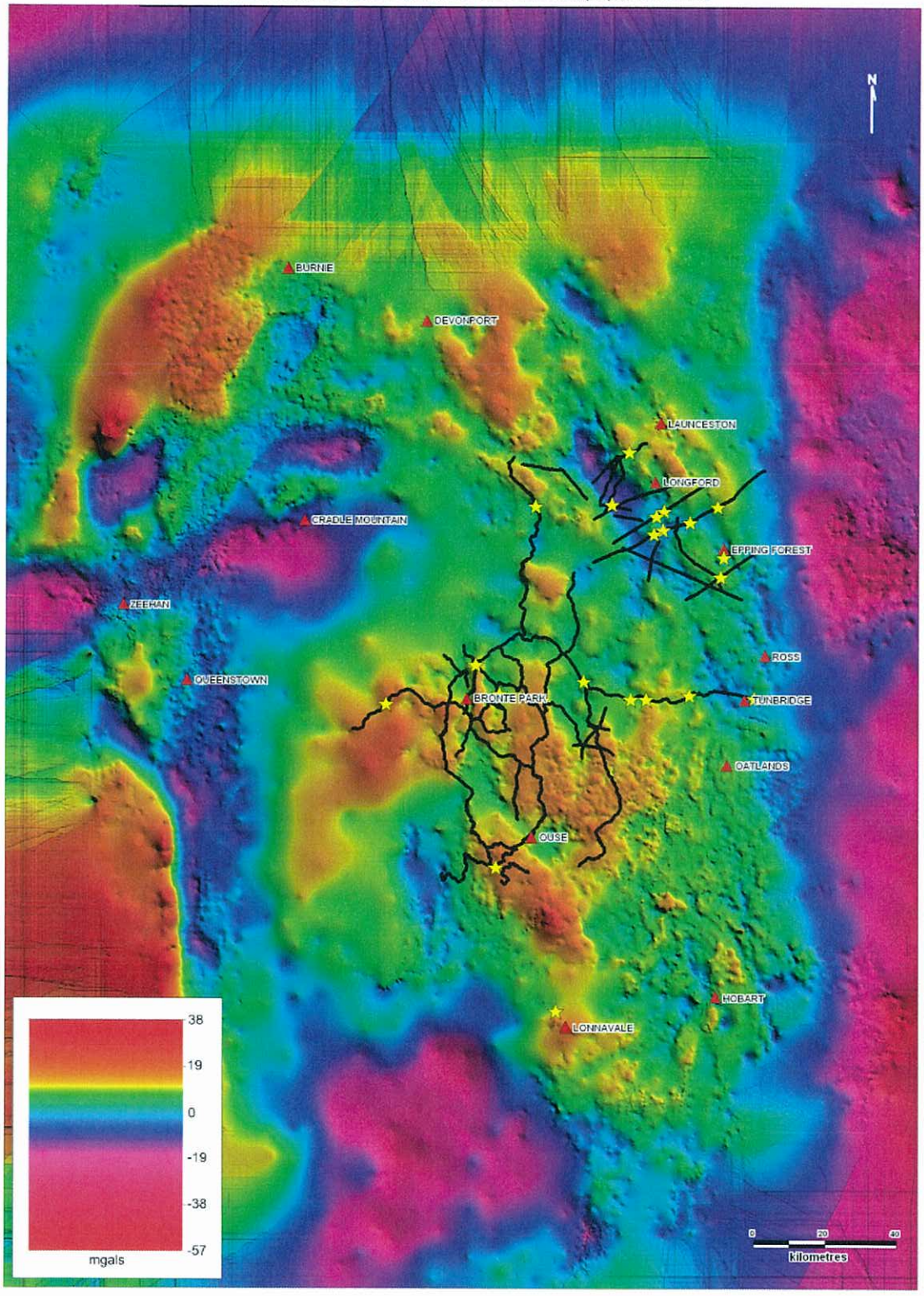


Figure 2. Residual Bouger Anomaly - Tasmania - (Illuminated from the southeast)
with Tasmanian towns, GSLM seismic lines and GSLM proposed drill sites

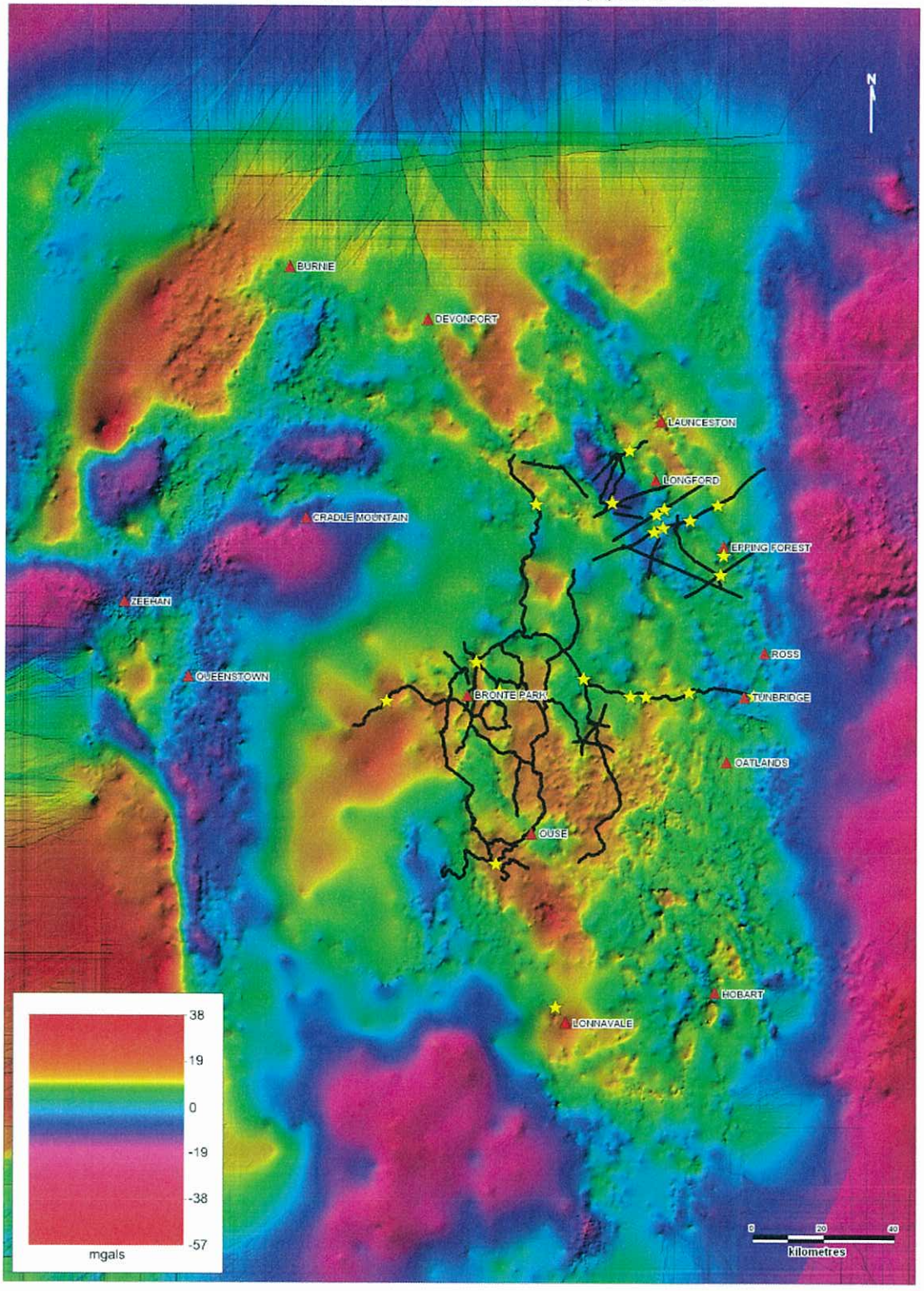


Figure 3. Residual Bouger Anomaly - Tasmania - (Illuminated from the southwest)
with Tasmanian towns, GSLM seismic lines and GSLM proposed drill sites

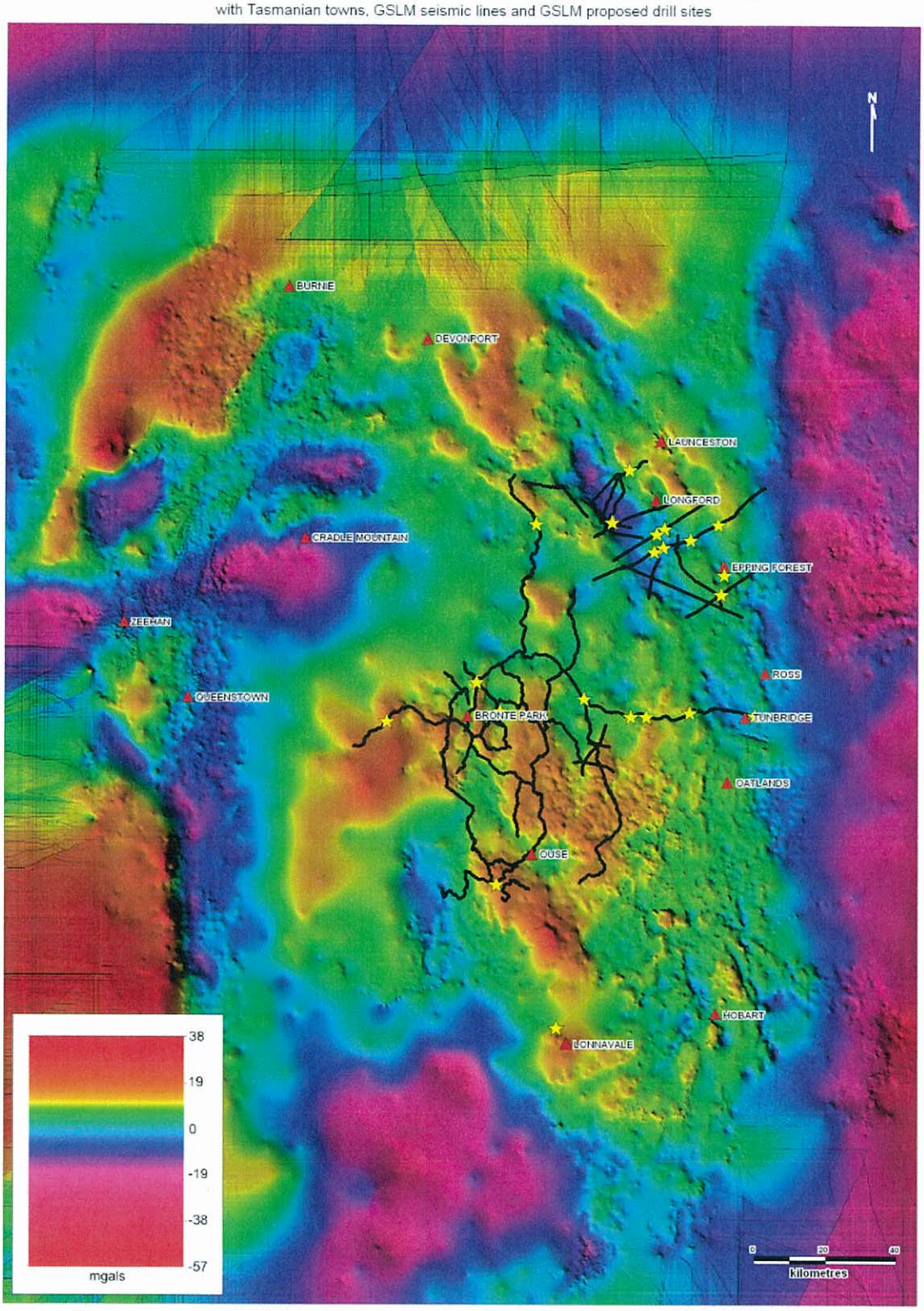


Figure 4. Residual Bouger Anomaly - Tasmania - (Illuminated from the northwest)
with Tasmanian towns, GSLM seismic lines and GSLM proposed drill sites

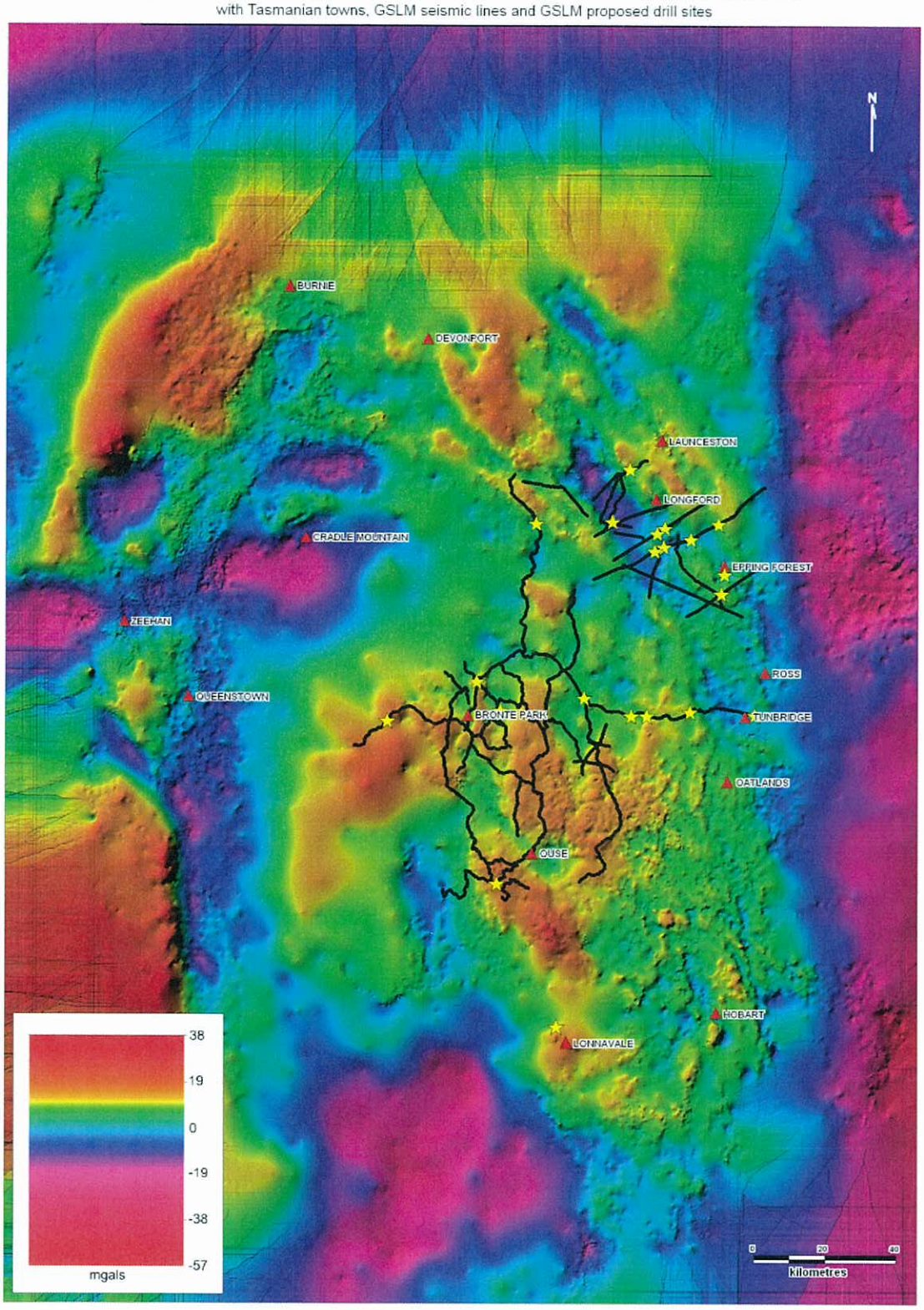


Figure 5. Bouger Anomaly - Tasmania - (Illuminated from the northeast)
with Tasmanian towns, GSLM seismic lines and GSLM proposed drill sites

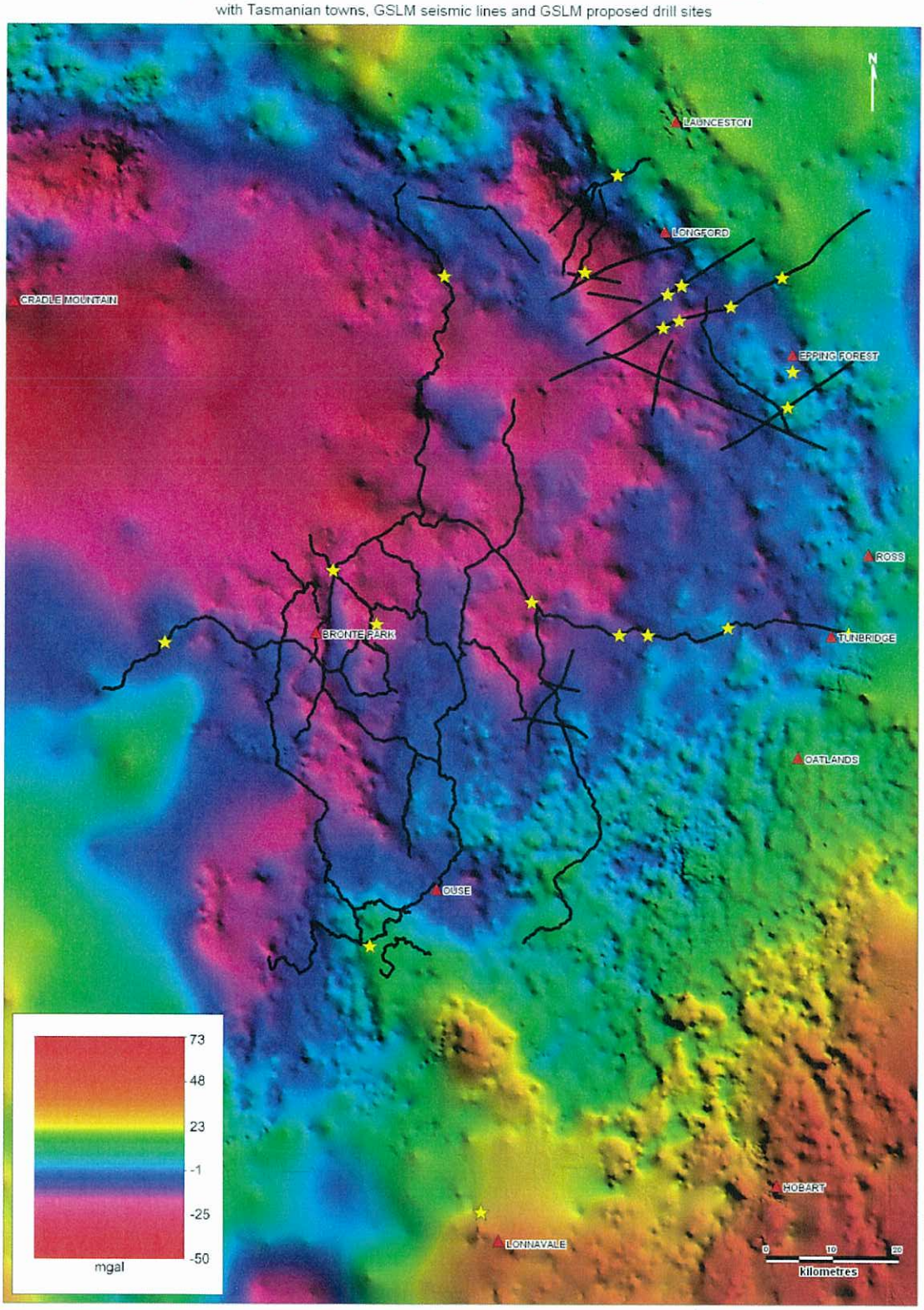


Figure 6. Bouger Anomaly - Tasmania - (Illuminated from the southeast)
with Tasmanian towns, GSLM seismic lines and GSLM proposed drill sites

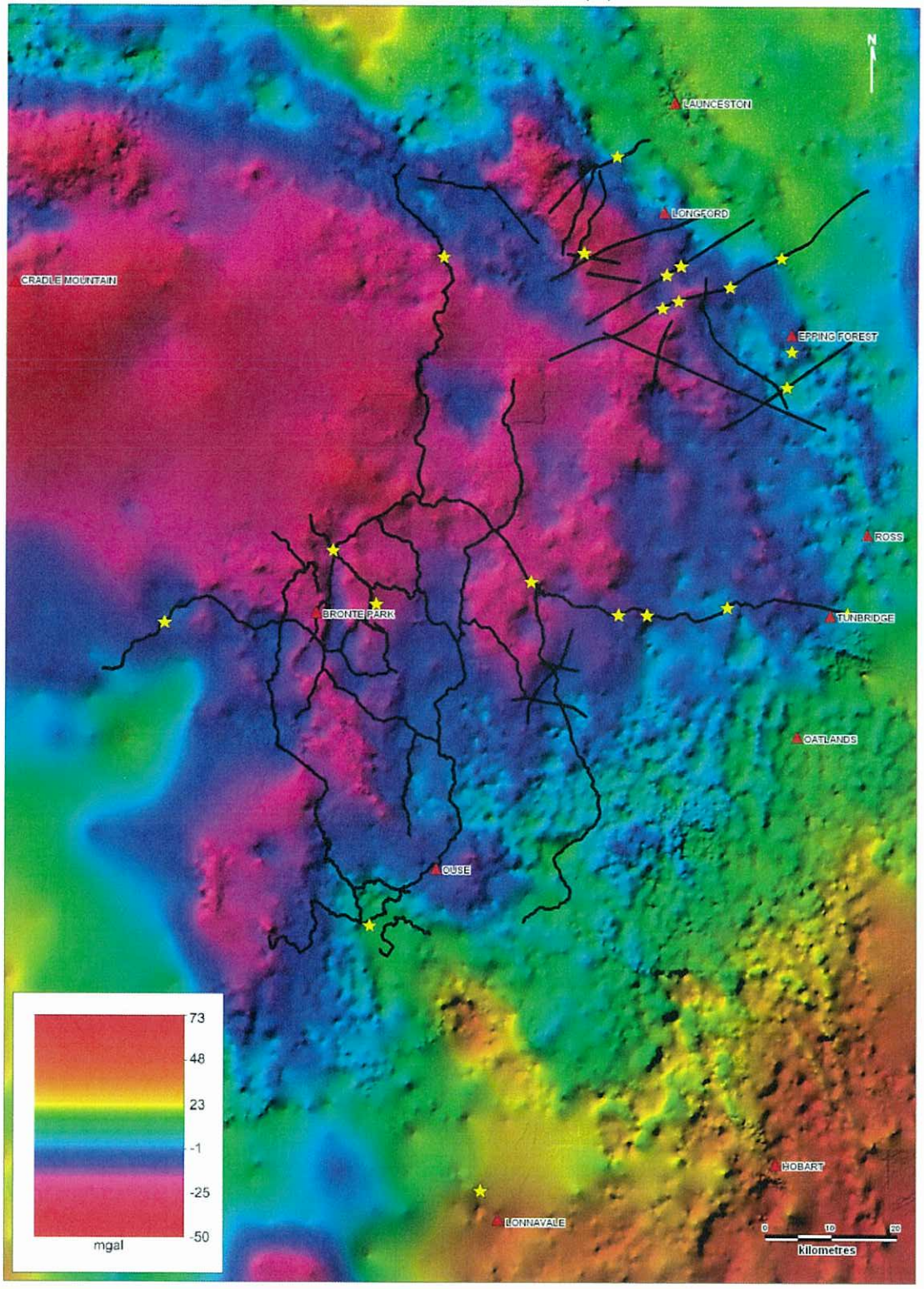


Figure 7. Bouger Anomaly - Tasmania - (Illuminated from the southwest)
with Tasmanian towns, GSLM seismic lines and GSLM proposed drill sites

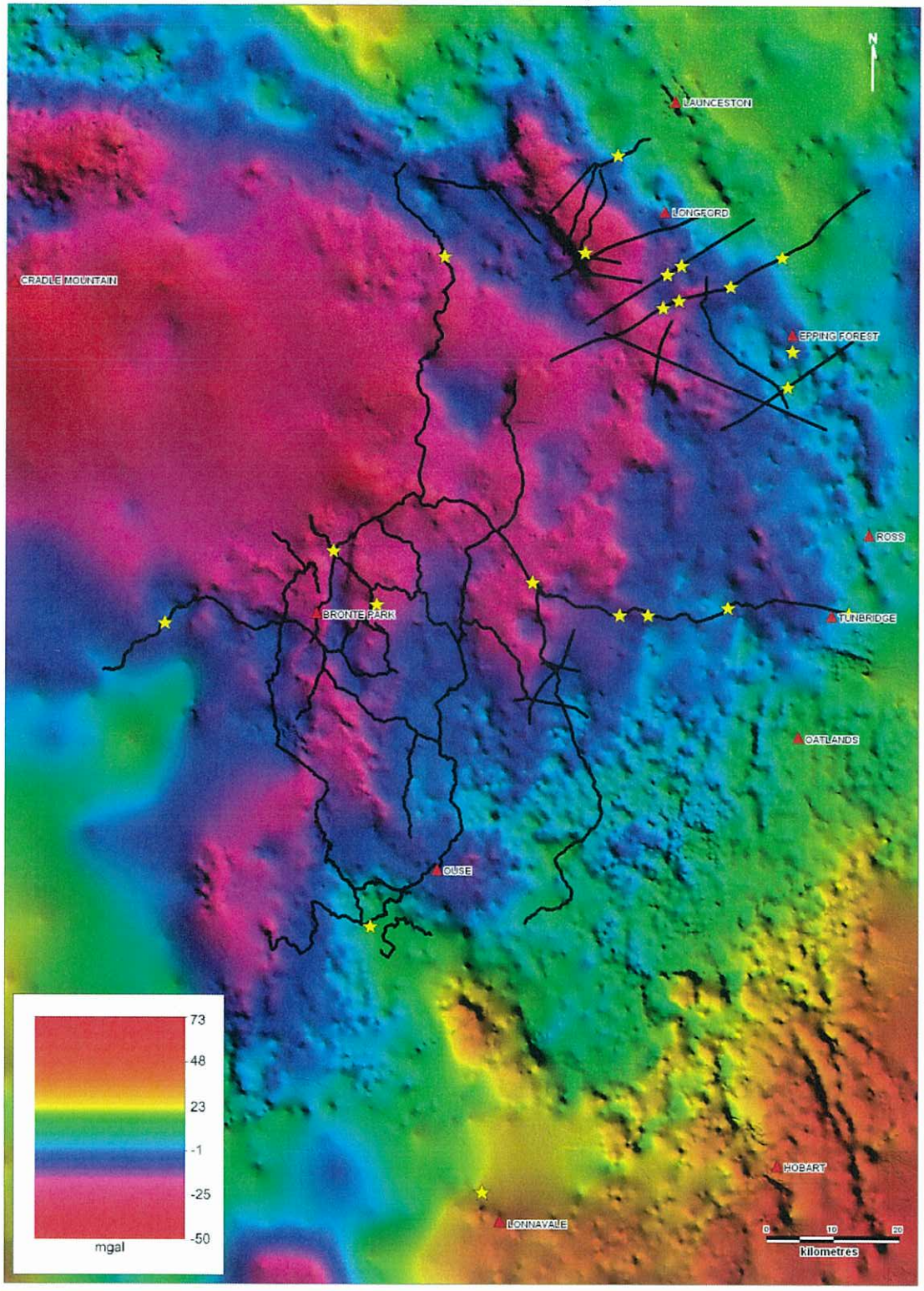


Figure 8. Bouger Anomaly - Tasmania - (Illuminated from the northwest)
with Tasmanian towns, GSLM seismic lines and GSLM proposed drill sites

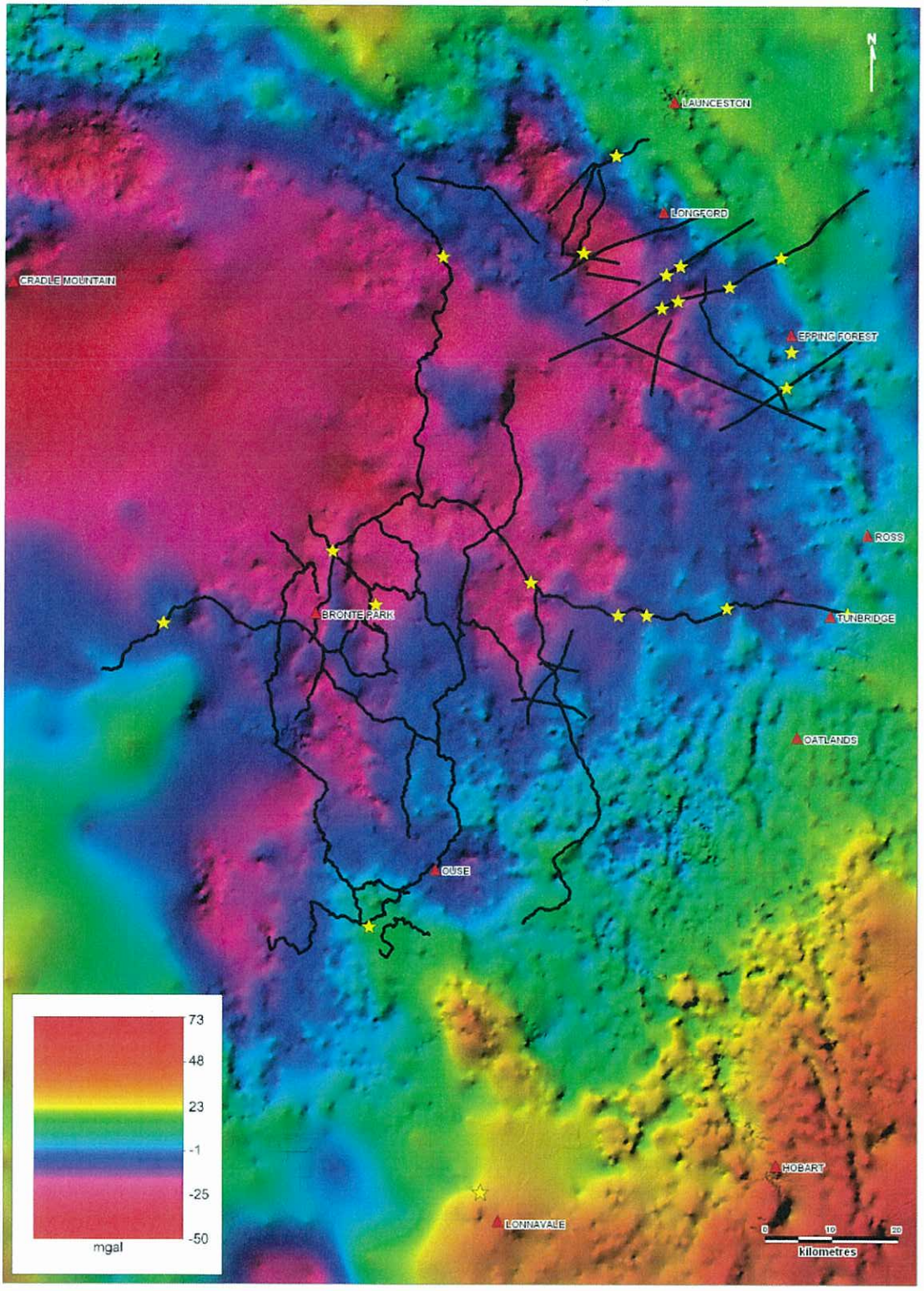


Figure 9. Residual Bouger Anomaly - Central Highlands - (Illuminated from the northeast)
with Tasmanian towns, GSLM seismic lines and GSLM proposed drill sites

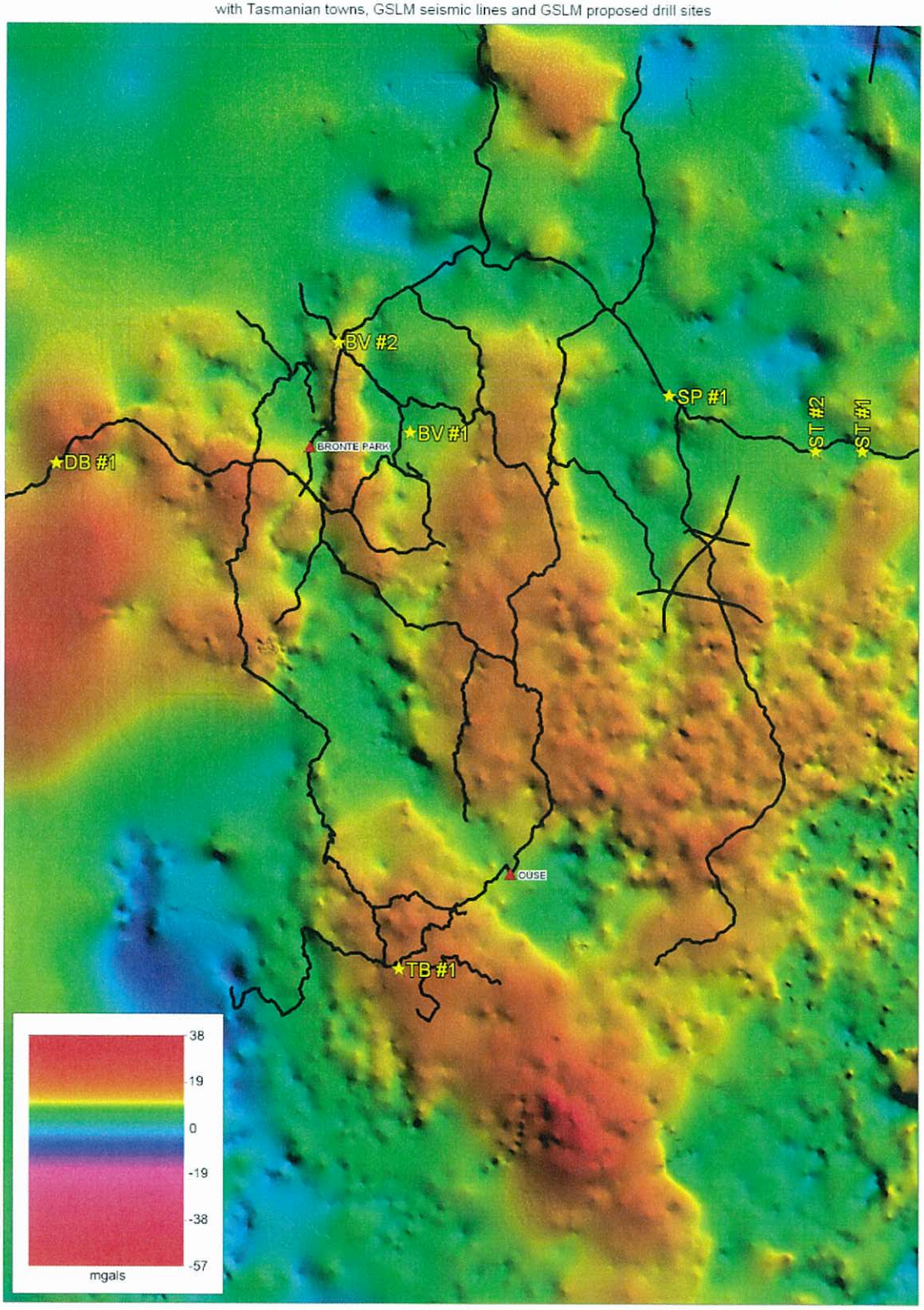


Figure 10. Bouger Anomaly - Central Highlands - (Illuminated from the northeast)
with Tasmanian towns, GSLM seismic lines and GSLM proposed drill sites

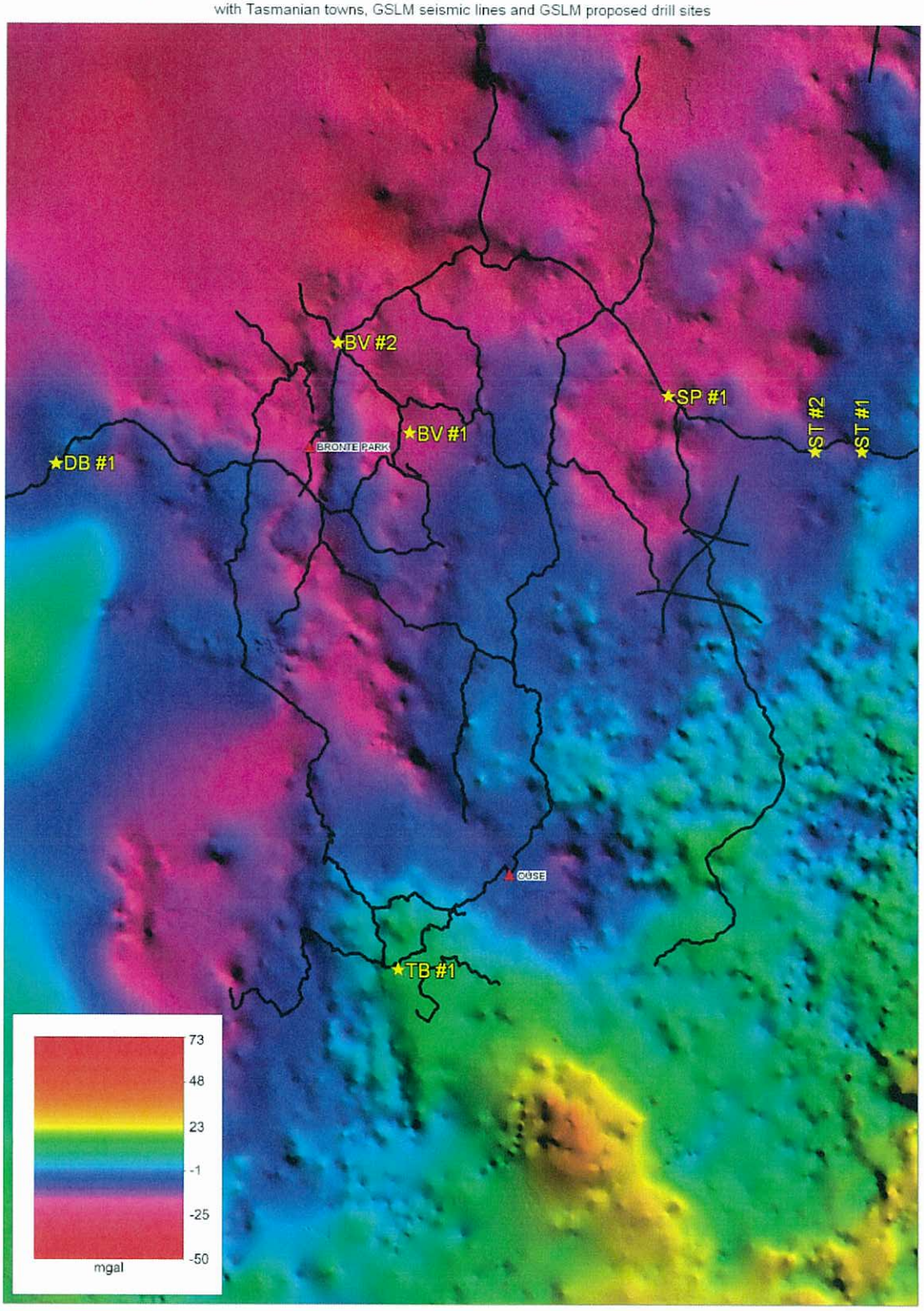


Figure 11. Residual Bouger Anomaly - Midlands - (Illuminated from the northeast)
with Tasmanian towns, GSLM seismic lines and GSLM proposed drill sites

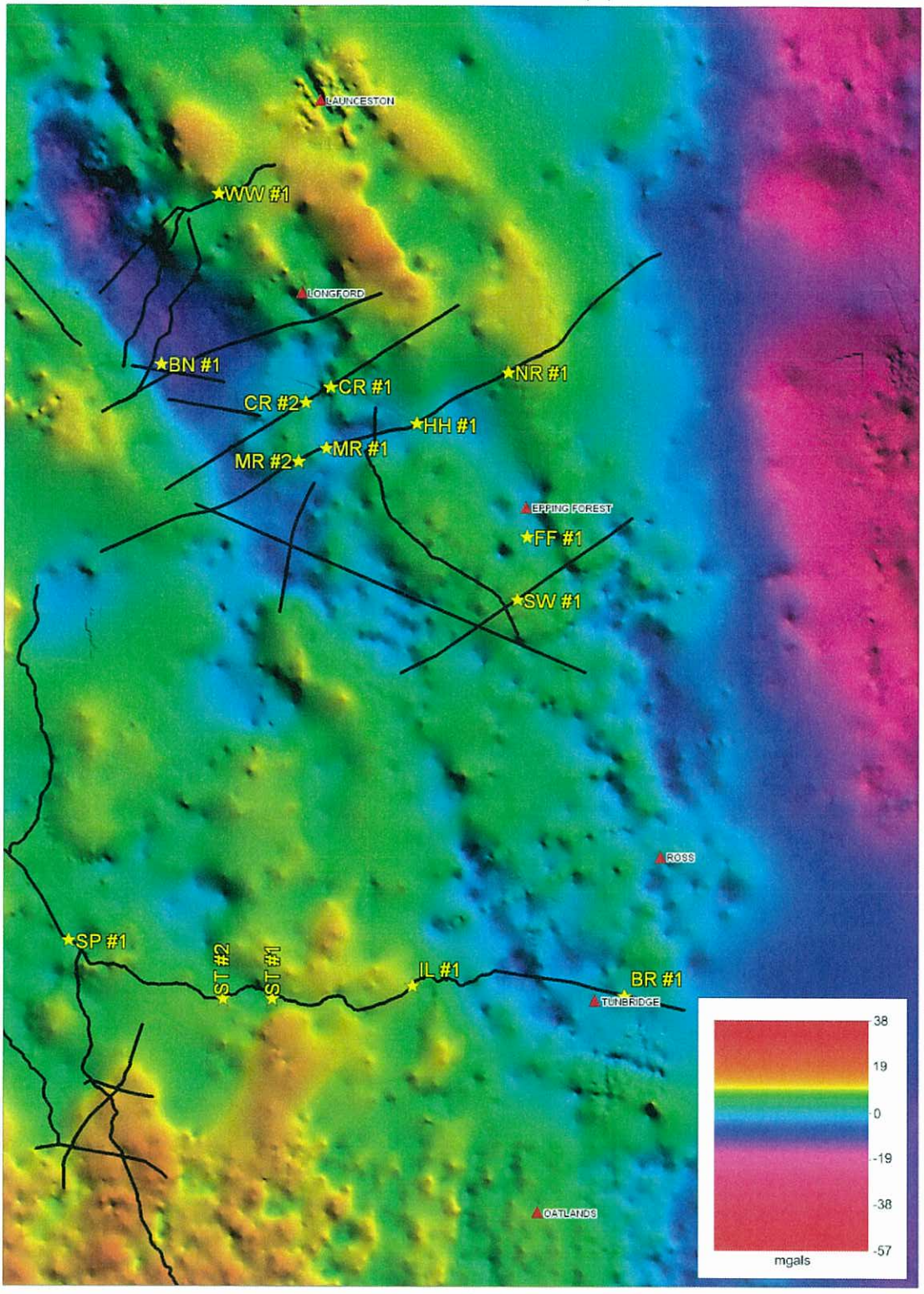
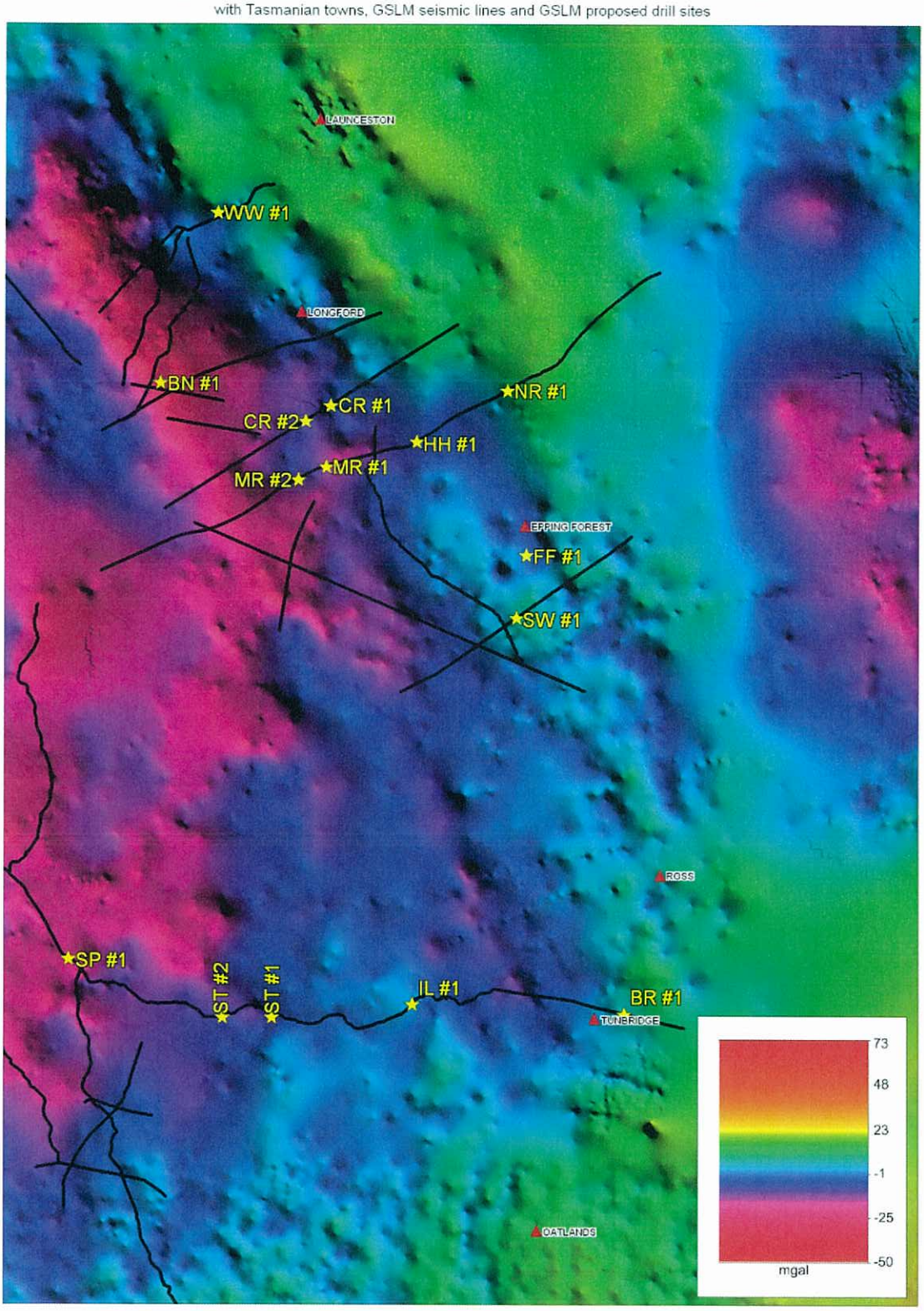


Figure 12. Bouger Anomaly - Midlands - (Illuminated from the northeast)
with Tasmanian towns, GSLM seismic lines and GSLM proposed drill sites



Discussion/Conclusions

The Kriging method used to create the gravity grid in SURFER is complex, with many of the parameters able to be adjusted to fine tune the result. The default parameters were used for this data and deemed to produce a consistently acceptable result across the entire area.

The results were compared with Dr David Leaman's interpolation for the Central Highlands as well as an older state gravity map as check for gross errors. None were found.

The Kriging algorithm produced some artefacts in the final grids. These artefacts appear as a series of straight ledge-like shapes, particularly in areas where there are a limited number of input data points.

The choice of cell size was difficult given that the distance between data points varied significantly throughout the dataset. A value of 100m was chosen as being a good average. A smaller cell size than 100m may have been appropriate in certain areas and produced a smoother looking grid when viewed close-up, however, in areas of wide distribution of data points, a very fine cell size gives the appearance of much higher precision in the data than is actually the case.

Of course, a better result could always be obtained with the addition of more gravity measurements spaced a in a regular grid pattern.

Applying a colour range across a state-wide dataset naturally means that local variations will not be so apparent since they are small variations in terms of the entire dataset. For a more detailed examination of local variations in gravity, a subset of the state-wide data should be taken and the methodology outlined previously applied to this subset.

References

Leaman, D.E., 2007. Completion Report, Gravity Survey, Central Plateau Area, Tasmania, SEL 13/98. Report for Great South Land Minerals Ltd, by Leaman Geophysics, July.

Solo Geophysics, 2007. Gravity Survey, Central Highlands Areas, Tasmania. Report for Great South Land Minerals Ltd, by Solo Geophysics, June.