Toitu te Land whenua Information New Zealand

LINZS25001

Standard for Ross Sea Region Geodetic Datum 2000

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TERMS AND DEFINITIONS

Term	Definition
Cartesian coordinates	values representing the location of a point in relation to three orthogonal intersecting straight lines called axes. For the purpose of this standard, the intersection of all three axes coincides with the centre of mass of the Earth so that the z-axis is aligned with the Earth's mean pole of rotation; the x-axis passes through 0° longitude on the equator; and the y-axis passes through 90° longitude on the equator such that it completes a right-handed rectangular coordinate system. Cartesian coordinates are expressed as (X,Y,Z) triplets with units of metres.
coordinate	any one of a set of numbers used in specifying the location of a point on a line, in space, or on a given plane or other surface (for example, latitudes and longitudes are coordinates of a point on the Earth's surface)
coordinate reference system	a type of coordinate system based on orthogonal axes intended to provide a consistent and standardised reference for many users to reliably specify and share information on the location of points in space
coordinate system	a system for allocating coordinates to points in space in some specified way in relation to designated axes, planes, or surfaces. The simplest coordinate system consists of orthogonal coordinate axes known as a Cartesian coordinate system.
datum	a particular type of reference system in which coordinates are defined in relation to a particular reference surface by means of distances or angles, or both
ellipsoid	a surface formed by the rotation of an ellipse about a main axis. In this standard, the ellipsoids used are oblate to match the general shape of the Earth. An oblate ellipsoid is one in which the semi-minor axis of the ellipse is the axis of revolution.
geodetic system	a system that enables positions on the surface of the Earth to be determined by reference to a mathematical model that describes the size and shape of the Earth (as defined in s 4 of the Cadastral Survey Act 2002)
GNSS	Global Navigation Satellite System
GRS80	Geodetic Reference System 1980 – an ellipsoid adopted by the International Association of Geodesy as the recommended best-fit ellipsoid for the Earth, Moritz (2000)
LINZ	Land Information New Zealand

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IERS	International Earth Rotation and Reference Systems Service
IGS	International GNSS Service
ITRF	International Terrestrial Reference Frame - a realisation of an ITRS through a global set of space geodetic observing sites. An ITRF comprises geodetic Cartesian coordinates and velocities for a set of fiducial points
ITRF96	International Terrestrial Reference Frame 1996 (Boucher et al 1998) – the 1996 realisation of the ITRF
ITRS	International Terrestrial Reference System – an Earth-fixed reference system (one that rotates with the Earth) that is defined by a three-dimensional geocentric coordinate reference system. The system is realised by the IERS as the ITRF
Ross Sea Region	for the purposes of this standard Ross Sea Region includes the Ross Sea and that area bounded between longitudes 160° East and 150° West and south of latitude 60° South
RSRGD2000	Ross Sea Region Geodetic Datum 2000
semi-major axis	semi-diameter of the longest axis of an ellipsoid; this is the axis measured in the equatorial plane for an oblate ellipsoid

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FOREWORD

Section 7(1)(a) of the Cadastral Survey Act 2002 makes it a function and duty of the Surveyor-General to maintain a national geodetic system. The Surveyor-General has issued this standard to meet that obligation.

Purpose of standard

The purpose of this standard is to:

(a) define the Ross Sea Region Geodetic Datum 2000 (RSRGD2000), and

(b) detail the parameters that define the RSRGD2000.

Rationale for new standard

Land Information New Zealand (LINZ) is tasked with meeting the Government's desired economic, social, and environmental outcomes in relation to its mandated subject areas. Accordingly, end outcomes, intermediate outcomes, and sub-objectives have been developed to clearly articulate the regulatory framework for each subject area.

A risk-based approach is then used to determine the optimum level of intervention. If there is a high risk of not achieving an objective or sub-objective, then, generally, a higher level of intervention is required. Similarly, a low risk of not achieving an objective or sub-objective means a low level of intervention is necessary. The desired intervention is then developed to manage the identified risks and thereby achieve the relevant sub-objectives, objectives and, therefore, the outcome.

This standard has been developed to mitigate the risk of not achieving the following end outcome and objectives.

End outcome	**Objectives**
A single common reference system that underpins the efficient operation of the cadastral, hydrography, and topography systems and meets directed government needs	• Common preferred geodetic datums and projections are used by Managers of geospatial data • National datasets and positioning systems accurately relate to global datasets

Brief history of standard

In 2000, LINZ introduced RSRGD2000 as the official three-dimensional geodetic datum for New Zealand in the Ross Sea Region of Antarctica. There was no prior standard for the Ross Sea Region.

This standard supersedes the following document:

LINZ 1999, *Ross Sea Region Geodetic Datum 2000, Policy 99/4,* Office of the Surveyor-General, LINZ, Wellington

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Committee responsible for standard

The expert committee responsible for reviewing this standard consisted of the following representatives:

Business Group (Company)	**Name**
Office of the Surveyor-General (LINZ)	Don Grant Matt Amos
National Topographic and Hydrographic Authority (LINZ)	Dave Mole
Regulatory Frameworks & Processes (LINZ)	Amanda Thompson Michelle Gooding Ruth Willis
Customer Services (LINZ)	Graeme Blick John Ritchie Chris Kinzett
GNS Science	John Beavan
Antarctica New Zealand	Dean Peterson
New Zealand Cartographic Society	John Beavan
University of Otago – School of Surveying	Paul Denys

References

The following documents were used in the development of this standard:

Boucher, C., Altamimi, Z. & Sillard, P. 1998, *IERS Technical Note 24: Results and analysis of the ITRF96*, International Earth Rotation Service, Paris.

DeMets, C., Gordon, R.G., Argus, D.F. & Stein, S. 1994, *Effect of recent revisions to the geomagnetic reversal time scale on estimates of current plate motions*, Geophys. Res. Let., 21, pp. 2191-2192.

LINZ 2000, *OSG Technical Report 15: Realisation of Ross Sea Region Geodetic Datum 2000*, Office of the Surveyor-General, LINZ, Wellington.

McCarthy, D.D. (ed) 1996, IERS Conventions (1996), *IERS Technical Note 21,* International Earth Rotation Service, Paris.

Moritz, H. 2000, *Geodetic Reference System 1980*, Journal of Geodesy, 74(1), pp. 128-133.

1 INTRODUCTION

In 2000, LINZ introduced RSRGD2000 as the official three-dimensional geodetic datum for New Zealand in the Ross Sea Region of Antarctica. The methodology adopted when computing coordinates of the initial stations defining RSRGD2000 is contained in LINZ 2000, *OSG Technical Report 15: Realisation of Ross Sea Region Geodetic Datum 2000*.[1]

1.1 Scope

This LINZ standard defines RSRGD2000.

1.2 Intended use of standard

Spatial data provided to and supplied by LINZ must comply with this standard when it is referenced by coordinates in terms of RSRGD2000.

Any person using RSRGD2000 must comply with this standard.

2 ROSS SEA REGION GEODETIC DATUM 2000

The following section defines RSRGD2000. Spatial data provided to and supplied by LINZ must conform to this standard when it is referenced by coordinates in terms of RSRGD2000.

2.1 RSRGD2000 parameters

The parameters for RSRGD2000 are:

(a) the GRS80 equipotential ellipsoid, described in Moritz (2000) (see table 1), as the reference ellipsoid.

Table 1: GRS80 Ellipsoid Parameters (Moritz 2000)

Ellipsoid	Semi-major axis (metres)	Inverse flattening
GRS80	6378137	298.257222101

(b) the ITRS and the parameters defining ITRF96 as defined in Boucher et al (1998) following the conventions in McCarthy (1996).

(c) Longitude, latitude and optional ellipsoidal height at 1 January 2000 (2000.0).

[1] The positions and velocities in ITRF96 of IGS sites MCM4, CAS1, DAV1, OHIG, EISL, HOB2, KERG, PERT, and SANT, were constrained when computing the coordinates for RSRGD2000.

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Commentary:

The previous datum in the Ross Sea Region was the Camp Area Datum. The relationship between this and the RSRGD2000 is variable and should be determined locally.

When using RSRGD2000 the following should be noted:

1. The positions of the IGS sites were constrained to the ITRF96 coordinate values computed at the mean epoch of each survey using their ITRF96 velocities.
2. The positions of all the non-IGS sites were estimated based on their ITRF96 coordinates at the time of survey, propagated to 2000.0 using the NUVEL1A-NNR [DeMets *et al*. 1994] velocity model.
3. RSRGD2000 can be regarded as a static datum with coordinates fixed at 2000.0.
4. RSRGD2000 is intended primarily for mapping use and absolute coordinate accuracies need not be as high as in datums required for cadastral work.
5. The RSRGD2000 coordinates are provided for a set of points in the Ross Sea Region. New coordinates can be generated in terms of the datum; for example, by doing a differential GNSS survey relative to one of those points.

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