AN OVERVIEW OF GEOSCIENCE AUSTRALIA WORK AS PART OF THE NORTH AUSTRALIA NGA PROJECT

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In July 2000, Geoscience Australia (GA; then the Australian Geological Survey Organisation) joined with the Northern Territory Geological Survey (NTGS) in the North Australia NGA (National Geoscience Agreement) Project (NAP), a three year program to assist NTGS in their regional mapping and metallogenic programs in the southern Northern Territory. We are presently about half-way through this project, which is due to be completed in June 2003. Geoscience Australia has worked closely with NTGS on a number of aspects of this project, most of which are being reported separately at this conference (Wygralak and Mernagh, 2002; Fraser, 2002; Hoatson *et al*, 2002; Hussey and Huston, 2002; Korsch *et al*, 2002; and Meixner *et al*, 2002). Topics not covered by other presentations include results of a gravity survey in the Tennant Creek area, certain aspects of mineral potential of the region, and diamond potential. This contribution summarises these latter results, reports new developments on the NAP web page, and presents proposed work for the remainder of the project. The locations of the areas of work in the NAP are shown in Figure 1.

In July 2001, Scintrex Pty Ltd conducted a gravity survey on behalf of GA and NTGS covering the Tennant Creek and parts of the Green Swamp Well and Bonney Well 1:250 000 sheets. The survey was conducted on a 4 km × 4 km grid or better, and the data were combined with existing detailed gravity data for a complete coverage of the survey area (Figure 2). These data are available online at www.dme.nt.gov.au/downloads/ or as part of the complete Australina gravity data set (available on CD from the Sales Centre, Geoscience Australia, GPO Box 378, Canberra, ACT, 2601 for $99 plus postage and handling). As part of this coming year's work program, these data, in combination with aeromagnetic data, will be modelled to establish the 3-D geologic architecture of the Tennant Creek region.

Weight of evidence analysis has been used in a preliminary mineral potential assessment for lode gold in the Tanami Region using weight-of-evidence analysis (Figure 3). This technique assesses the influence of factors such as proximity to faults, or ganitoids, and host rocks on known deposits, and uses these data to determine mineral potential as measured by for the entire region. Analysis of known deposits indicates that they are closely related to faults, but no statistically significant relationship was noted with respect to granitoids. The most common host unit is the Mt Charles Formation, but significant deposits are hosted by the Killi Killi and Dead Bullock Soak Formations. Future work in mineral assessment will be to refine the Tanami lode gold assessment using open file geochemical data and fault classification, and to assess the potential for sediment-hosted Zn-Pb-Ag deposits in the Victoria and Ashburton Basins.

The North Australian Craton (NAC) has considerable potential for diamonds. Diamondiferous kimberlites are known to have been emplaced during three separate events: *ca* 1200 Ma (Argyle), *ca* 360 Ma (Merlin), and *ca* 180 Ma. These kimberlites are located along the northern margins of the thickest part of the North Australia crust (Fig. 4). Parts of the NAC pose significant problems for diamond exploration. For instance, diamond indicator minerals,

with the exception of diamond and, to a lesser extent, chromite, typically do not survive intense weathering, and the Merlin pipe is not magnetic. The purpose of this part of the NAP is to define areas of higher potential at the craton scale to better focus exploration.

In addition to the work program already identified, GA, in close collaboration with NTGS, will concentrate on: (1) characterising regional fluids in the Tanami region and their relationship to ore fluids; (2) determining the timing, origin, and stratigraphic correlation of the eastern Arunta Cu-Zn-Pb deposits; (3) assessing links between the Tanami and Arunta in terms of correlation, provenance, and thermotectonic history; and (4) placing constraints on the internal geologic architecture and geologic history of the Arunta.

References

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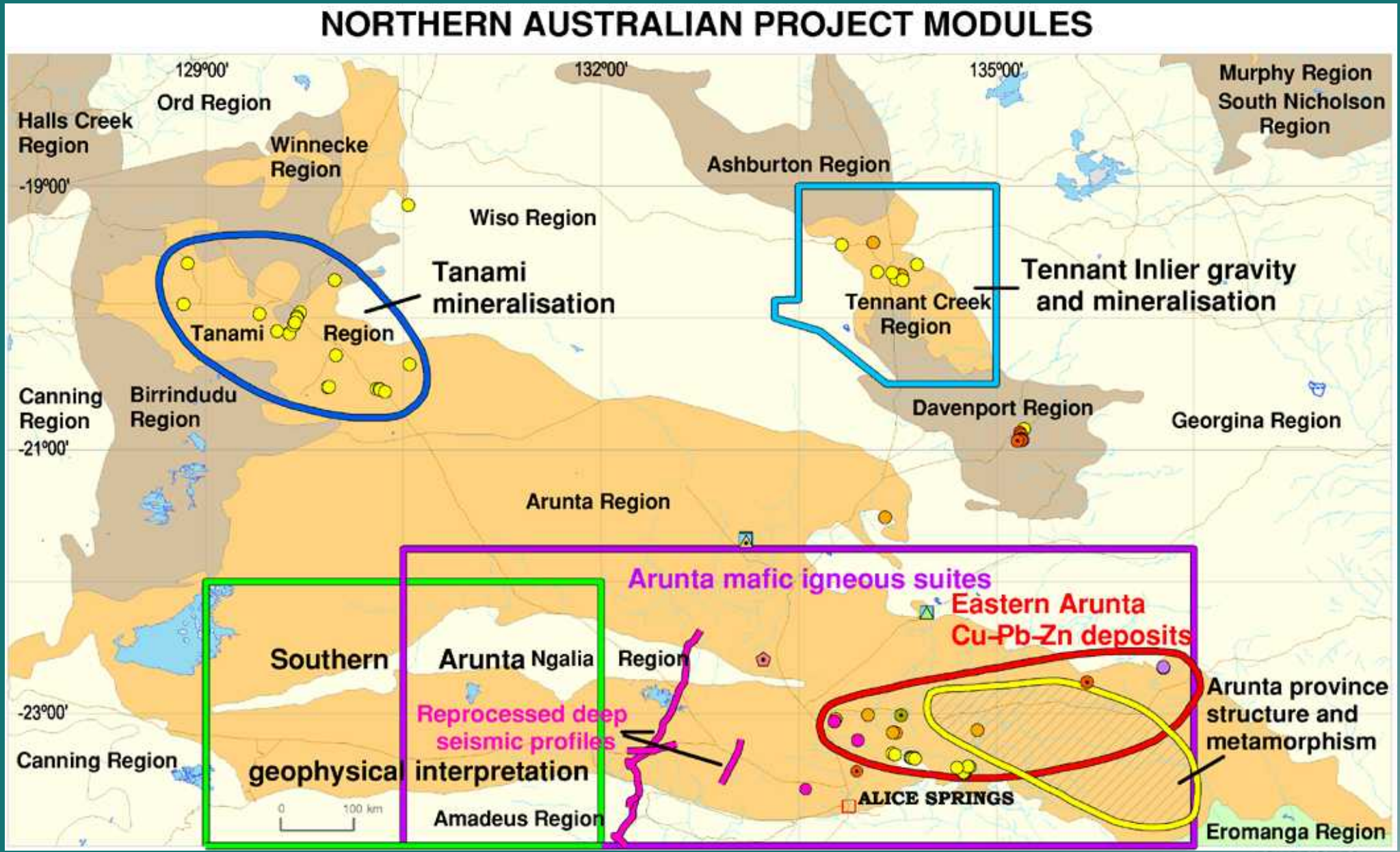
Figure 1. Location of North Australia Project research programs. The geochronology, regional synthesis-GIS development and diamond modules cover the entire area shown.

Figure 2. Image showing variations in the gravity field in the Tennant Creek region. Station spacing is at 4 km × 4 km or better.

Figure 3. Weights of evidence analysis of lode gold mineral potential in the Tanami Region. The analysis is based on host rocks and proximity to faults and granitoids. Warmer colours indicate higher prospectivity.

Figure 4. Relationship of diamondiferous intrusions to depth to Moho in Australia.



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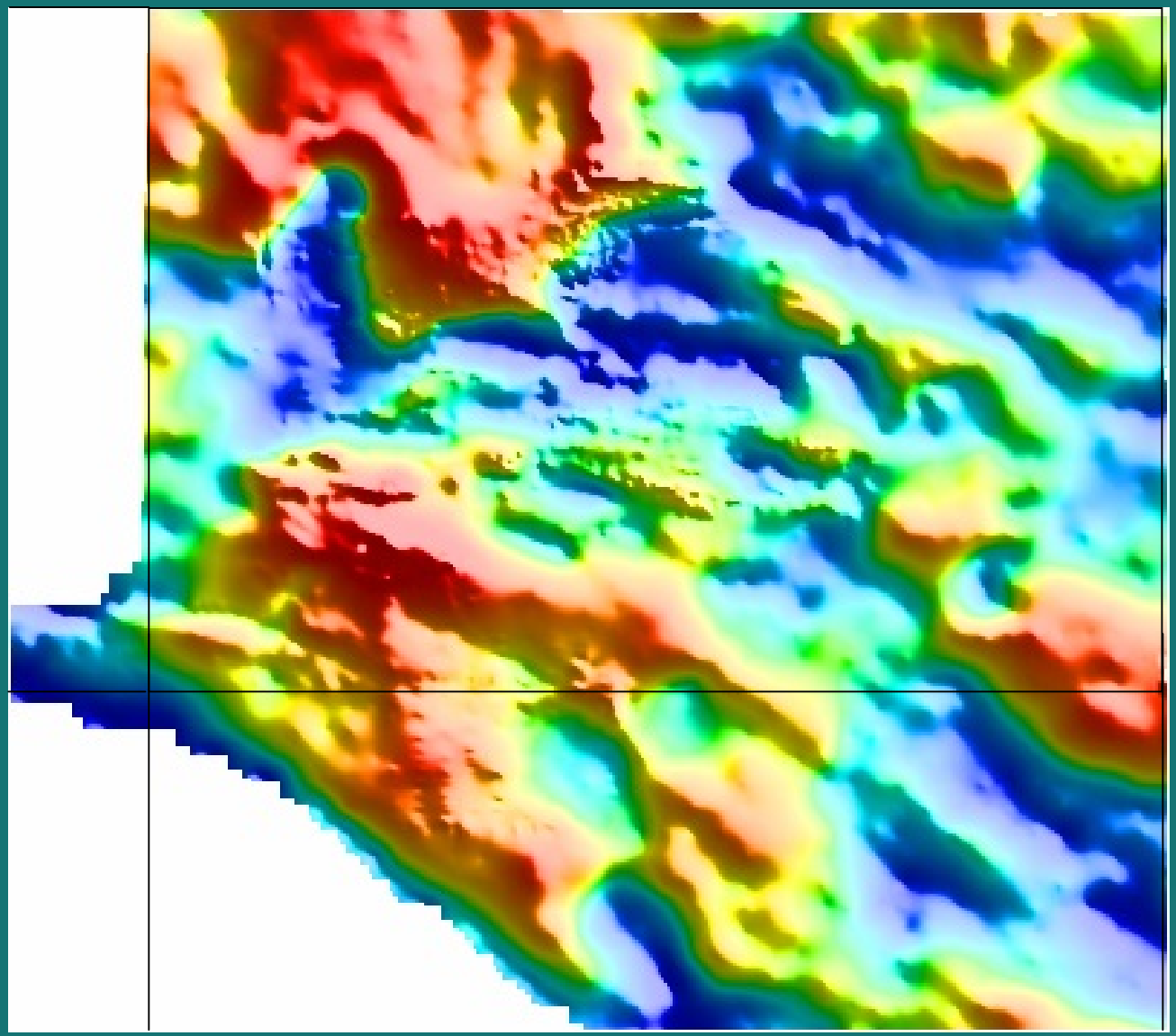

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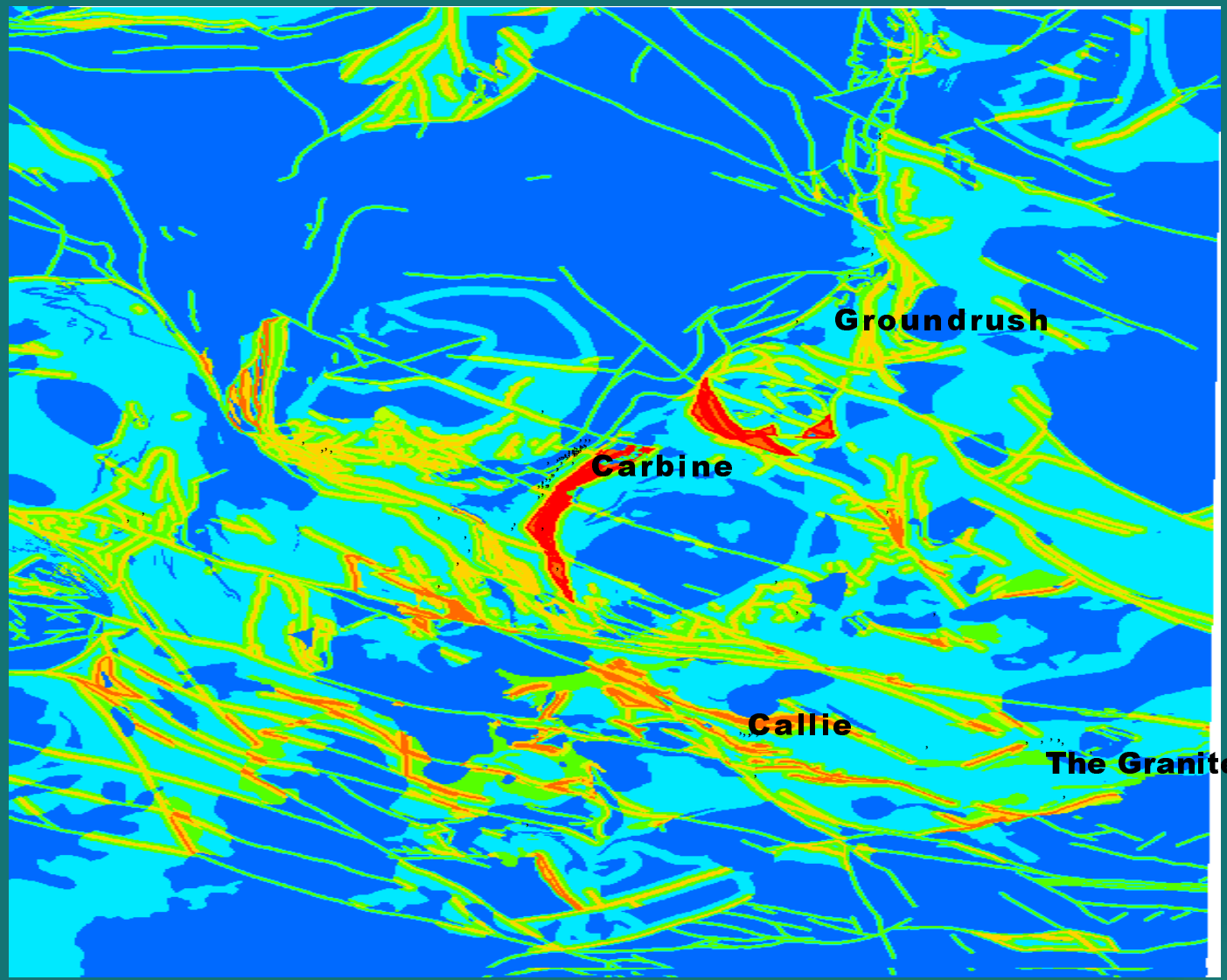
Weight-of-evidence favourability map (Tanami Region)



Posterior Probability

- 0-0.000193
- 0.000193-0.000865
- 0.000865-0.00357
- 0.00357-0.00711
- 0.00711-0.0144
- 0.0144-0.0261
- 0.261-0.705

Prior probability: 0.0028 deposits/km^2

Data considered:

- Solid Geology
- Proximity to faults
- Proximity to granitoids

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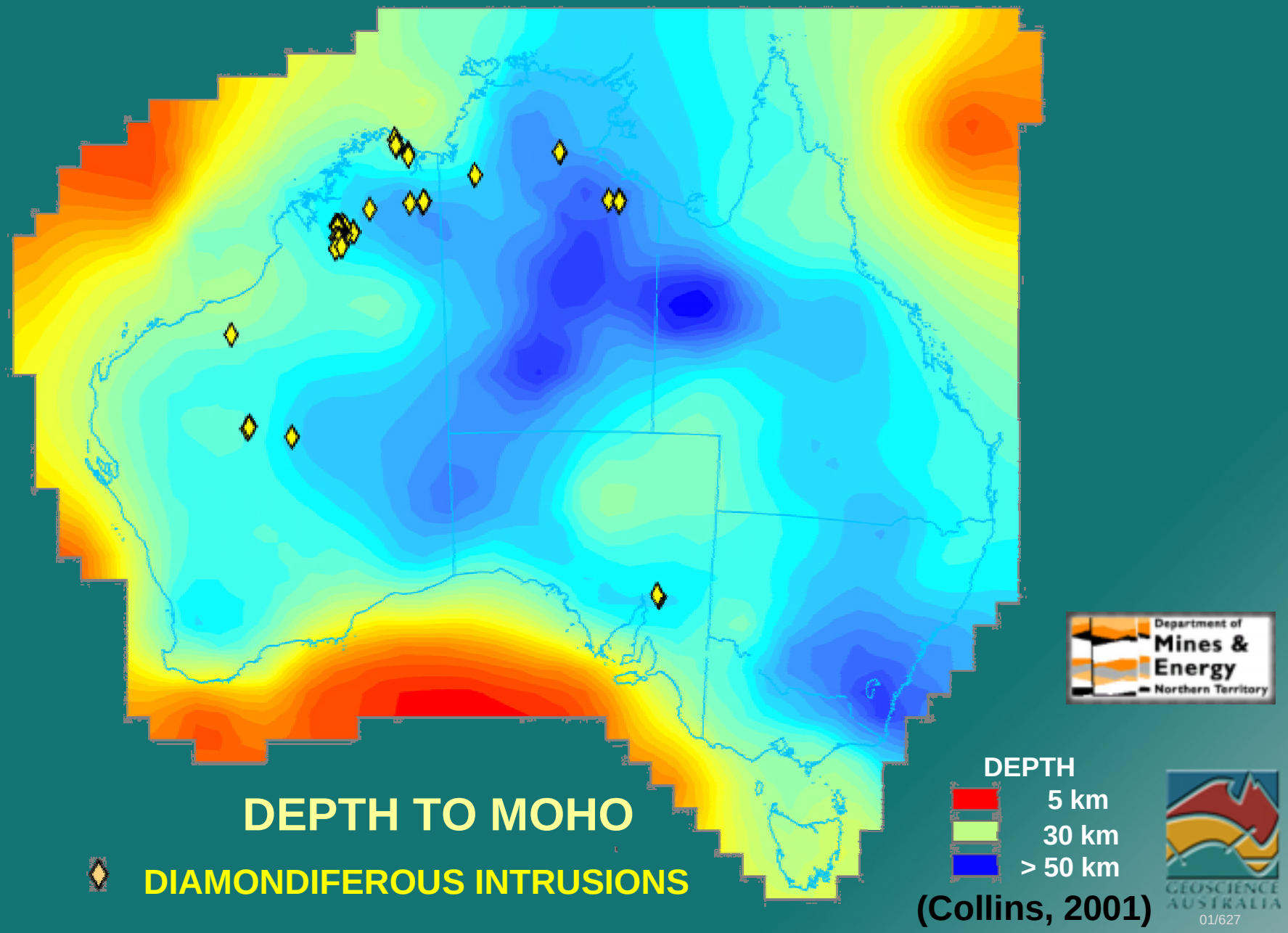
Figure 3. Weights of evidence analysis of lode gold mineral potential in the Tanami Region. The analysis is based on host rocks and proximity to faults and granitoids. Warmer colours indicate higher prospectivity.



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