

1:100 000 regolith reinterpretation of the Eastern Goldfields

by

A. Riganti and P. B. Groenewald

Regolith deposits cover about 90% of the Eastern Goldfields Granite–Greenstone Terrane of the Yilgarn Craton, and are host to significant mineral deposits, including lateritic gold, lateritic nickel, rare earth elements, and industrial minerals. Mineral exploration is also increasingly focused on the identification of mineral deposits hidden beneath thick residual or transported regolith cover. A correct interpretation of the regolith is therefore an essential tool in the search for new mineral deposits.

To serve the developing needs of the mineral exploration industry, the Geological Survey of Western Australia (GSWA) embarked upon a complete regolith reinterpretation for the area covered by the Combined East Yilgarn Geoscience Database (EYGD), in which the fifty-six 1:100 000 maps covering the Eastern Goldfields region are compiled. As this mapping was conducted and compiled over a period of more than eighteen years, a regolith reinterpretation was essential to produce a consistent coverage that accommodates recent advances in understanding the processes that control the formation and evolution of regolith deposits (compare Figs 1a and 1b). A full standardization of regolith codes across the area covered by the database was also introduced, according to the revised GSWA regolith classification scheme (Hocking et al., 2001), which is based on the Residual–Erosional–Depositional (RED) scheme of Anand et al. (1993). In addition to the erosional regime (X) typical of bedrock exposures, the main regolith elements are colluvial (C), alluvial (A), sheetwash (W), and lake deposits (L), representative of increasingly distal transport and deposition, and relict or residual deposits (R) representing either remnants of a previous land surface or weathering products of the underlying bedrock in situ. Eolian and residual sandplain deposits (S) are developed in various parts of the landform profile.

Reinterpretation of the regolith coverage was carried out largely using Landsat TM images and published geological maps. In addition to ground truthing in critical areas, the reinterpretation drew heavily from the experience gained during several years of aerial photography- and Landsat-based regional field mapping. The Landsat TM images routinely used for the reinterpretation include:

- bands 7, 4, 1 (RGB) — these bands are the least correlated of all bands, and therefore provide a sensitive response across a broad spectrum of variations in composition;
- the Gozzard band ratio, 5/7, 4/7, 4/2 (RGB) provides finer subdivision in areas where iron and clay are important components of the regolith (Tapley and Gozzard, 1992).

The 1:100 000 regolith reinterpretation in the Combined EYGD represents a seamless and homogeneous regolith coverage across the Eastern Goldfields region, and represents the most extensive work undertaken thus far at this scale. The regolith geology for the area is resolved in much greater detail (Fig. 1), with a total of 46 regolith types recognized, and the number of regolith polygons increased by about 10% (from ~39 000 to ~43 000). It reflects our deeper understanding of regolith formation and evolution, and as such it is a critical tool in the search for mineral deposits in the deeply weathered terrain of the Eastern Goldfields.

References

- ANAND, R. R., CHURCHWARD, H. M., SMITH, R. E., SMITH, K., GOZZARD, J. R., CRAIG, M. A., and MUNDAY, T. J., 1993, Classification and atlas of regolith-landform mapping units: CSIRO/AMIRA Project P240A, Exploration and Mining Restricted Report 440R (unpublished).
- HOCKING, R. M., LANGFORD, R. L., THORNE, A. M., SANDERS, A. J., MORRIS, P. A., STRONG, C. A., and GOZZARD, J. R., 2001, A classification system for the regolith in Western Australia: Western Australia Geological Survey, Record 2001/4, 22p.
- TAPLEY, I. J., and GOZZARD, J. R., 1992, Aerial photographic interpretation and Landsat Thematic Mapper image processing techniques for regolith-landform mapping: Australia CSIRO Restricted Report 239R (unpublished).
- WITT, W. K., and SWAGER, C. P., 1989, Bardoc, W.A. Sheet 3137: Western Australia Geological Survey, 1:100 000 Geological Series.

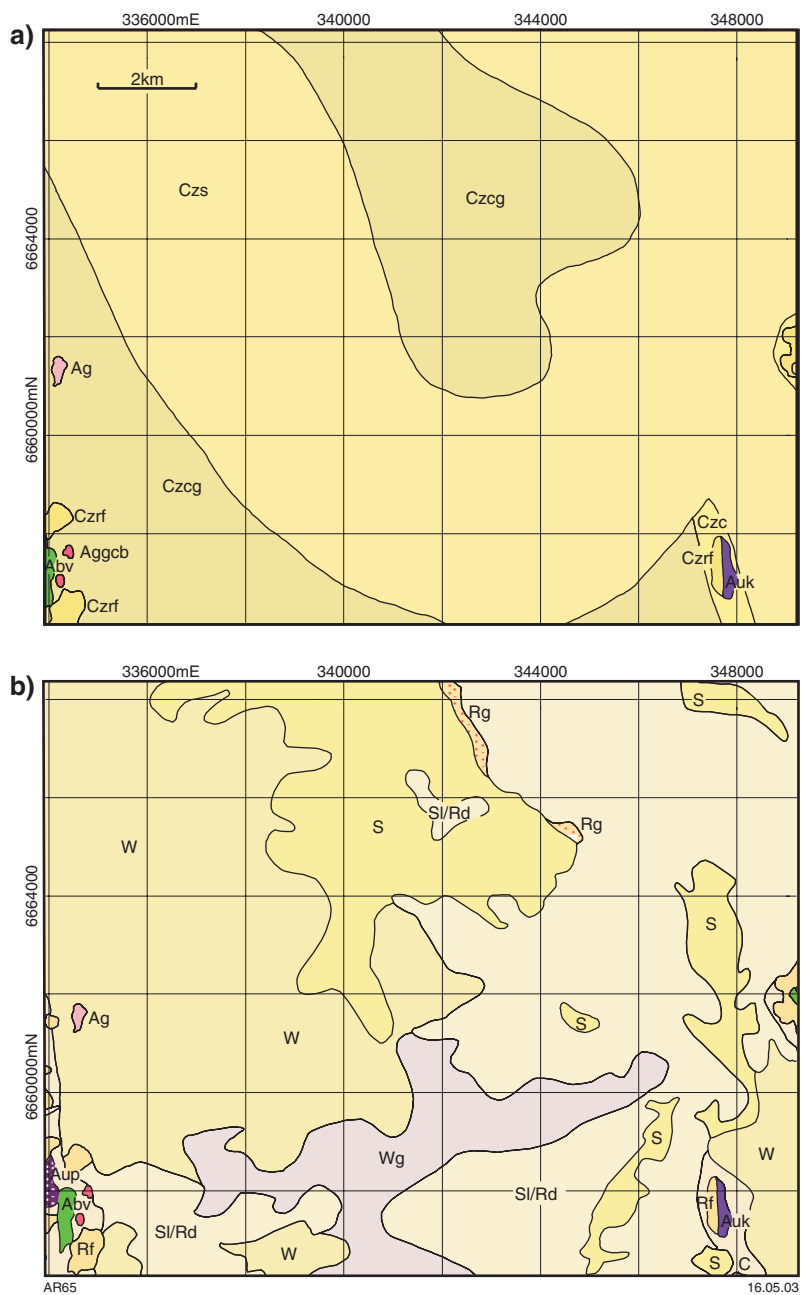


Figure 1. Comparison of a) original published (Witt and Swager, 1989) and b) reinterpreted regolith geology for a portion of the BARDOC 1:100 000 map sheet, illustrating the significant adjustments required by application of the GSWA regolith scheme (Hocking et al., 2001). Grid references in Figure 1a and b refer to the Australian Geodetic Datum 1966 (AGD66) and the Geocentric Datum of Australia 1994 (GDA94) respectively