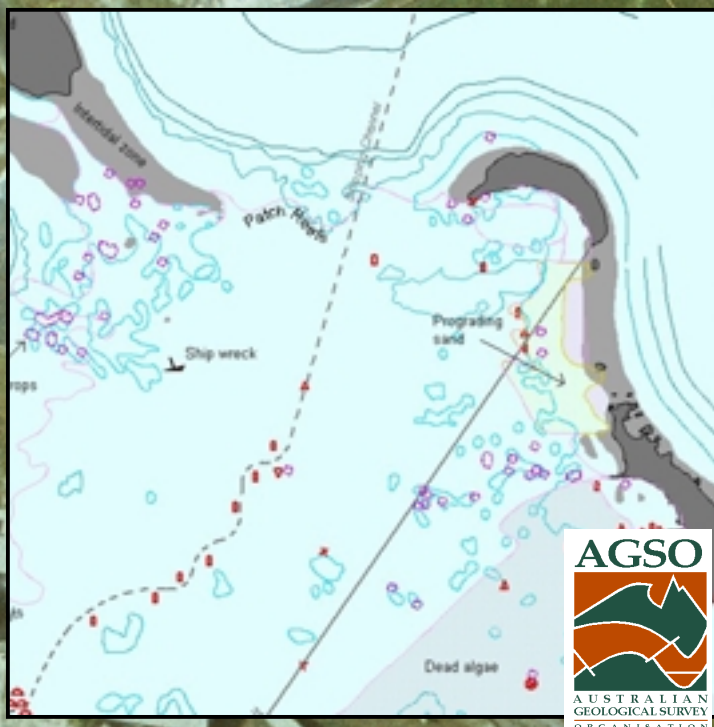# Cocos (Keeling) Islands GIS

Stage One Report

**for Territories Office
DoTRS, 10-Feb-2000**

THE AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION

MINERAL RESOURCES AND ADVICE PROGRAM

COCOS (KEELING) ISLANDS GEOGRAPHIC INFORMATION SYSTEM STAGE ONE REPORT

Prepared for the

Territories Office, Commonwealth Department of Transport and Regional Services

by

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February 2000

Cocos (Keeling) Islands GIS Stage One Report

List of figures:

Executive Summary

- A sample of the orthophotography has been created to resolution standards equivalent to those in the Christmas Island GIS.

- Data covering Cocos (Keeling) Islands have been obtained from the Commonwealth Environmental Resource Information Network (ERIN), the Australian Surveying and Land Information Group (AUSLIG), the Western Australian Department of Land Administration (DOLA), and the National Capital Planning Authority (NCPA).

- An initial version of the CKIGIS is ready for installation and demonstration on the Territories Office GIS PC.

- Sample colour maps, posters and an interim CD backup are provided with this report.

- There was unavoidable delay of about a month in Stage 1 of the project resulting from the Christmas holiday break and resolving grid systems in various old datasets. However, we have been able to make good progress in other areas and can advise that the project should be completed within three months after acceptance of this report

Introduction

This report summarises progress with the development of the Cocos (Keeling) Islands Geographic Information System (CKIGIS) on completion of Stage 1 (early February 2000). The major tasks and activities associated with the project are as set out in the Memorandum of Arrangement with Territories Office dated 10th October 1999 (see Appendix).

Thematic layers and data

Orthophotography

Digital orthophotography is being prepared from aerial photography flown in 1987. Figure1 is an example from a 1km square sample area in the vicinity of the airport. The sample has 24bit colour and a 20cm on-the-ground pixel size. AGSO aims to enhance the colour balance to more natural and vibrant colours as part of stage 2, and will ensure that a consistent colour balance is applied to all orthophotography.

Figure 1. A section of the preliminary orthophotography for an area north west of the airport terminal. Data overlayed includes cadastral boundaries and topography.

Cocos (Keeling) Islands GIS
Topography & Cadastre

STAGE 1 REPORT
PRELIMINARY SAMPLE
(11 FEBRUARY 2000)

0   10   20   30   40   50

Metres

Cadastre (Labelled with Loc No/Lot No)

Airport Infrastructure (Points)
- Windsock

Airport Infrastructure (Lines)
- Miscellaneous
- Pavement
- Runway Lights

Airport Infrastructure (Polygons)
- AI_MISC
- AI_RUNWAY_L
- West Island Spot Heights

West Island Contours
- Major Contour (Depresion)
- Minor Contour (Depression)
- Major Contour
- Minor Contour

West Island Features (Lines)
- Drainage (Open Unlined Drain)
- Drainage (Sump)
- Rock
- Sandhill/Dune
- Low Water Mark
- Water Storage (Tank)

West Island Infrastructure (Points)
- Light Pole

West Island Infrastructure (Points)
- ST_SIGN

West Island Infrastructure (Lines)
- Kerb
- Path (Concrete)
- Rail Barrier
- Road (Sealed)
- Road (Track)
- Building
- Building UC
- Causeway
- Fence
- Gate
- Mast/Pylon
- Concrete Pavement
- Ruins
- Wall
- Sign
- Retaining Wall
- Wharf

Marine environment

Marine environmental data were obtained from the Environmental Resources Information Network (ERIN). This includes coastlines, bathometric contours, coral outcrops and other features (Fig. 2).

The data were supplied as ArcInfo export files, but important relevant documentation was not available. Documentation provided by ERIN with the data referred to the Cocos (Keeling) Islands Land Use Plan 1992 data. The projection specified in that documentation (UTM Zone 47 WGS72) does not match that of the actual ERIN data.
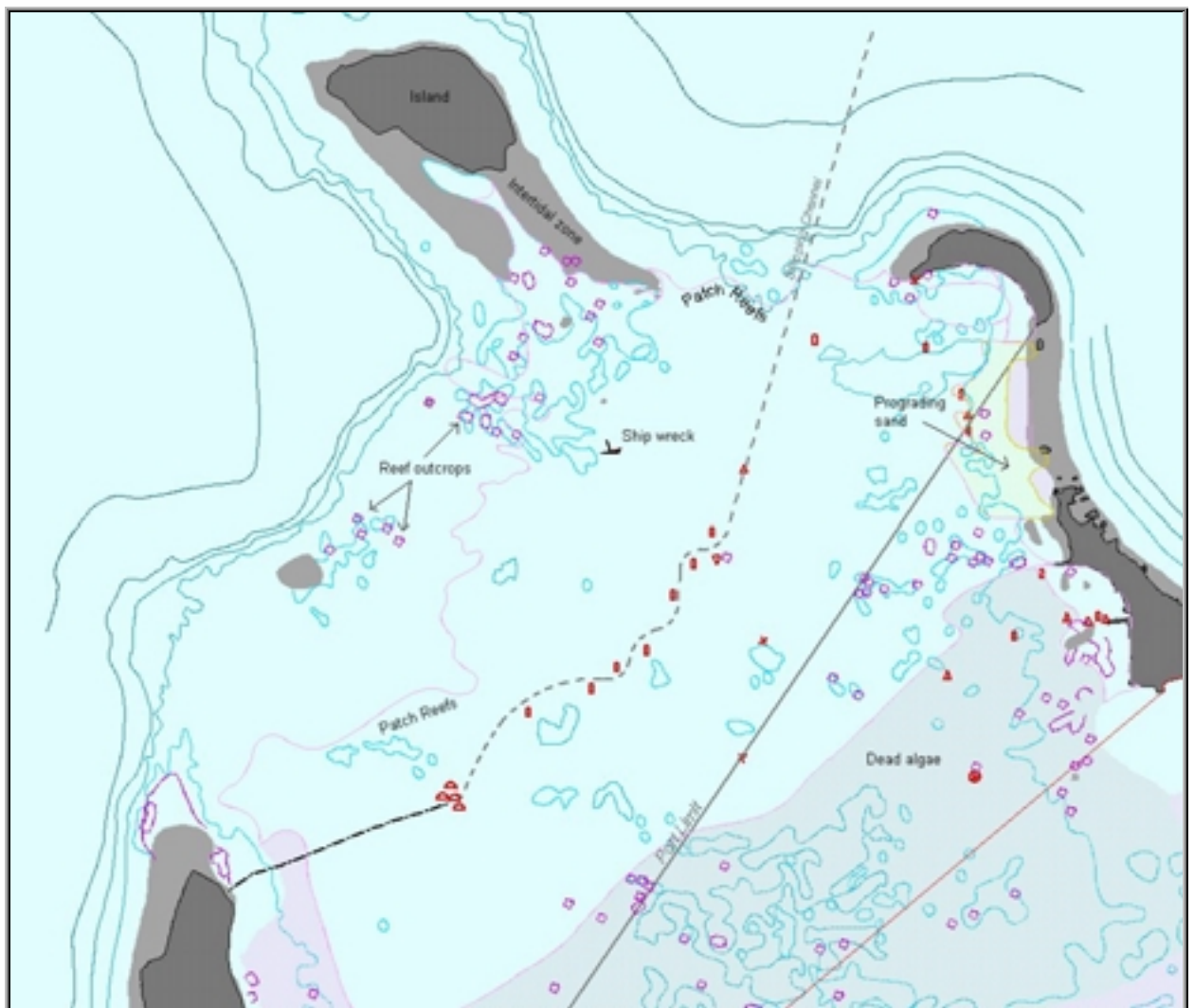
Figure 2. Data from ERIN include marine environmental data, some marine infrastructure and management zones.

Topography

Topographical data were received from LandInfo (on behalf of the Australian Surveying and Land Information Group (AUSLIG)) in design file format (DGN). Documentation was not provided with this data. Coverage is restricted to Home and West Islands with an example shown in Figure 3.

Evaluation of the data suggests that the probable coordinate system is Universal Transverse Mercator Zone 47 (World Geodetic System 1972 (WGS72)). Using this input coordinate system, projection to CKIG92 resulted in a mismatch of coordinates. Using similarly digitised features in the coastlines AGSO has found that an X-shift (16.86m) and a Y-shift (4.12m) of the AUSLIG data results in a match with the cadastre.

Figure 3. An example of AUSLIG topographic data around the airport. The dataset also has elevation data including contours and spot heights and some incomplete polygon data.

Cadastre

Cadastre was supplied by the Western Australian Department of Land Administration (DOLA) in ESRI shapefile format. The original coordinate system is geographic (World Geodetic System 1984).

DOLA advised that the local grid is Cocos (Keeling) Islands Grid 1992 (CKIG92). The surveyor on Christmas Island confirmed that this is the grid currently in use. AGSO have accepted this coordinate system as the basis for the Cocos (Keeling) Islands GIS. In the near future, DOLA expects to move its cadastral coordinate system for the islands to the Geocentric Datum of Australia 1994 (GDA94), and have confirmed that a transformation will be available between CKIG92 and GDA94.

The cadastral data covers most of the main group of islands. It does not include Horsburgh Island or North Keeling Island.

The original shapefile had some erroneous polygons (43 regions) which had small visible representations and large areas (Figure 4). As these areas did not have attributes and in all cases checked were not unique, they were deleted from the projected shapefile.
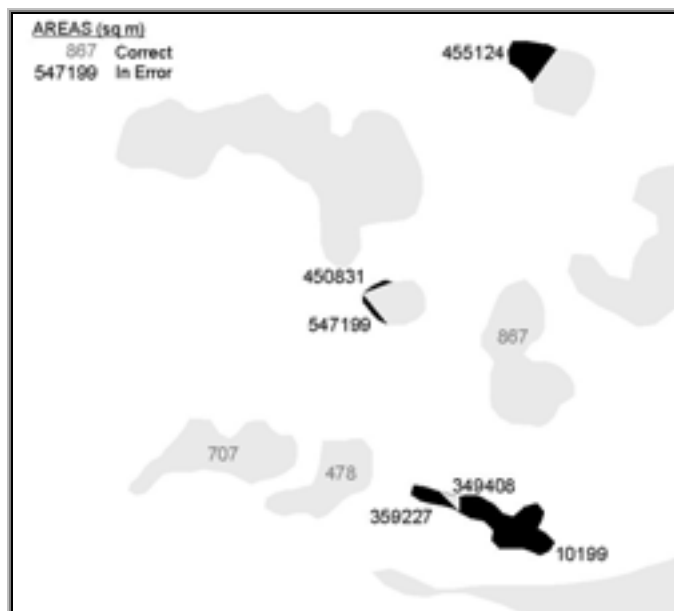
Figure 4. Visual representations of erroneous regions in the original cadastre shapefile. Large areas for erroneous polygons contrast with smaller areas for correct polygons.

Ground audit

Australian Estate Management (AEM) supplied ground audit data in a flat MS Access table (in contrast to the relational database structure identified in the *Ground Audit Module 1 Final Report*). An example of four attributes of the data is shown in Figure 5.

AGSO has joined the data to the cadastral shapefile using *Pin* and *A_Pin* fields. This still needs thorough checking to ensure all data in the ground audit is available via the cadastral shapefile attribute table.

Figure 5. An example of some attributes (Zoning, Lot number, Current land use, Total value of land and improvements) available as a result of joining Ground Audit data to the cadastre
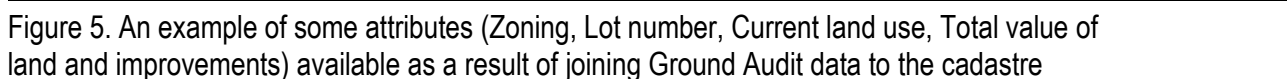
Cocos (Keeling) Islands Land Use Plan and Planning Scheme (June 1992)

This plan was prepared for the Cocos (Keeling) Islands Council by the National Capital Planning Authority (NCPA) and the Commonwealth Department of the Arts, Sport, the Environment and Territories. The example shown in Figure 6 is based on data recently received that still needs attribution and projection adjustment.

Documentation for this dataset is of a high standard and includes attribute descriptions and metadata for each dataset. The coordinate system is UTM Zone 47 (WGS72). The data coverage is primarily for the southern atoll, but some include North Keeling Island. Data accuracy is variable depending on the dataset and location.

Figure 6. An example of land use data from the Land Use Plan and Planning Scheme (June 1992)

Data just received

AGSO has just received further data from LandInfo's Perth office (on behalf of AUSLIG WA, now disbanded). The data are included on the CD in a largely 'as received' form and as yet, we have not examined it in any detail and are unsure of the lineage and purpose.

Other data-related tasks

Although some of the data sets have been reconciled with regard to a coordinate system, some data reconciliation has yet to be completed. For example, the ERIN data, which arrived with no relevant documentation, does not seem to be in an obvious coordinate system (metadata was not supplied with the data). If a coordinate system is not found, the data may need some warping to match other datasets.

Where some duplication occurs between sources, decisions still need to be made with regard to which layers should be used as the primary data (Figure 7). This will be based on the nominal scale, apparent reliability and content of the data.
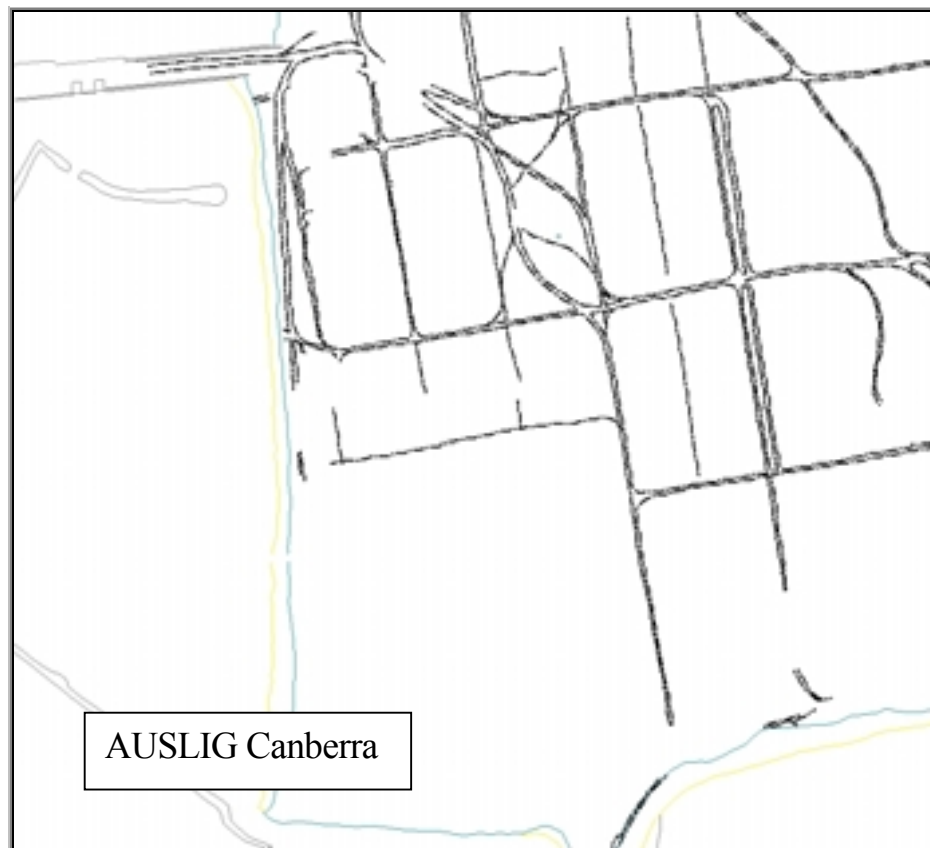
AUSLIG Canberra

Figure 7. A comparison of road and coastline feature representation in different datasets. First is the AUSLIG topographic data, next is the ERIN environmental data and at the bottom is data from the Cocos (Keeling) Islands Land Use Plan and Planning Scheme. Each dataset contains

different representations of many features, and each omits some features and contains some unique features. The AUSLIG data will probably become the primary dataset for the roads as its primary purpose is the representation of these features. However, its omission of some features necessitates the use of other layers. All layers will be available in the system to be provided by AGSO.

References

National Capital Planning Authority and the Commonwealth Department of the Arts, Sport, the Environment and Territories, 1992, Cocos (Keeling) Islands Land Use Plan and Planning Scheme (June 1992). Prepared for the Cocos (Keeling) Islands Council.

National Capital Planning Authority (P. Kendall) and the Commonwealth Department of the Arts, Sport, the Environment and Territories, 1992, Geographic Information System Database Accompanying Documentation for the Cocos (Keeling) Islands Land Use Plan and Planning Scheme (June 1992). Prepared for the Cocos (Keeling) Islands Council.

Australian Estate Management with input from AUSLIG, AVO and AGS, 1996, Indian Ocean Territories Ground Audit Module 1 Final Report. Prepared for the Territories Office, Commonwealth Department of the Environment, Sport, and Territories.

Appendix

Memorandum of Arrangement - Particulars of Services:

" To develop a Geographic Information System (GIS) for Cocos (Keeling) Islands. AGSO's proposals, dated 17 November 1998 and 6 May 1999 for the development of the GIS, form part of this MOA. (Attachment 1)

The Services include the provision of detailed orthophotography and feature datasets based on a two stage approach as follows:

Stage 1.
The creation of a sample of the orthophotography similar to Christmas Island GIS (CIGIS) resolution standards;

The retrieval and integration of available line and point data held by AUSLIG, the WA Department of Land Administration (DOLA), or the Commonwealth Environmental Resource Information Network covering Cocos (Keeling) Islands;

The installation and demonstration of the Stage 1 version of the Cocos (Keeling) Islands GIS (CKIGIS) on the Territories Office GIS PC; and

The provision of sample colour maps, posters and an interim CD backup.

Stage 2.
The creation of the remainder of the orthophotography;

The integration of ground audit data with DOLA cadastral boundaries;

The integration to the extent possible of existing datasets that come to light through the process of carrying out Stage 1;

The documentation of the system to the CIGIS standards;

The publishing of the whole system on CD-ROM and delivery of five copies to the Department; and

The installation and demonstration to the Contact Officer of the GIS at the Department's PC GIS location

The Timetable for the Services is:

Milestone	Due Date
Stage 1 completed	2 months from execution of MOU
Stage 2 completed	3 months after acceptance of Stage 1

Fee

AGSO are entitled to render an invoice, and the Department will pay within 30 days of the date of the invoice, when AGSO:

1.   Achieves Stage 1, an interim payment of the Fee of:
2.   Completion Stage 2 and the remainder of the Services,
        a final payment of the balance of the Fee of: