

# The Derivation of Conformal Horizontal Datum Transformation Parameters Using a Gravimetric Geoid Model

<b>Degree:</b>	Honours
<b>Keywords:</b>	geodesy, geoid, datum transformations, spheroid, heights
<b>Entry:</b>	Bachelors degree in geoscience, physics, mathematics, or any related discipline, or invited entry to the Honours program in the Department
<b>Supervisor:</b>	Professor Will Featherstone ( <a href="mailto:W.Featherstone@curtin.edu.au">W.Featherstone@curtin.edu.au</a> ), <a href="#">Western Australian Centre for Geodesy</a> , Department of Spatial Sciences, Curtin University of Technology
<b>Project Funding:</b>	Western Australian Centre for Geodesy
<b>Student Funding:</b>	The student will receive some assistance with the costs of thesis production and photocopying
<b>Resources:</b>	Some software, control data, AUSGeoid98
<b>Collaboration:</b>	Geoscience Australia
<b>Starting Date:</b>	Unrestricted

## Project Description:

The conventional determination of horizontal datum transformation parameters has used common coordinates from the two datums. However, there is an alternative and largely independent approach, which uses only the geoid-ellipsoid separation. Given a gravimetric geoid on a geocentric datum and assuming that the local geodetic datum was properly oriented such that its defining ellipsoid was a close fit to the geoid in that region, the transformation can be achieved by using a geoid model.

This project will use least squares to determine the transformation parameters between the Australian Geodetic Datum (AGD) and the Geocentric Datum of Australia (GDA94) based on AUSGeoid98 (Featherstone et al., 2001). These transformation parameters will then be compared with the national transformation parameters produced by the then Australian Surveying and Land Information Group (AUSLIG, 1999). For example, AGD coordinates can be transformed to the GDA94 using the various techniques and compared with known GDA94 coordinates of the same points. The student will develop or modify existing the least-squares software to determine these parameters (cf. Wolf, 1980).

This research is totally novel. To the best of my knowledge, no-one has ever undertaken such an investigation. It has the potential to offer an independent means to verify horizontal datum transformation parameters, such as those now being used in Australia for the new GDA94. Of course, the project contains some technical risk in that the method may also fail.

**Related literature:**

- AUSLIG (1999) *Geocentric Datum of Australia –Technical Manual*, Version 2.0, <http://www.anzlic.org.au/icsm/gdatm/gdatm.htm>, Australian Surveying and Land Information Group, Canberra, August.
- Burford, B.J. (1985) A further examination of datum transformation parameters in Australia, *The Australian Surveyor*, 32(7): 536-558.
- Defense Mapping Agency (1997) Department of Defense World Geodetic System 1984: its definition and relationships with local geodetic systems (third edition). *Technical Report no. 8350.2*, Defense Mapping Agency, Washington
- Featherstone, W.E. (1997) An evaluation of existing coordinate transformation models and parameters in Australia, *Cartography*, 26(1): 13-26.
- Featherstone, W.E. and R Kinneen (2001) Transformation models and parameters in Western Australia - how good are they?, *Timepiece*, 2(1): 9-10.
- Featherstone, W.E., J.F. Kirby, A.H.W. Kearsley, J.R. Gilliland, G.M. Johnston, J. Steed, R. Forsberg, M.G. Sideris (2001) The AUSGeoid98 geoid model of Australia: data treatment, computations and comparisons with GPS-levelling data, *Journal of Geodesy*, 75(5/6): 313-330.
- Harvey, B.R. (1986) Transformation of 3D co-ordinates, *The Australian Surveyor*, 33(2): 105-125.
- Kinneen, R. (2000) An investigation of coordinate transformations from the AGD84 to the GDA94 in Western Australia. *Project Report*, Department of Spatial Sciences, Curtin University of Technology, Perth.
- National Mapping Council (1999) *Geocentric Datum of Australia –Technical Manual*, National Mapping Council, Canberra, 62 pp.
- White, L.A. (1992) Orthometric heights in GPS networks by Seven-parameter transformation, proceedings of the National Conference on GPS Surveying, University of New South Wales, Sydney, June.
- Wolf, R (1980) *Elements of Photogrammetry* (third edition), Wichmann, Karlsruhe.