Cocos (Keeling) Islands
Geographic Information System
System Documentation

Prepared for the
Territories Office, Commonwealth Department of
Transport and Regional Services (DoTRS)

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AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION

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AGSO Catalogue #35120

Disclaimer

The data in this GIS were assembled by the Mineral Resources and Advice Project of the Australian Geological Survey Organisation (AGSO). In compiling the product, AGSO has translated and integrated data as received from many other sources. AGSO has undertaken initial checks as to the accuracy or completeness of these externally supplied datasets and the result of these examinations are reported throughout this documentation manual.

It should be noted that the Cocos GIS datasets may contain information that is not totally accurate or complete. Therefore you should not rely solely on the information in this GIS when making a commercial decision. Please read the accompanying documentation and where further information is required please contact:

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Acknowledgments

Cocos GIS Team

The Mineral Resources and Advice Project of the Australian Geological Survey Organisation would like to acknowledge the support of Mr. Hugh Moore and Mr. Peter Lawler of Territories Office whose efforts made the undertaking of this work possible.

A number of people from AGSO contributed to the Cocos (Keeling) Islands GIS. Dr. William McKay provided management support and advice and reviewed this documentation. Martin Sholtez developed a substantial proportion of the HTML documentation and contributed data edits and documentation for a number of datasets. Neal Evans advised on and checked data and documentation issues. Geoff Lawford contributed quality assurance and quality control checks.

Through this team effort valuable spatial and attribute data, that over time may have become lost, are now readily accessible in one integrated system.

Cocos GIS Data

Data capture was commissioned by Territories Office in a variety of projects over the last thirteen years for all data sets bar one:

LandInfo Canberra generated orthophotography from aerial photography flown by the Australian Survey Office Canberra on 5-Apr-87.

The Australian Land Information Group (AUSLIG) digitised cultural and topographic themes for the Cocos (Keeling) Islands at both Canberra and Western Region offices in the early 1990's on behalf of Territories Office.

The National Capital Planning Authority (NCPA) was commissioned by the Commonwealth Government to carry out a planning study that assembled the *Land Use Plan and Planning Scheme* data dated February 1992.

The Western Australian Department of Lands Administration (DOLA) extracted the cadastre snapshot packaged on this CD-ROM set from the DOLA database on 30-Dec-99. Responsibility for the cadastral information passed from AUSLIG to DOLA in 1992. On-going maintenance of cadastre is undertaken by DOLA under a Memorandum of Arrangement with Territories Office.

AUSLIG, DOLA and the Australian Valuation Office (AVO) jointly developed data underpinning the March 1996 ground audit of Cocos (Keeling) Islands through Australian Estate Management (AEM) as consultants to Territories Office.

Environment Australia is the custodian of the marine environment data referred to as *Environment Australia (1998) Whelans Cocos GIS (1998).* A separate licence agreement applies to this data set (see Appendix 5).

The Cocos (Keeling) Islands

The Cocos (Keeling) Islands are one of Australia's Indian Ocean Territories. They are located in the Indian Ocean 2,950 kms north-west of Perth, 3,700 kms west of Darwin, and 900 kms south west of Christmas Island (96° 52' East' 12° 10' South). There are 27 coral islands in the group, with a total land area of approximately 14km2.

Geography and Climate

Apart from North Keeling Island, which is approximately 30kms from the main group, the islands form a typical horseshoe-shaped atoll surrounded by a coral reef. Each island has rough coral beaches to seaward and sandy beaches or mudflats on the lagoon side. The Islands are low lying and most are thickly covered with coconut palms.

Wildlife consists mainly of seabirds, such as frigatebirds and boobie birds, which are restricted to uninhabited islands, especially North Keeling. Land crabs are common on all islands.

The climate is tropical with high humidity. Temperatures range from 20°C to 30°C. The average rainfall is 2000mm per annum, falling mainly from January to August. The south-east trade winds blow most of the year, producing pleasant weather conditions.

Social Aspects

The population of the Cocos (Keeling) Islands was estimated at 675 persons in November 1998. This represents a slight increase from the figure of 655 persons reported at the 1996 census. The 1998 population comprised 552 persons on Home Island and 123 persons on West Island.

Home Island is the location of the Cocos Malay community. The Cocos Malays have significant social and cultural links to communities in Asia (particularly Sabah) and Western Australia. West Island's population comprises mainland-based public servants and contractors, long term residents and their families.

Copra provided an initial base for the Cocos (Keeling) Islands economy. The public sector is now the largest area of economic activity, although contracting out of activities has provided increased opportunities for the private sector. Tourism is potentially a significant area of economic activity in the Cocos (Keeling) Islands. Local attractions include diving, fishing and wind-surfing.

Chapter 1

Introduction

Background

This documentation accompanies the delivery of the Cocos (Keeling) Islands Geographic Information System (Cocos GIS) to the Department of Transport and Regional Services (Territories Office), on completion of Stage 2 (October 2000). The major tasks and activities associated with the project are as set out in the Memorandum of Arrangement (MoA) with Territories Office dated 10th October 1999 (Appendix 1).

General Features

The Cocos (Keeling) Islands Geographic Information System is a collection of spatial data, viewing and analysis tools dealing with the Cocos (Keeling) Islands. The data include orthophotography, topographic, cultural and environmental features both of the islands and the ocean immediately surrounding them.

Compilation of data and its organisation into a GIS together with documentation was undertaken by the Australian Geological Survey Organisation (AGSO) at the request of the Territories Office, Department of Transport and Regional Services (DoTRS).

The data are presented in both ESRI ArcView and ArcExplorer projects. The ArcView projects require a licensed copy of ArcView. ArcExplorer is a free viewer and is distributed with the Cocos GIS CD-ROM. Data are stored as ESRI shapefiles and therefore readily useable with most modern GIS applications.

Data were received from a variety of custodians and in many cases had no accompanying documentation. Lack of documentation made it increasingly difficult for AGSO with interpretation, translation and documentation of data. AGSO has attempted to include metadata for all datasets to ANZLIC core metadata standards, but the value of this is limited by the poor initial documentation. In addition to limited documentation, many datasets had inconsistent spatial accuracy.

In some cases further work could be done by AGSO to improve the value of the data, but this would be beyond the scope of the current MoA.

Getting Started

CD-ROM # 1 automatically runs a web (HTML) document containing details and tools for getting started with the Cocos (Keeling) Islands GIS. A hard copy of this document is included with this documentation as Appendix 2.

Chapter 2

Thematic Layers and Data

Viewers

The Cocos GIS CD-ROM # 1 contains ESRI's free data viewer ArcExplorer 2.0. This enables viewing of all the vector data and the TIFF versions of the raster data.

If editing or more complex GIS analysis is required, ArcView GIS should be used. AGSO has made every effort to correct errors in the source data. Use in ArcInfo or most other available GIS software packages should be straightforward.

Data Formats

The Cocos GIS uses ESRI shapefiles as its major vector format. This enables editing within ESRI ArcView GIS rather than requiring a more expensive software package. It also allows preservation of 3-D data components. The existence of a 3-D component, which enables easy viewing in a 3-D viewer such as ArcView's 3-D Analyst, was preserved wherever possible to maximise data value. In cases where this may limit shapefile portability to other software packages, the 3-D component can be removed by saving as a 2-D shapefile from ArcView.

The primary format for raster data is uncompressed Tagged Image File Format (TIFF) full colour. A secondary format is Enhanced Compressed Wavelet (ECW) format (a compressed format distributed with ERMapper and viewable in ArcView after the installation of a plugin). This format significantly reduces file size and is quick to view. AGSO has observed some spatial accuracy variability at higher resolutions with some ECW format images.

Source files are in a variety of formats, as received from the data custodian. Source formats include Microstation Design Files (DGN), ESRI Shapefiles, ESRI Coverages, ESRI ArcInfo Export (E00), MapInfo (TAB, MID/MIF) as well as various tabular and database formats.

Projection

The Western Australian Department of Land Administration (DOLA), who are the custodians of the cadastral data, advised that the local grid is Cocos (Keeling) Islands Grid 1992 (CKIG92). The surveyor[1] 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.

[1] Russell Payne, The Christmas Island Surveying Company Pty Ltd (cisurvey@iocomm.com.au).

COCOS (KEELING) ISLAND GRID 1992 (CKIG92)

Projection: Transverse Mercator
Datum: WGS 1984
Spheroid: WGS 1984
False Easting: 50000
False Northing: 1400000
Central Meridian: 96.875
Scale Factor: 1
Units: metres.

If creating ArcView projection files (PRJ), be aware that this can cause problems in loading shapefiles into ArcExplorer 2.

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 a transformation available between CKIG92 and GDA94[2]. Also, AGSO may include some instructions here on using GPS in conjunction with the Cocos GIS.

Projection of source data to CKIG92 was complex due to spatial inaccuracy in some source data, lack of metadata accompanying most source data, and source data with varied nominal scales.

[2] Pers Comm; Linda Morgan, DOLA 26/7/00, Ph 08 9273 7135

Orthophotography

Digital orthophotography has been prepared from aerial photography flown on the 5th April 1987 by the Australian Survey Office Canberra. AGSO commissioned LandInfo Canberra to generate orthophotography from the 1987 aerial photography as a component of this Cocos GIS project that AGSO undertook on behalf of Territories Office.

The orthophotography has a 25cm on-the-ground pixel size. A ‘pixel’ or ‘picture element’ is the smallest component in a digital image — a pixel is an individual square of colour. The quality of the orthophotography is impressive, with acceptable resolution down to 1:400 scale.

Figure 1: An image captured from the Cocos (Keeling) Islands GIS orthophotography at approximately 1:500 scale, showing clarity and resolution of land and underwater features. Of all the datasets in the GIS, the orthophotography (created from aerial photography flown in 1987) is considered to have the highest overall spatial accuracy.

The orthophotography is considered to be the most accurately located dataset overall. This high quality locational accuracy results from the use of surveyed ground control points in conjunction with recognisable features and a 3D model. In addition, the southern atoll is bridged by an intersecting flight line pattern, which also underpins the high positional accuracy. The triangulation report for the survey control is stored in ‘data/orthphto/source/control/aig_ls3.doc’ on the CD-ROM (Microsoft® Word 97 format — a text only version is also stored at that location) and shows there was a good fit of the control from a mathematically rigorously method and pattern. Hardcopy sketches of the survey ground control points are held in archive and are available for inspection.

Orthophotography was generated in Cocos (Keeling) Islands Grid 1992 (CKIG92) by transforming the aerial photography survey control to CKIG92. This involved a projection of the survey control file "aig.ctl" from UTM47S (WGS72) to Transverse Mercator (WGS84) with the following parameters plus an XY shift[3] of 16.86mE and 4.12mN:-

False Easting	50000.000
False Northing	1400000.000
Central Meridian	96° 52' 30"
Central Scale Factor	1.000000

From experience with similarly created orthophotography and subsequent GPS checks, AGSO would expect the Cocos orthophotography over the main atoll to be within a meter of its true position. Exceptions to this high level of accuracy are Horsborough Island and North Keeling Island, which are on unconnected flight lines and did not have reliable ground control available[4]. Initial indications are that the North Keeling orthophotography could be around 35 meters out, and the Horsborough Island orthophotography could be up to 20 meters out.

The original orthophotography consists of 24-bit colour Tagged Image File Format ('.tif') files taking up about 4.7Gb of disk space. To decrease storage, AGSO has supplied orthophotography in two reduced size formats:

1. as 256 colour '.tif' tiles suited to both ArcExplorer and ArcView use, and
2. as full colour Enhanced Compressed Wavelet (ECW) compressed images which can be viewed in ArcView using a plugin[5] provided on the CD-ROMs.

Also supplied are ArcView Image Catalogs, which use a single theme to represent all the orthophotograph '.tif' tiles. An attempt has been made to match the digital orthophotography colour to that of the source aerial photography.

[3] The XY shift is necessary to accord AUSLIG and ERIN data with the DOLA cadastre data, which has been chosen by AGSO as the authoritative vector dataset.

[4] Two datasets covered Horsburgh and North Keeling Islands. AGSO judged the planning data to be more reliable, but the ERIN marine environment data had more resolution. AGSO warped the ERIN data to match the Planning data, and supplied the resultant coastline data to LandInfo to aid in georeferencing the orthophotography.

[5] File 'averm21.exe' in folder '\util\arcview\extensions'.

ORTHOPHOTOGRAPHY DETAILS
Aerial Photography: Australian Survey Office, Canberra Aerial Photography for the Cocos Keeling Islands
Film No: SOC 760 Film Type: colour Photo Scale: 1:10000
Date: 5-4-87 O/Lap: 80% Project Name: COCOS KEELING ISLANDS Run No(s): 1 - 7
Scanning for COCOS GIS: Kevron Aerial Surveys Orthorectification for Cocos GIS: LandInfo (Canberra)

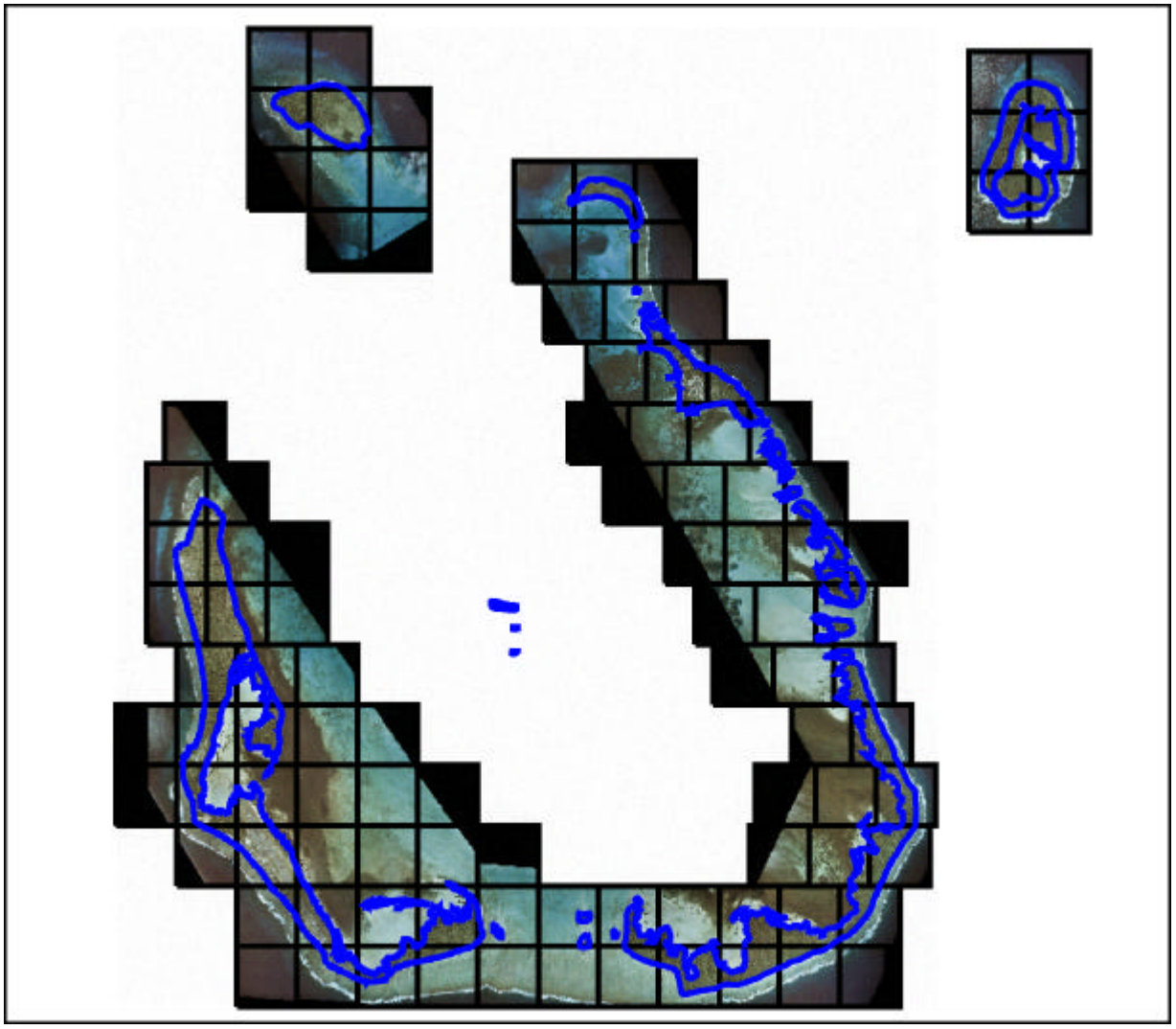


Figure 2: Layout of all 105 1Km X 1Km orthophotography tiles created for the Cocos GIS from the 1987 aerial photographs.

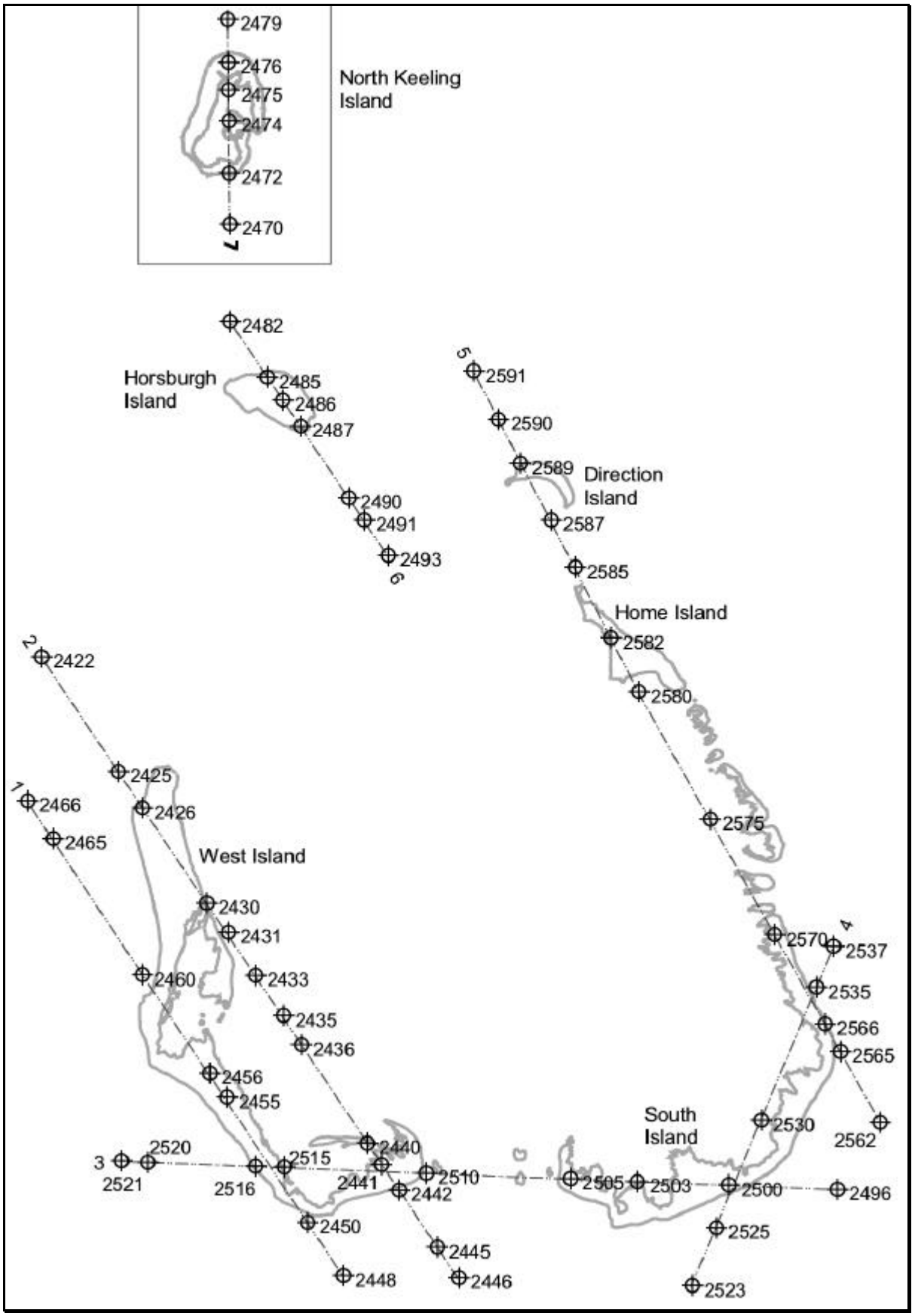


Figure 3: Flight lines and photo centres of the 1987 aerial photographs used for the Cocos GIS orthophotography. Flight lines are numbered at one end of the line.

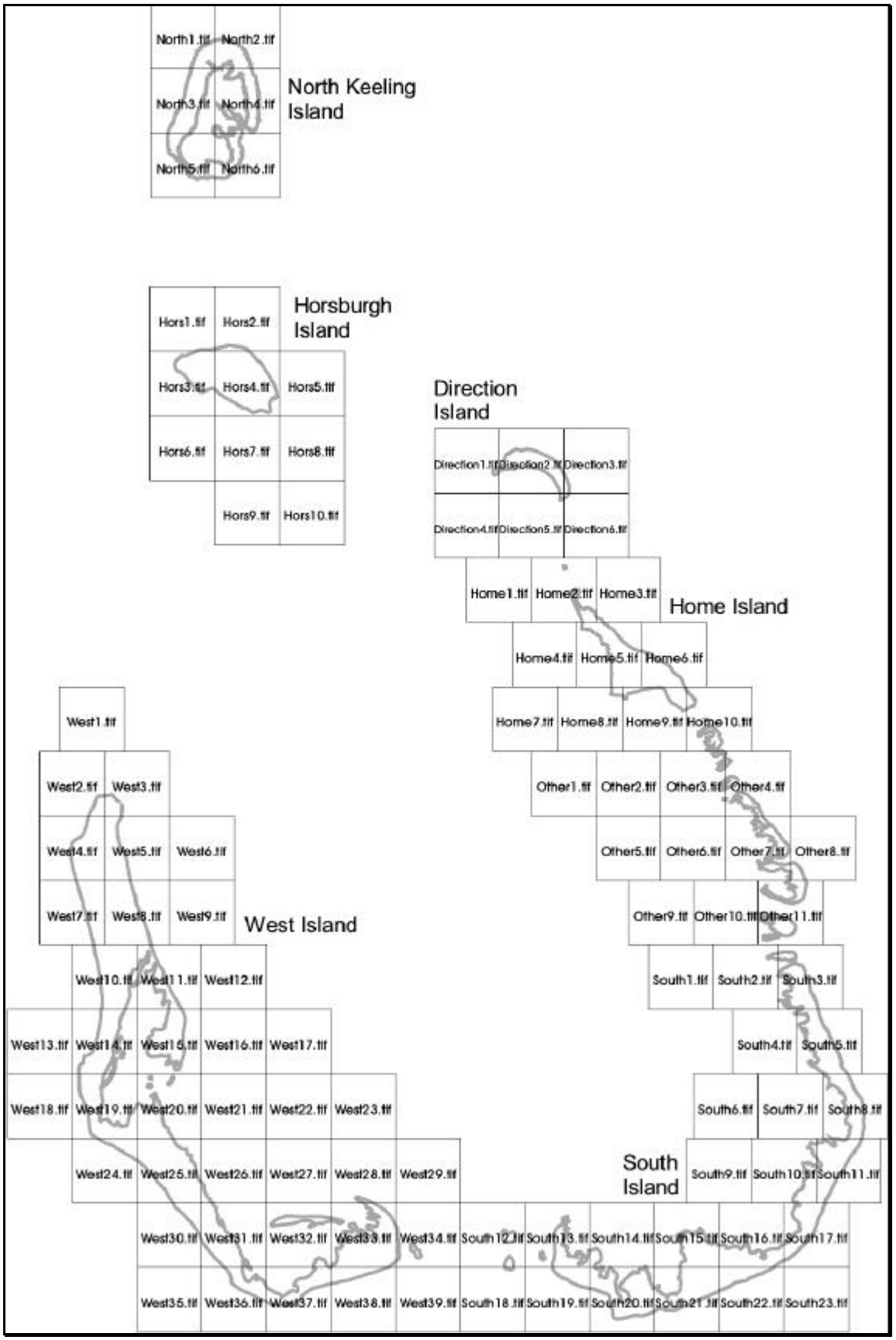


Figure 4: Index of the orthophotography showing the names and extents of each orthophotograph tile. Each '.tif' file is associated with a '.tfw' file which georeferences the image. The index file is stored as a shapefile ('orthindx.shp') for use within ArcView and ArcExplorer projects.

Cadastre and Ground Audit

Cadastre

Cadastre was supplied by DOLA as an ESRI shapefile. On-going maintenance of cadastre is undertaken by DOLA under a Memorandum of Arrangement with Territories Office. The cadastre snapshot packaged on this CD-ROM set was extracted from the DOLA database on 30-Dec-99.

No metadata were supplied with the cadastre. However, AGSO confirmed the coordinate system to be geographic (World Geodetic System 1984). DOLA are confident of the transformation of the original WGS72 data to WGS84 but note earlier co-ordinates are based on a doppler survey and so may not be so accurate[6]. The cadastre is however the most rigorously surveyed vector dataset and so the cadastre was selected by AGSO to be the authoritative vector dataset.

AGSO projected the cadastral dataset to CKIG92 using the ArcView 3.2a projection utility.

The cadastral data cover most of the main group of islands. Horsburgh Island and North Keeling Island were not included in the cadastre.

By observation spatial accuracy is variable (the cadastre is difficult to check, since cadastral boundaries do not usually correspond to natural features). When compared to the orthophotography (which should be spatially accurate for the southern atoll), West Island features match well over the whole island. Home Island matches well for the majority of the island, but with significant offset of features at the northern end of the island. Direction Island matches well.

The cadastre for South Island and the small islands of southeast Cocos appears poorly located. For this area, different groups of islands in similar vicinities have different offsets from the orthophotography, suggesting erroneous positioning of the cadastre rather than a general projection error. For the final cadastre version, AGSO moved some of these individual small islands, and occasionally stretched the features in an X and/or Y direction. The majority of this work was done at a scale of 1:2500. South Island required warping to get a reasonable match to the orthophotography. AGSO used the ArcView Extension ShapeWarp to register and warp this island and small islands surrounding it. Movements of cadastre features for southeast Cocos tend to be up to 20 meters, but can be around 40 meters. The un-altered cadastre is stored in file ‘cadastro.shp’ for comparison.

The original shapefile had some erroneous polygons (43 regions), which had small visible representations and large areas. As these areas did not have attributes and in all cases checked were not unique, they were deleted from the projected shapefile.

The majority of attributes in the final cadastre shapefile are from the Ground Audit data, which were joined to the cadastre using the Pin field.

[6] Pers Comm and e-mail; Linda Morgan, DOLA 21&27/1/00, Ph 08 9273 7135.

Figure 5: Screen capture of cadastral data including some of the ground audit data relating to Lot 223.

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*). This data has been compared to queries of a version of the Ground Audit database supplied with AUSLIG data. It appears to match this data exactly.

Filling of the attributes appears incomplete. Examples of probable missing data are:

- Some fields have no data in them for all records;
- Nearly all fields have some blank entries;
- Only one street name has been entered (“Nelson Mandela”);
- The locality of “Cocos (Keeling) Islands” is only entered for some lots;
- A postcode is only entered for some lots.

AGSO has joined the ground audit data to the cadastral shapefile using the following steps:

- Creating field name aliases in MS Access to fit ArcView's DBASE field definition format limits (eg. ten characters maximum, no spaces)
- Exporting the MS Access table to DBASE V
- Adding the DBASE table to ArcView
- Joining using "Pin" field to the cadastre shapefile's "A_pin" field.

There are 538 records in the MS Access database for the ground audit. The cadastral shapefile contains 469 polygons. For 457 of the 469 cadastre polygons (97%) ground audit records matched on field PIN (see Appendix 2 for a list). The twelve that did not match in are in Appendix 2. Eighty-one of the Ground Audit records were dropped in the join to the cadastre and most of these appear to be duplicate records (see Appendix 2). AGSO could further research these if required.

For the June 2001 general release version, ground audit fields with dollar values have been removed from the cadastre attribute table, and the source data moved to CD-ROM 4, which will not be widely circulated. For the internet map version, fields with small populations and fields with questionable value have also been removed.

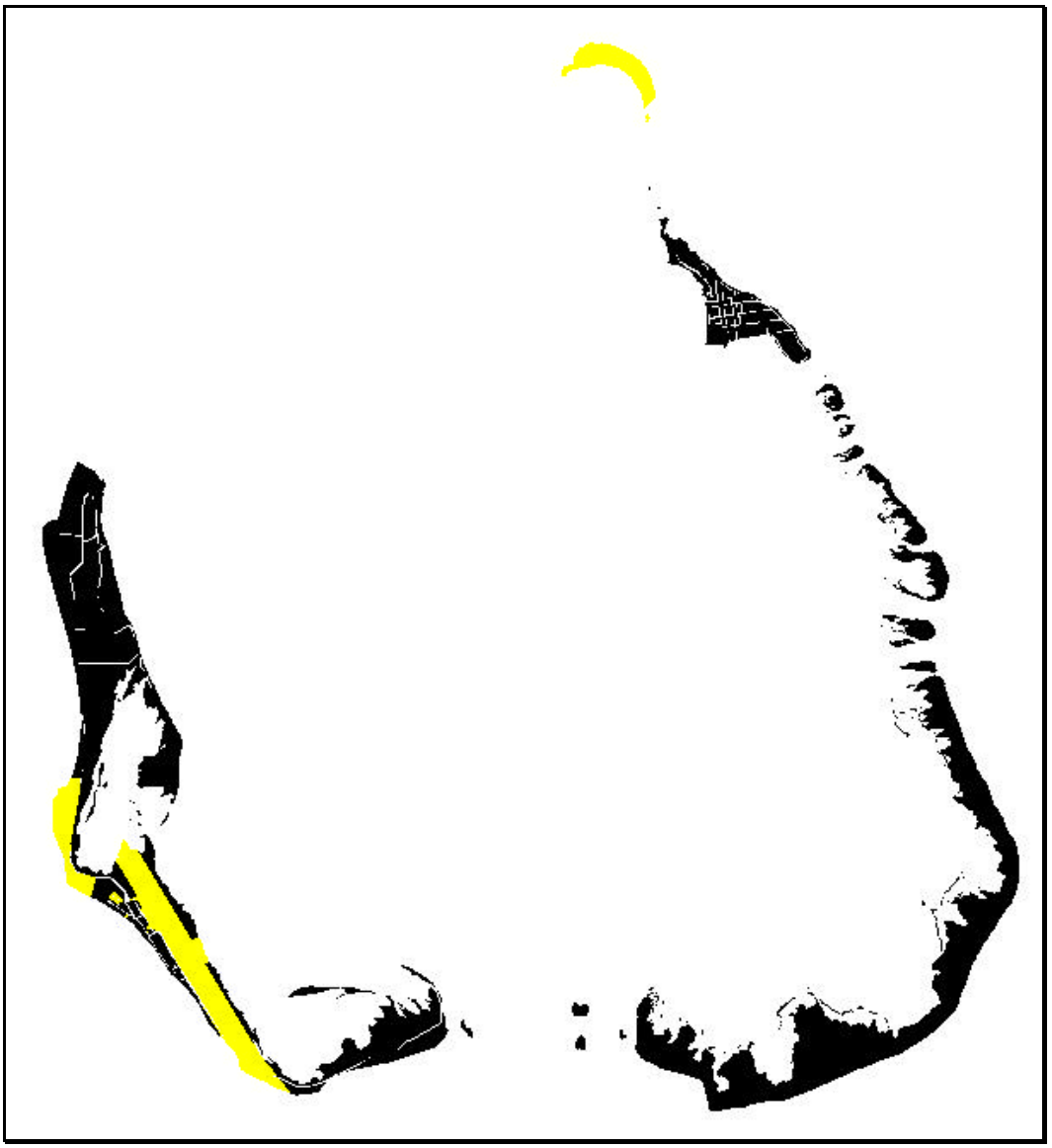


Figure 6: Spatial location of cadastre polygons without Ground Audit data (in yellow).

Table 1: Table field definition modifications as a result of translation from MS Access format to DBASE V format. Use this table to interpret cadastral shapefile field names.

Field Name	*Original Field Name*	*Original Type*	*Orig. Size*	*New Type*	*New Width*	*Decimal*
Pin	PIN	Number (Long)	4	DECIMAL	11	0
Luse_id	LUSE ID	Number (Long)	4	DECIMAL	11	0
Loc_no	Location No	Text	255	CHAR	254	0
Piptlot	PIPTLOT	Text	1	CHAR	1	0
Calc_area	Calculated Area	Text	255	CHAR	254	0
Land_rec	Land Record	Text	255	CHAR	254	0
Lot_no	Lot Number	Text	255	CHAR	254	0
Plan	Plan	Text	255	CHAR	254	0
Diagram	Diagram	Text	255	CHAR	254	0
C_t	C/T	Text	255	CHAR	254	0
Locality	Locality	Text	50	CHAR	50	0
Current_us	Current_Use	Text	255	CHAR	254	0
Category	Category	Text	50	CHAR	50	0
Improvemts	Improvements	Text	255	CHAR	254	0
Desc	Description	Text	255	CHAR	254	0
Luse_cmnt	LUSE Comments	Text	255	CHAR	254	0
Luse_rd	LUse_Reliability_ Date	Date/Time	8	DATE	8	0
Luse_sa	LUse_Source_ Agency	Text	25	CHAR	25	0
Grp_lndval	Group Land Value	Currency	8	DECIMAL	20	5
Grp_impval	Group Improvements Value	Currency	8	DECIMAL	20	5
Grp_totval	Group Total Value	Currency	8	DECIMAL	20	5
Grp_rntval	Group Rental Value	Currency	8	DECIMAL	20	5
Group_id	Group-ID	Number (Integer)	2	DECIMAL	6	0
Land_val	Land Value	Currency	8	DECIMAL	20	5
Impv_val	Improvements Value	Currency	8	DECIMAL	20	5
Total_val	Total value	Currency	8	DECIMAL	20	5
Rent_val	Rental Value	Currency	8	DECIMAL	20	5
Valn_data	Date of Valuation	Date/Time	8	DATE	8	0
Valued_by	Valued By	Text	10	CHAR	10	0
Val_rd	Val Reliability Date	Date/Time	8	DATE	8	0
Val_cmnt	Val Comments	Text	125	CHAR	125	0
Lndvalmthd	Land Valuation Method	Text	1	CHAR	1	0
Impvalmthd	Improvement Valuation Method	Text	1	CHAR	1	0
Lease_no	Lease Number	Text	50	CHAR	50	0
Lease_desc	Lease Description	Text	125	CHAR	125	0
Lease_type	Lease Type	Text	15	CHAR	15	0
Lessor_nm	Lessor Name	Text	50	CHAR	50	0
Lessor_ty	Lessor Type	Text	50	CHAR	50	0
Lessee_nm	Lessee Name	Text	65	CHAR	65	0
Lessee_ty	Lessee Type	Text	50	CHAR	50	0
Lease_area	Lease Area	Text	50	CHAR	50	0
Floor_no	Floor Number	Number (Integer)	2	DECIMAL	6	0
Land_alloc	Land Allocation	Number (Double)	8	DECIMAL	20	5
Start_date	Start Date	Date/Time	8	DATE	8	0
End_date	End Date	Date/Time	8	DATE	8	0
Period	Period	Text	25	CHAR	25	0
Options	Options	Text	50	CHAR	50	0
Pptymgr	Property Manager	Text	65	CHAR	65	0
Pptymgr_ty	Property Manager Type	Text	1	CHAR	1	0
Spptymgr	Sub Property Manager	Text	65	CHAR	65	0
Spptymgrty	Sub Property Manager Type	Text	1	CHAR	1	0
Annualrent	Annual Rent	Currency	8	DECIMAL	20	5
Lease_cmnt	Leases Comments	Text	255	CHAR	254	0
Lease_rd	Leases Reliability Date	Date/Time	8	DATE	8	0

Field Name	Original Field Name	Original Type	Orig Size	New Type	New Width	Decimal
Lease_sa	Leases Source Agency	Text	25	CHAR	25	0
Zone_desc	Zone Description	Text	50	CHAR	50	0
Zone	Zone	Text	255	CHAR	254	0
Asset_code	Asset Code	Text	25	CHAR	25	0
Elec	Elec	Text	255	CHAR	254	0
Sewer	Sewer	Text	255	CHAR	254	0
Water	Water	Text	255	CHAR	254	0
Access	Access	Text	255	CHAR	254	0
Phone	Phone	Text	255	CHAR	254	0
Leg_access	Leg_access	Text	255	CHAR	254	0
Road_name	Road_name	Text	255	CHAR	254	0
Licdto_coa	Council Land Licenced to COA	Text	255	CHAR	254	0
Occby_coop	Occupied By Coop	Text	255	CHAR	254	0
Coop_sa	Co-op Source Agency	Text	25	CHAR	25	0
Coop_rd	Co-op Reliability Date	Date/Time	8	DATE	8	0
Island_nm	Island Name	Text	150	CHAR	150	0
Dev_pot	Development Potential	Text	255	CHAR	254	0
Devpot_id	Devel Pot Identified By	Text	50	CHAR	50	0
Devpotcmnt	Devel Pot Comment	Text	255	CHAR	254	0
Devpotsa	Devel Pot Source Agency	Text	25	CHAR	25	0
Devpotrd	Devel Pot Reliability Date	Date/Time	8	DATE	8	0
Prop_res	Proposed Reserve	Text	255	CHAR	254	0
Propres_cm	Proposed Reserve Comments	Text	50	CHAR	50	0
Propres_sa	Prop Res Source Agency	Text	25	CHAR	25	0
Propres_rd	Prop Res Reliability Date	Date/Time	8	DATE	8	0
Lndonr_nm	Land Owner Name	Text	50	CHAR	50	0
Lndonr_rd	Land Owner Reliability Date	Date/Time	8	DATE	8	0
Lndonr_sa	Land Owner Source Agency	Text	50	CHAR	50	0
Mgr_name	Manager Name	Text	50	CHAR	50	0
Mgr_rd	Manager Reliability Date	Date/Time	8	DATE	8	0
Mgr_sa	Manager Source Agency	Text	50	CHAR	50	0

Topography and Culture

Data representing topography and culture were received from LandInfo Canberra (on behalf of the Australian Surveying and Land Information Group (AUSLIG)) in design file format (DGN). Documentation was not supplied with this data and is apparently not available. Coverage is restricted to Home and West Islands.

It is probable that the nominal scale of this data is 1:1000 as similar data collected by AUSLIG for Christmas Island are of this scale.

Evaluation of the data suggests that the probable source coordinate system is Universal Transverse Mercator (UTM) 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 found that an X-shift (16.86m) and a Y-shift (4.12m) of the AUSLIG data resulted in a match with the cadastre for West Island.

Home Island did not match as well and a further shift of 2.22 metres east matched the centre of the township on Home Island to ± 0.25 metres. The far northern end of Home Island is the worst located with features approximately 5 metres west of the orthophotography. In the wharf area, features are approximately 1.5 metres west of

the orthophotography. The road features in the far east of the island are approximately 2.5 metres east of the orthophotography, and the south-west of the island matches the orthophotography to ± 0.5 metres. Attempts to warp Home Island features to match the orthophotography were not acceptable.

Figure 7: Topography and culture data from LandInfo Canberra (on behalf of AUSLIG). Labels refer to vegetation polygons (extracted and corrected by AGSO). These codes cannot be sensibly decoded by reference to the AUSLIG code sheets; they will probably require someone with local knowledge to add a description.

Data derived from topography

Two coverages have been derived from the AUSLIG topography by AGSO in order to enhance the useability of the data in a GIS. These are a vegetation layer (vegetatn.shp) and a road centrelines layer (roads.shp).

There are a number of features in the original topography data that do not have valid AUSLIG codes. Comparison with the orthophotography indicates that all these codes represent vegetation. AGSO has extracted these codes and created a polygon layer (in ArcInfo) by including common lines as well as those coded as a particular type. The resulting layer is coded according to the erroneous codes in the original data. Because the level of detail is different from the vegetation layers in the planning data, correlation was not conclusive. Re-coding according to actual vegetation types is recommended if this layer is to be used for analysis. The vegetation appears to match the 1987 orthophotography, and would therefore be out of date in some areas due to

the fact that the 1992 planning data documentation reveals that areas have been cleared since the 1987 air photos.

For GIS analysis using a road network, AGSO has created a road centreline layer based on the topographic data. This was accomplished using the ArcInfo 8.0.2 CENTERLINE command and then manually correcting (in ArcEdit) at intersections and elsewhere based on the original dataset and, to a lesser extent, the orthophotography. Converting to ArcInfo format necessitated dropping the third dimension from the data. AGSO did not attempt to digitise road features from the orthophotography where digital data did not exist. Users should be aware that the road centreline coverage is therefore incomplete. It would be useful if future work included the addition of further attributes (especially road names — which none of the available topographic and cultural data include).

Detailed Survey

LandInfo Perth supplied detail survey data on behalf of AUSLIG. No documentation was available for this data except for working notes on the CD-ROM. The spatial component of the data was supplied in design file format (DGN). As Ground Audit databases were also supplied with this data, it is possible that the detail survey was associated with the ground audit, which would date it at around 1996. This dataset is valuable in that it contains features such as services (utilities) that are not available in other datasets.

Coverage is restricted to the populated areas of Home and West Islands for the detailed data, with lower resolution data for general coverage of Home and West Islands.

It was assumed that the data was supplied in the UTM Zone 47 (WGS72) coordinate system. Projection to CKIG92 with the addition of an X-shift of 16.86 metres and a Y-shift of 4.12 metres appears to confirm this. This is the same X-Y shift that was applied to both the Topography & Culture dataset and to the Marine Environment dataset. In contrast to other datasets, a good match of features with the orthophotography at the northern end of Home Island has been achieved (this area matches the cadastre). Inside the detail survey area features generally match the orthophotography locationally to within 0.25 metres. Outside the detail survey area features may be up to 7.5 metres displaced with respect to the orthophotography.

Many building shapes do not match the orthophotography, to the extent that their shapes are not even close to a match. One row of buildings is consistently displaced by approximately three metres. Many features are mislabelled. For example, map tic marks are labelled as drainage pipes. It appears that this dataset is incomplete and has certainly not gone through rigorous quality control. Some housing shapes appear to be from an early conceptual plan rather than a survey of housing at the time of this data's creation. Although there is a lot of potentially useful data in this dataset, the logical consistency of both the spatial and attribute components appears flawed.

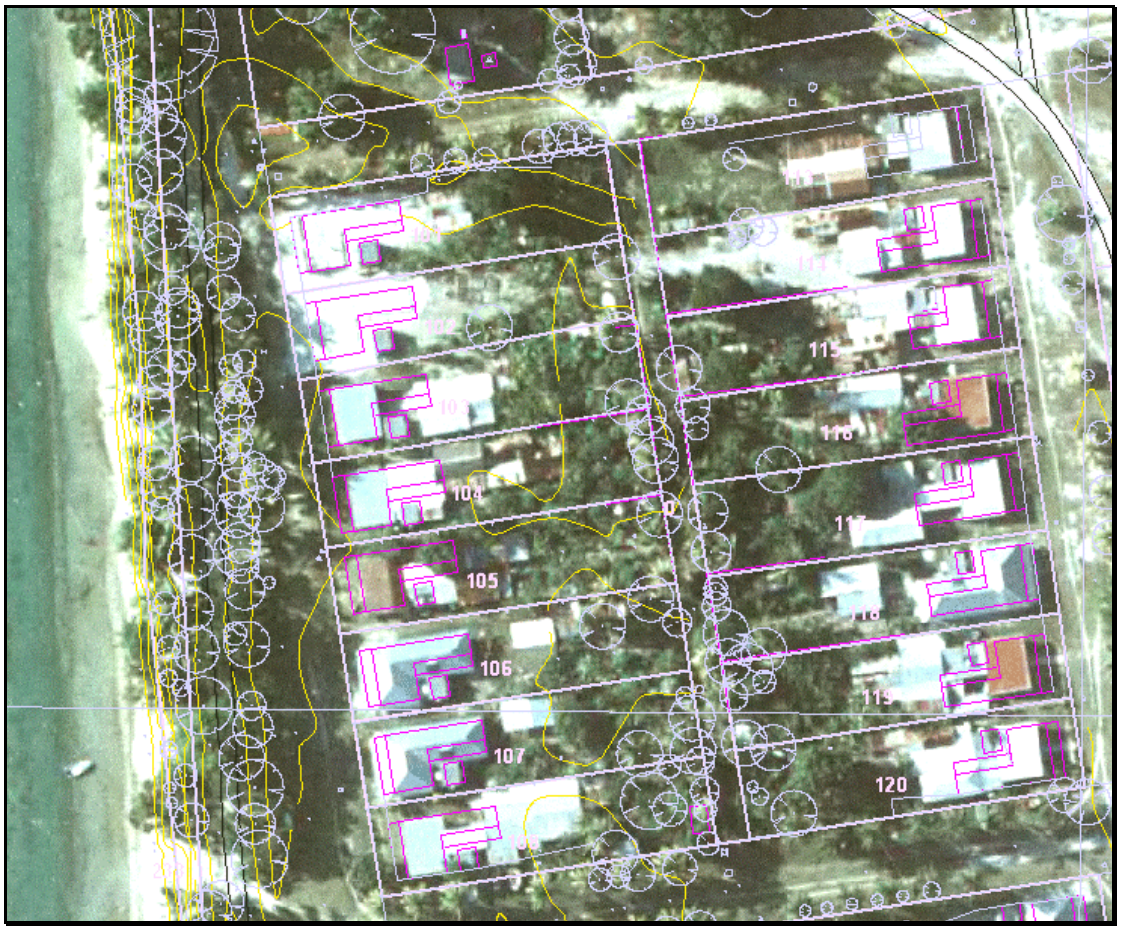


Figure 8: Screen capture of part of Home Island showing poor spatial accuracy for some housing features of the detail survey data. The right hand row of houses has features offset by approximately 2.5 metres compared to the orthophotography. Many of the houses also have very different shapes in the data when compared to the orthophotography. It seems probable that these features are not surveyed but retrieved from an earlier, perhaps conceptual, plan.

Marine Environment

Marine environment data were obtained from the Environmental Resources Information Network (ERIN). ERIN refers to this dataset as *Environment Australia (1998) Whelans Cocos GIS (1998).* This includes coastlines, bathometric contours, coral outcrops and other features.

These data are not supplied on CD-ROM 1 of the 2001 release Cocos (Keeling) Islands GIS. They require a separate license and are consequently packaged on CD-ROM 4.

The data were supplied as ArcInfo export files, but relevant documentation was not available. Documentation provided by ERIN with the data actually referred to a different dataset, namely the Cocos (Keeling) Islands Land Use Plan of 1992.

Evaluation of the marine environment data established a match with the cadastre on West Island using a projection from UTM Zone 47 (WGS72) to CKIG92 plus an x-shift of 16.86 metres and a Y-shift of 4.12 metres. This is the same X-Y shift that was applied to both the Topography & Culture dataset and to the Detailed Survey dataset.

However all other islands are significantly mis-located. Attempts to warp these features or to derive a coordinate transformation were not successful. The actual marine zone features appear to be of a relatively low resolution anyway, defining approximate rather than exact boundaries. Interestingly they seem to match the spot image.

CAUTION

It is recommended that the use of the Marine Environment data be restricted to broad-scale applications and that caution be exercised (especially away from West Island) due to poor spatial accuracy.

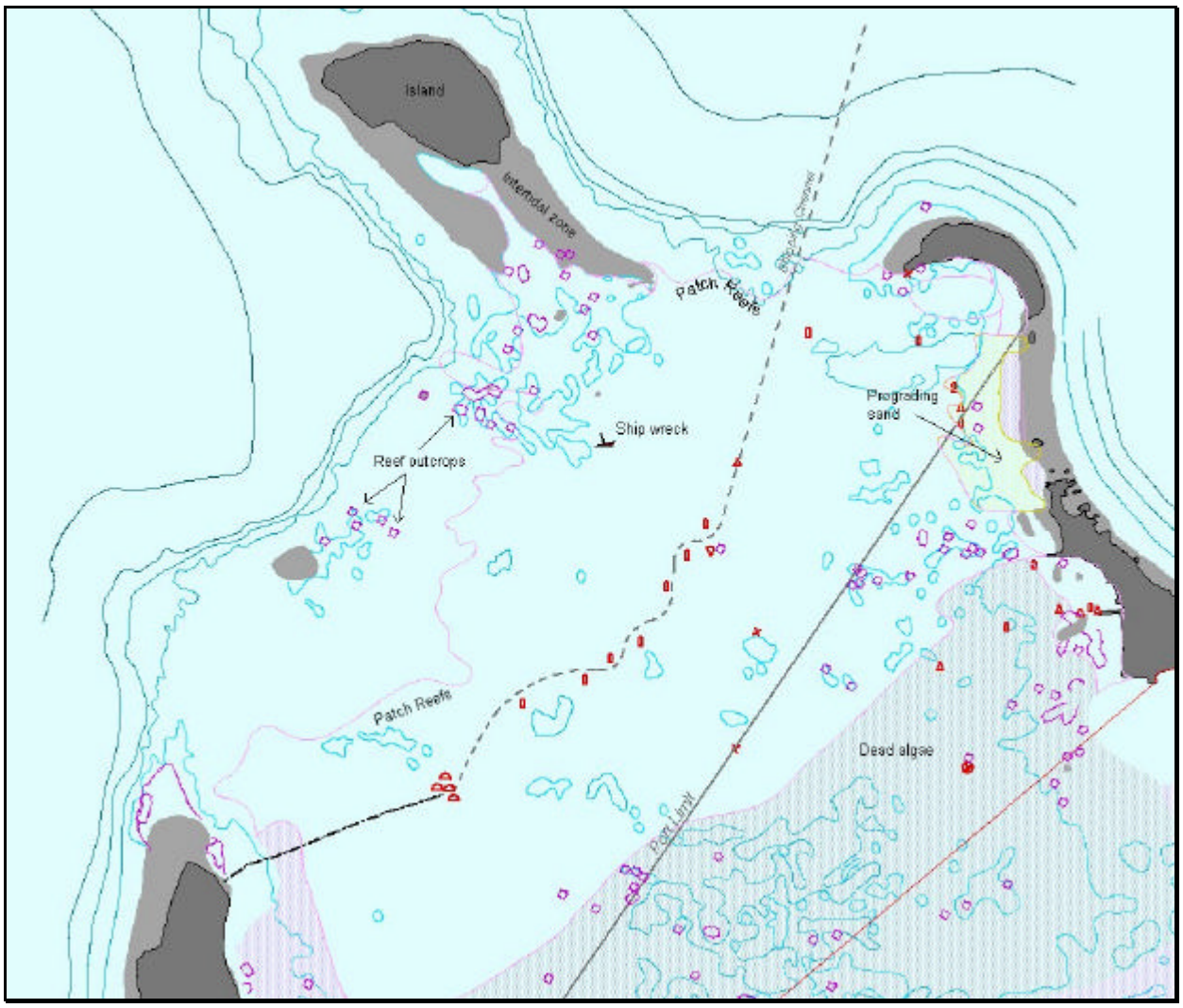


Figure 9: Data from ERIN include marine environmental data, some marine infrastructure and management zones.

Planning

The Cocos (Keeling) Islands Land Use Plan and Planning Scheme (June 1992) was prepared for the Cocos (Keeling) Islands Council by the National Capital Planning Authority (NCPA) and the Commonwealth Department of Arts, Sport, Environment and Territories (ref). As part of the planning study, a geographic information system

(GIS) database was established in order to prepare base and thematic maps and to enable the production of high quality figures to illustrate the planning report and to present the plans for public consultation.

The GIS data was stored by NCPA as ESRI coverages and includes planning-related cultural and environmental layers. The data coverage is primarily for the southern atoll, but some include North Keeling Island.

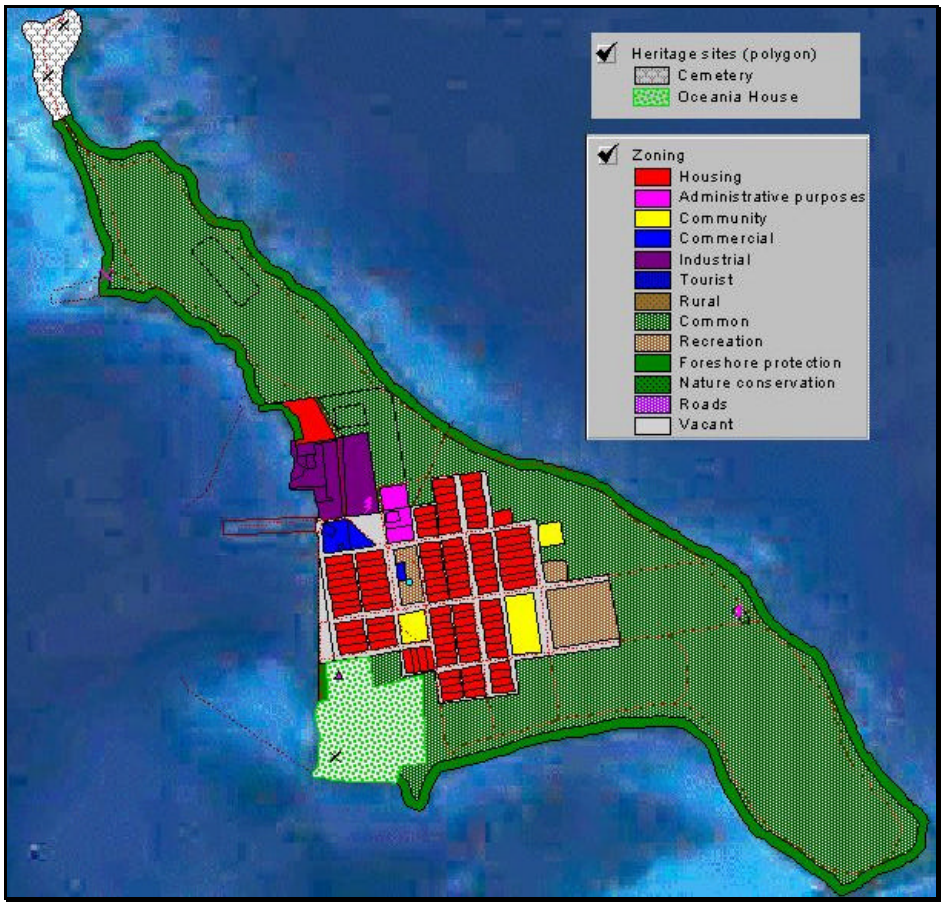


Figure 10: Data from NCPA include the 1992 Planning Scheme, together with over twenty supporting layers — all documented to a high standard.

The source coordinate system is UTM Zone 47 (WGS72). AGSO has projected the features to CKIG92. Data accuracy is variable depending on the dataset and location.

Documentation for this dataset is of a high standard (hard copy only was supplied) and includes attribute descriptions and metadata for each dataset. (Appendix 1 is a digital version created by AGSO of the original 1992 GIS data documentation).

Although this data is often broad scale in nature, it has a large range of useful layers. Some of the NCPA marine data boundaries are more detailed than those received from Environment Australia.

The original digital data includes numeric feature codes whose descriptions were stored in the hard-copy documentation and for some in ArcInfo look-up tables. In

some cases the look-up tables' code definitions were different from the hard copy. AGSO has added fields to the shapefile attribute tables to contain these feature codes and descriptions.

Water Resources

Figure 11: Water resources data supplied by ECOWISE Environmental Ltd includes freshwater lens extents, galleries and other water resources infrastructure.

ECOWISE Environmental prepared water resources data for the Cocos (Keeling) Islands. They were delivered in April 2001 in association with a report prepared for Cocos (Keeling) Islands Administration, Department of Transport and Regional Services and AGSO. Data was collected for incorporation into the Cocos GIS and subsequent distribution to stakeholders and other authorised users. ECOWISE Environmental supplied the data ready to use in the CKIG92 projection.

AGSO has now incorporated the layers into the Cocos (Keeling) Islands GIS and will prepare ANZLIC compliant metadata. Good non-compliant metadata was supplied with the data and is in the ECOWISE report at 'data/waterres/source/document/Report.doc' and Appendix 7 of this report.

These data supersede the water resources layers in the planning dataset.

National Estate

Figure 12: Data from the Register of the National Estate includes point and polygon representations of registered significant sites (historic and natural).

The Australian Heritage Commission, Environment Australia, supplied data of sites on the Register of the National Estate in May 2001. The data were supplied as a polygon shapefile and a point shapefile. The data cover the whole island group, including North Keeling Island. This was supplied in the geographic coordinate system (WGS84). No other metadata was supplied with the data. However the Australian Heritage Commission (AHC) have a website (http://www.environment.gov.au/heritage/register/index.html) which contains detailed descriptions of each heritage site and, in most cases, a photograph of the site.

After projection, the majority of polygon boundaries closely match the cadastral boundaries. If they are derivatives, they may have similar positional accuracy. The points, however, have very variable accuracy. Some seem to be based on centroids of cadastral polygons, but many appear to represent the general vicinity of a site.

This dataset includes a number of points and areas which do not appear in the 1992 planning data. The planning data includes a number of points “of heritage interest” which do not appear in this dataset, including Direction Island’s cable station ruins,

the wrecks of the *Phaeton* and the *RCL*, West Island's cemetery and the Twiss Memorial.

Other Data

There are a number of other datasets and digital products supplied on the Cocos GIS CD-ROMs.

The 'graphics' directory contains a spot-derived image covering the entire Cocos (Keeling) Islands in JPG format. Because the original image was very large and had a substantial proportion of featureless ocean, a 256 colour clipped image covering just the southern atoll has been supplied ('data/misc/sthaspot.tif'). It is recommended that this clipped image be used in the GIS as a backdrop only - the positional accuracy is not sufficient for full GIS use. This is a scan of a DoTRS poster, with the scanned image pixel size representing about 5 metres on the ground. Poster printing, scanning and JPEG resampling have degraded colour information. It is not recommended for scales closer than 1:50,000. This image does however give some indication of marine features in the central lagoon beyond the extent of the orthophotography.

The 'data/misc/property' directory (on CD-ROM 4) contains spreadsheets with property information. AGSO has converted these Microsoft® Excel format spreadsheets to Dbase V tables for use in ArcView. This involved changing some field names to comply with Dbase limitations. The DBF tables can be added to ArcView as tables, and where a Pin or Loc/Lot No exists in the table, can be joined or linked (for 1 to many relationships) to the cadastre attribute table.

The 'data/misc/oceansub' directory contains data relating to an Expression of Interest and subdivision proposal for the Oceania House lot on Home Island. This is an example of use of the Cocos GIS prior to its completion. Of most interest in this directory is a CAD (DXF) file of the subdivision. This file is supplied in 'data/misc/oceansub/Lot14.dxf'. It is not geographically located so cannot be overlayed on Cocos GIS layers. AGSO could easily do the geolocation as part of future work, but future DOLA cadastre updates should reflect the new subdivision. The data can be viewed in ArcView if the Cad Reader extension is enabled.

In the 'graphics' directory are digital copies of several maps and posters. The maps are stored as postscript (EPS) and Adobe® Acrobat (PDF) files. The poster is stored as a JPEG image file.

Chapter 3

Further Work

AGSO has identified areas where improvement could be made in several datasets. These could be addressed in future work if required.

Annotation Capture

Some datasets have annotation that is yet to be captured as attributes. The capture of annotation as attributes is useful for full GIS functionality. An important example is the contour labels in the detail survey, which are the only height information stored in that dataset. A height attribute for this data would vastly improve the value of the data. A particular example is the wreck of the Emden, which is identified only as a shipwreck in the attributes but as the Emden in annotation.

Cadastre Updates

The digital cadastre will need regular updates to maintain currency. DOLA has indicated that a revision of the cadastral layer will be available late in 2000. This should be incorporated into the system. In addition further entries and updates could be made in the ground audit table.

Geographic Names and Road Names

Probably the most authoritative feature layers (the cadastre and the topography/culture data) do not have geographic names as attributes or annotation. The planning scheme data does have some named features (eg. island names in English and in Malay) and these could be transferred as attributes to more detailed feature layers if this is appropriate. Most road names are missing from all datasets that are currently in the Cocos GIS.

Other Data Improvements

A number of other limitations and weaknesses in the current datasets could be addressed in future. Some important potential improvements are:

- joining of the contour lines where broken (ideally completion of the contour coverage of the islands);
- improved spatial accuracy of orthophotography over North Keeling Island and Horsburgh Island (this would require authoritative coastline and/or recognisable survey marks);
- checking and correction of erroneous attribution in detail survey data;
- update of metadata to ANZLIC version 2, and storage as XML files;
- proper coding of vegetation layer and resurveying if and where necessary; and
- surveying of authoritative coastlines (especially south of Home Island and east of West Island, North Keeling Island and Horsburgh Island), remaining aware that the coastline in detail is variable over time.

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.

Department of The Arts, Sport, The Environment, Tourism and Territories 1991, TERR BCH – COCOS (K) ISLANDS DEVELOPMENT PLAN – MAPPING. Unclassified file no. 91/06398

Department of Land Administration (DOLA), 1992, Christmas Island & Cocos (Keeling) Islands Land Tenure System Project Planning & Detailed Costing Report

Bureau of Transport Economics 1998, Cocos (Keeling) Islands Regional Analysis Report prepared for the Indian Ocean Territories Review

ECOWISE Environmental Ltd, 2001, Report on Water Resources Component, Cocos (Keeling) Islands GIS, by Tanya Whiteway and Tony Falkland, prepared for Cocos Island Administration, Department of Transport and Regional Services & the Australian Geological Survey Organisation April 2001

AGSO Catalog details for the Cocos GIS (#35120):

Cat # : 35120 Flags **Product :** Y **Publication :** N **Dataset :** N **Resource :** N **WWW :** N
Title : Cocos (Keeling) Islands GIS
Medium : **Scale :** **Contact :** Keith Porritt
Type : One-Off Product **Sub Type :** No Subtype Available **Project Id :**
Pub'n Source : **Pub'n Year :** 2000 **Vol / Part :** **ISBN :**
Abstract : The Cocos (Keeling) Islands Geographic Information System (Cocos GIS) is a collection of spatial data, viewing and analysis tools dealing with the Cocos (Keeling) Islands. The data include orthophotography, topographic, cultural and environmental features both of the islands and the ocean immediately surrounding them.
---------- Bounding Rectangle ----------
N Latitude : -11.8 **S Latitude :** -12.25 **W Longitude :** 96.8 **E Longitude :** 96.95
Comments :
Data projection is Cocos (Keeling) Islands Grid 1992. Data scale is variable, due to the data being collated from various sources.
---------- List of Authors ----------
Name :

1 Lucas, A.P.
2 Porritt, K.R.

Theme :
GIS
culture
information management
topography

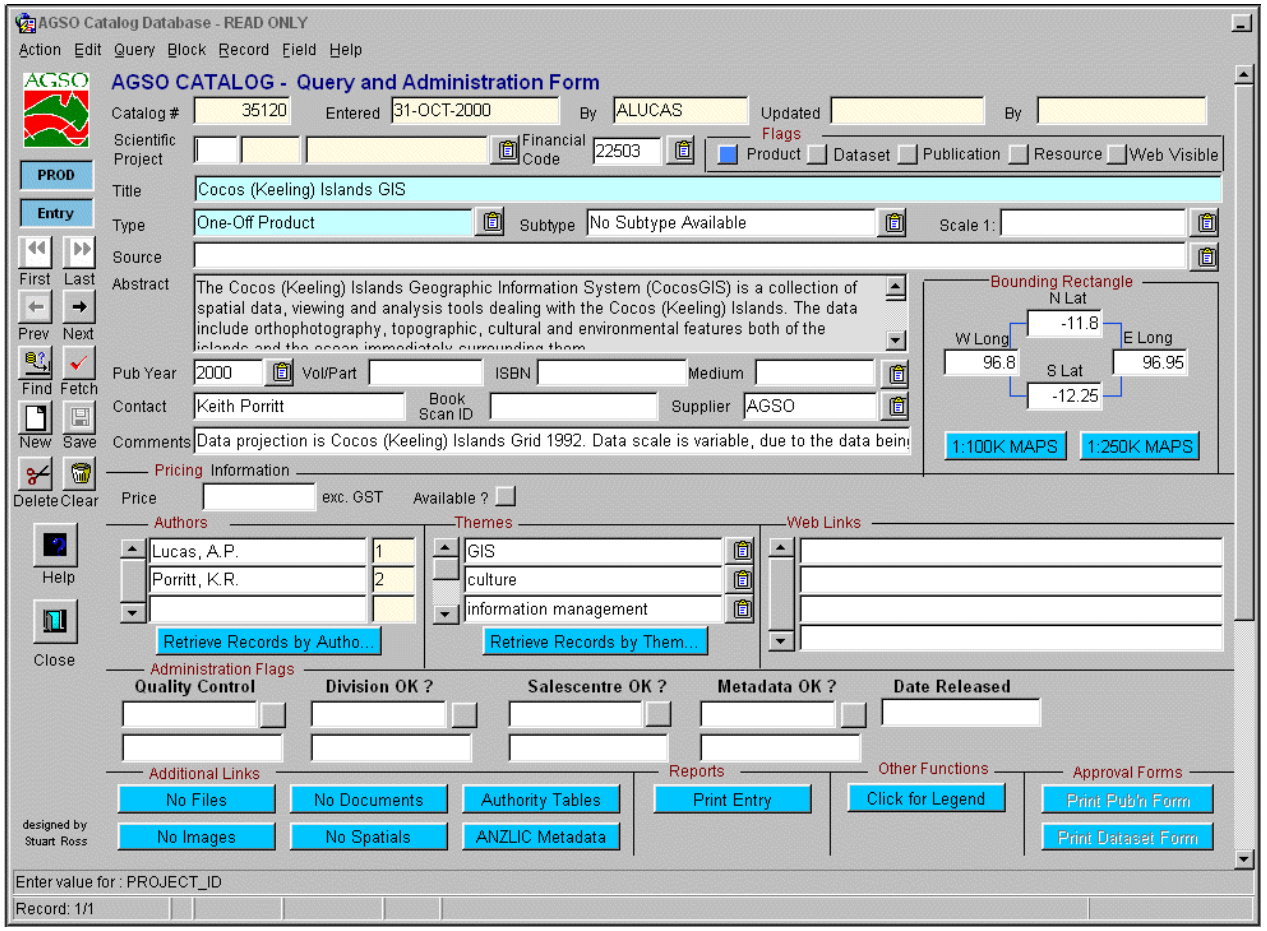


Figure 13: Cocos GIS AGSO Catalog entry (#35120).-

Chapter 4

Appendix 1: Metadata

Hard copy versions of the electronic metadata sheets. These metadata sheets comply with ANZLIC core metadata standards.

Cocos (Keeling) Islands GIS
Metadata

Important! In attempting to supply metadata according to the ANZLIC Core Metadata Elements, many elements are filled according to AGSO's understanding. Metadata was not available for a large number of datasets, or was informal and incomplete.

Imagery

- Orthophotography
- Spot Imagery

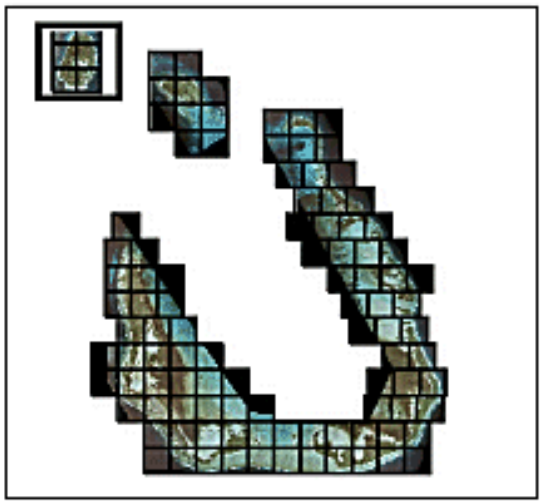
Vector Data

- Cadastre
- Topography/Culture
- Detailed Survey
- Planning
- Flight Lines and Photograph Centers
- Road Centerlines
- Vegetation
- Marine Environment

Cocos (Keeling) Islands GIS
Orthophotography

Orthophotography

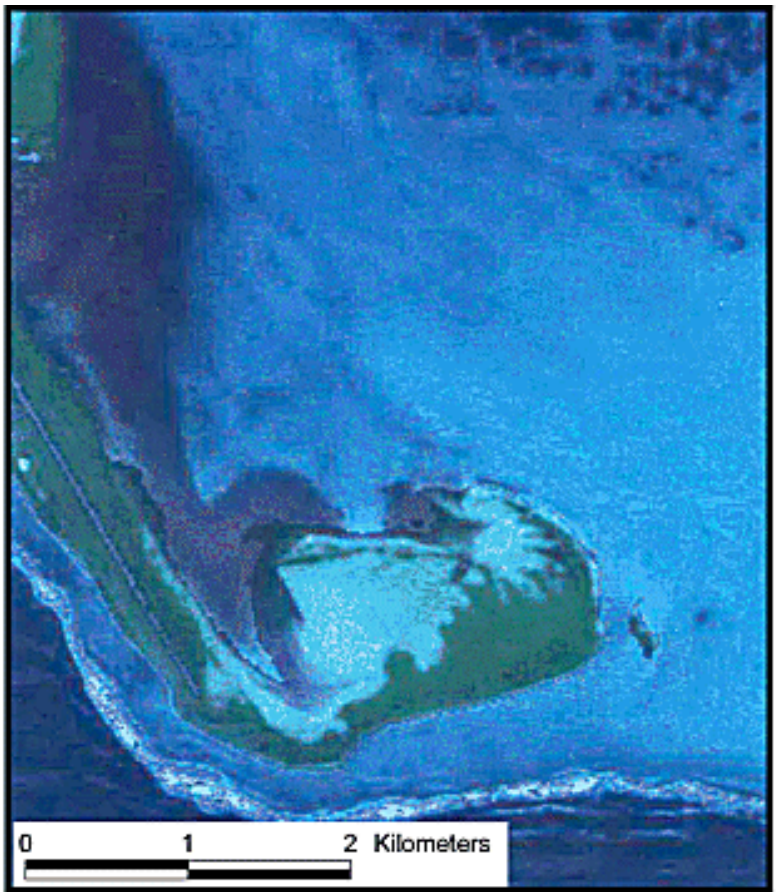
Orthophotography covers all Cocos Islands.
The sample (left) shows the vicinity of the jetty on Home Island



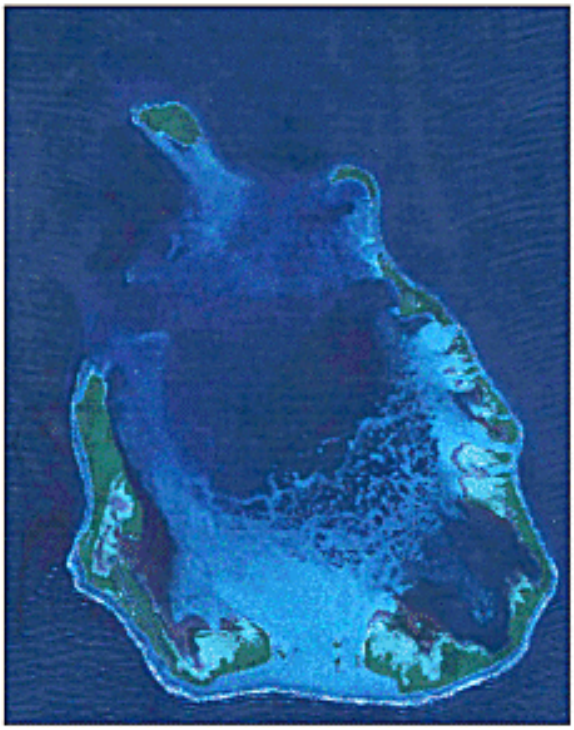
Dataset	
Title	Orthophotography
Custodian	Australian Geological Survey Organisation (AGSO)
Jurisdiction	Australia
Description	
Abstract	Orthophotography of the Cocos (Keeling) Islands, based upon aerial photography taken taken over the islands in 1987 (islands only, not including the lagoon) . Projection used was ckig92.
Search Word(s)	PHOTOGRAPHY AND IMAGERY Aerial PHOTOGRAPHY AND IMAGERY Orthophotography
Geographic Extent Name(s)	Cocos (Keeling) Islands
Data Currency	
Beginning Date	05APR1987
Ending Date	05APR1987
Dataset Status	
Progress	Complete

Maintenance and Update Frequency	as required
Access	
Stored Data Format	DIGITAL - ERMapper ERS & TIFF/TFW
Available Format Type	DIGITAL - ERMapper ERS & TIFF/TFW
Access Constraint	See contact details below.
Data Quality	
Lineage	Aerial photography was flown by Australian Survey Office Canberra in 1987, scanning was done by Kevron Aerial Surveys and orthorectification by LandInfo (Canberra) in 2000.
Positional Accuracy	AGSO expects the Cocos orthophotography over the main atoll to be within a meter of its true position. Exceptions to this high level of accuracy are Horsborough Island and North Keeling Island, which are on unconnected flight lines and did not have reliable ground control available. Initial indications are that the North Keeling orthophotography could be around 35 meters out, and the Horsborough Island orthophotography could be up to 20 meters out.
Attribute Accuracy	not applicable
Logical Consistency	not applicable
Completeness	Appears complete for all areas. Georeferencing of Horsburgh and North Keeling Islands has not proven to be very accurate.
Contact Information	
Contact Organisation	Department of Transport and Regional Services (DoTRS)
Contact Position	Assistant Director Policy, Non self governing Territories
Mail Address	GPO Box 594, Canberra, A.C.T 2601
Locality	111 Alinga St, Canberra
State	A.C.T
Country	Australia
Postcode	2601
Telephone	(02) 6274 8023
Facsimile	(02) 6274 8065
Electronic Mail Address	peter.lawler@dotrs.gov.au
Metadata Date	24-07-2000
Additional Metadata	
Projection	Cocos (Keeling) Islands Grid 1992 (CKIG92)

Cocos (Keeling) Islands GIS
Spot Satellite Image



Spot Imagery

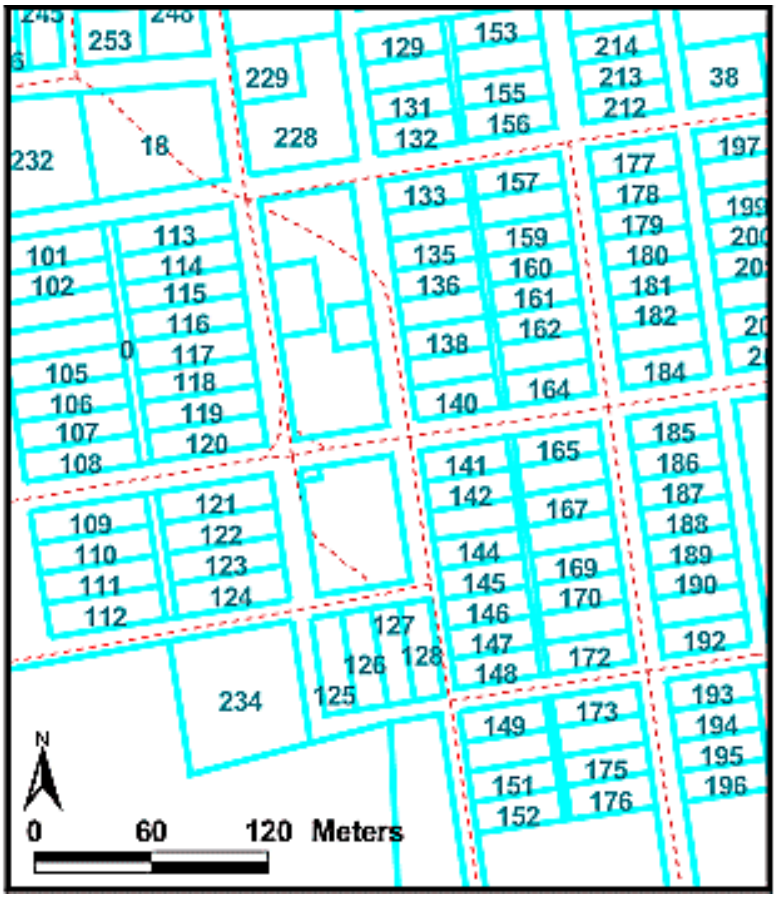


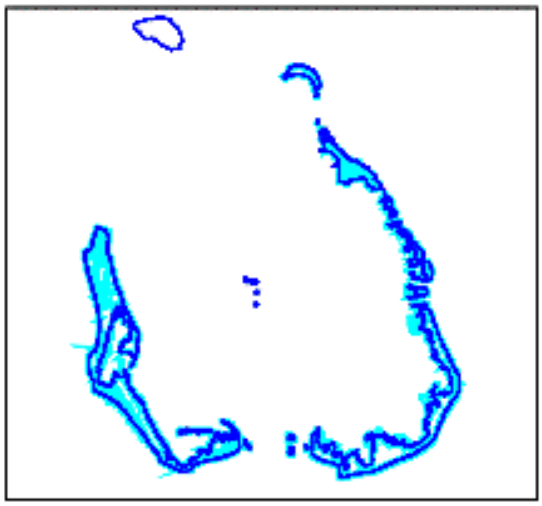
Dataset	
Title	Spot Image
Custodian	Australian Geological Survey Organisation (AGSO)
Jurisdiction	Australia
Description	
Abstract	A multi spectral spot image was used in a poster that was published by AUSLIG in 1992. This image (not the poster) was then scanned by AGSO on September 4th, 2000. Both TIFF and JPG files exist. This image was created to be used in areas (eg. center of southern atoll) where there was no orthophotography coverage. This TIFF image is best used at a scale no less than 1:50000, zooming in past this results in a pixelated image and a loss of definition.
Search Word(s)	PHOTOGRAPHY AND IMAGERY Multi Spectral PHOTOGRAPHY AND IMAGERY Spot
Geographic Extent Name(s)	Cocos (Keeling) Islands
Data Currency	
Beginning Date	01APR1987

Ending Date	01APR1987
Dataset Status	
Progress	Complete
Maintenance and Update Frequency	not planned
Access	
Stored Data Format	DIGITAL - TIFF/TFW & JPG NON DIGITAL - Hardcopy poster
Available Format Type	DIGITAL - TIFF/TFW & JPG
Access Constraint	See contact details below.
Data Quality	
Lineage	Spot satellite imagery was originally aquired in April 1987. This was then made into a poster and publised by ANZLIC in 1992. Since then the image has been scanned by AGSO (September 2000) using a high resolution drum scanner. The image is in TIFF format and has been geolocated and a TWF file created.
Positional Accuracy	The TFW file was created by matching the TIFF image against the vector line work of the southern atoll. Because of the loss of definition as you zoom in on the image, the lines cannot be matched very precisely. This results in positional accuracy around 40m of reference lines.
Attribute Accuracy	not applicable
Logical Consistency	not applicable
Completeness	Both the scan of the Spot image and the geolocation is complete and no changes or amendments are planned.
Contact Information	
Contact Organisation	Department of Transport and Regional Services (DoTRS)
Contact Position	Assistant Director Policy, Non self governing Territories
Mail Address	GPO Box 594, Canberra, A.C.T 2601
Locality	111 Alinga St, Canberra
State	A.C.T
Country	Australia
Postcode	2601
Telephone	(02) 6274 8023
Facsimile	(02) 6274 8065
Electronic Mail Address	peter.lawler@dotrs.gov.au
Metadata Date	24-07-2000
Additional Metadata	

Projection	Cocos (Keeling) Islands Grid 1992 (CKIG92)

Cocos (Keeling) Islands GIS
Cadastre



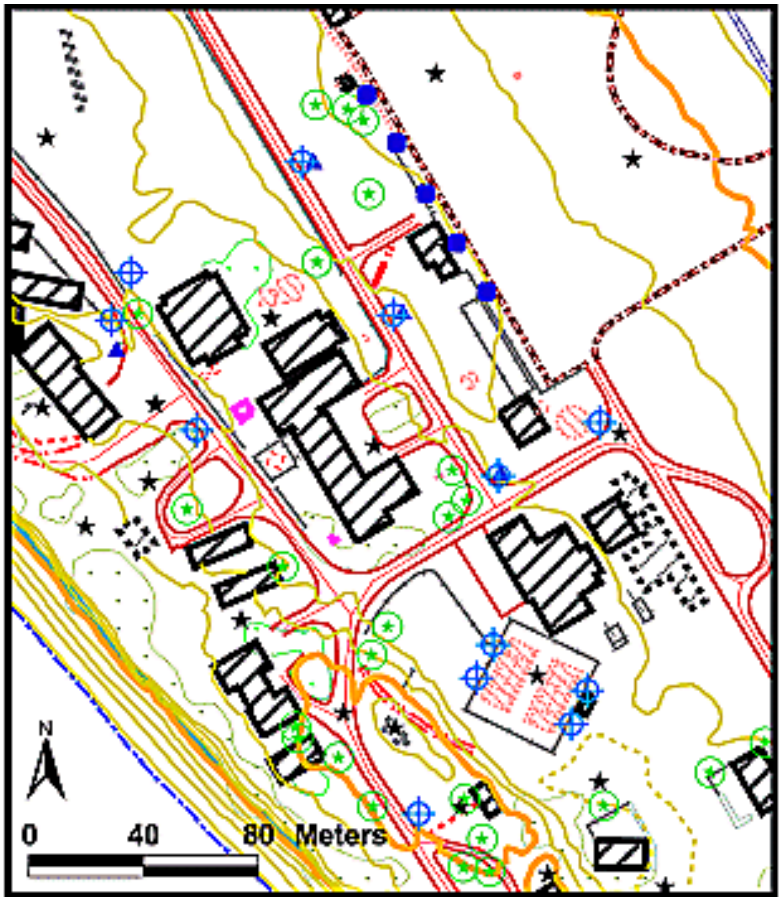


Dataset	
Title	Cadastre
Custodian	Department of Land Administration (DOLA)
Jurisdiction	Western Australia
Description	
Abstract	This dataset contains polygon cadastral data and non-spatial attribute data for the Cocos (Keeling) Islands. Horsburgh Island and North Keeling Atoll are not included in this dataset.
Search Word(s)	LAND Cadastre LAND Ownership
Geographic Extent Name(s)	Cocos (Keeling) Islands
Data Currency	
Beginning Date	not known
Ending Date	30DEC1999
Dataset Status	
Progress	Complete

Maintenance and Update Frequency	not known
Access	
Stored Data Format	DIGITAL - ESRI Shapefile
Available Format Type	DIGITAL - ESRI Shapefile
Access Constraint	See contact details below.
Data Quality	
Lineage	Territories Office contract DOLA to maintain this data under a 'Service Delivery Arrangement'. Prior to 1992 AUSLIG maintained the data on behalf of Territories Office. February 2000: AGSO projected the data from Geographic (WGS84) to Cocos (Keeling) Islands Grid 1992 using ArcView 3.2a projection utility. Deleted erroneous polygons (large area, small visible extent) from shapefile after checking that they were spatially non-unique and contained no attributes. AGSO also joined Cocos ground audit data aquired as a DBF to the cadastre table. August 2000: AGSO moved all small islands between Home Island and South Island to match the orthophotography. This was done by manually editing the shapefile in ArcView 3.2 (XY-shift and/or Stretch). Islands which formed logical groups were moved/stretched as a group in order to minimise modification of the original data. August 2000: AGSO warped South Island and all nearby small islands to visually match the orthophotography (translation/rotation/stretching was not adequate). This was done using the ShapeWarp 2.2 ArcView Extension and a third-order polynomial fit on 28 Ground Control Points which resulted in an RMS Error of 4.58057.
Positional Accuracy	Absolute positional accuracy is not known. Because this is understood to be the islands' authoritative cadastre, the cadastre has been used as the reference dataset. Comparison with the Orthophotography and other datasets indicate that for islands other than the main islands, accuracy may not be as high as hoped. For South Island, prior to AGSO's warping it to match the orthophotography, mismatches with the orthophotography were up to approximately 45 metres. Following warping, mismatches are up to approximately 5 metres.
Attribute Accuracy	not known (The field *A_Pin* was assumed equivalent to the *Pin* field in the Ground Audit data and the tables were joined. For a discussion of AGSO's evaluation of Ground Audit attribute accuracy see the System Documentation).

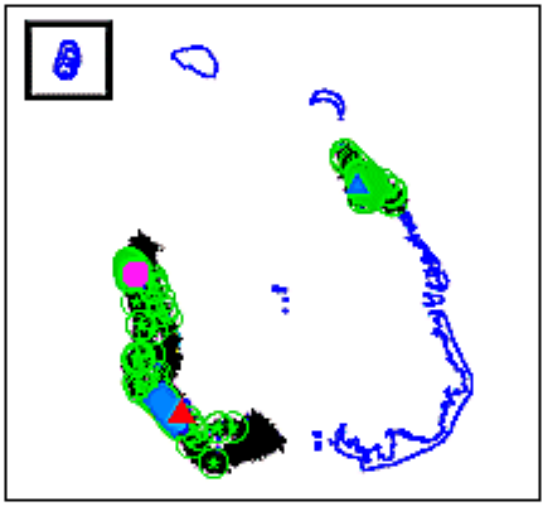
Logical Consistency	This shapefile contains lines that denote cadastral boundaries. Through their use, it has been noted that the spatial content is complete and consistent in describing cadastral boundaries. Attribute data contains fields that are not completely filled however all records have a unique ID number.
Completeness	Appears complete for areas other than Horsburgh and North Keeling Islands. Attributes are apparently not complete (there are a lot of blank entries where, for GIS use, entries should not be blank).
Contact Information	
Contact Organisation	Department of Land Administration (DOLA)
Contact Position	Product Officer, Land Enquiry Centre
Mail Address	PO Box 2222
Locality	Midland
State	Western Australia
Country	Australia
Postcode	6936
Telephone	(08) 9273 7344
Facsimile	(08) 9273 7655
Electronic Mail Address	Tony_Yeomans@notes.dola.wa.gov.au
Metadata Date	24-07-2000
Additional Metadata	
Projection	Cocos (Keeling) Islands Grid 1992 (CKIG92) - originally supplied as Geographic (WGS84) projection.

Cocos (Keeling) Islands GIS
Topography



Topography

Infrastructure
Topography
Roads
Hydrography
Airport Infrastructure

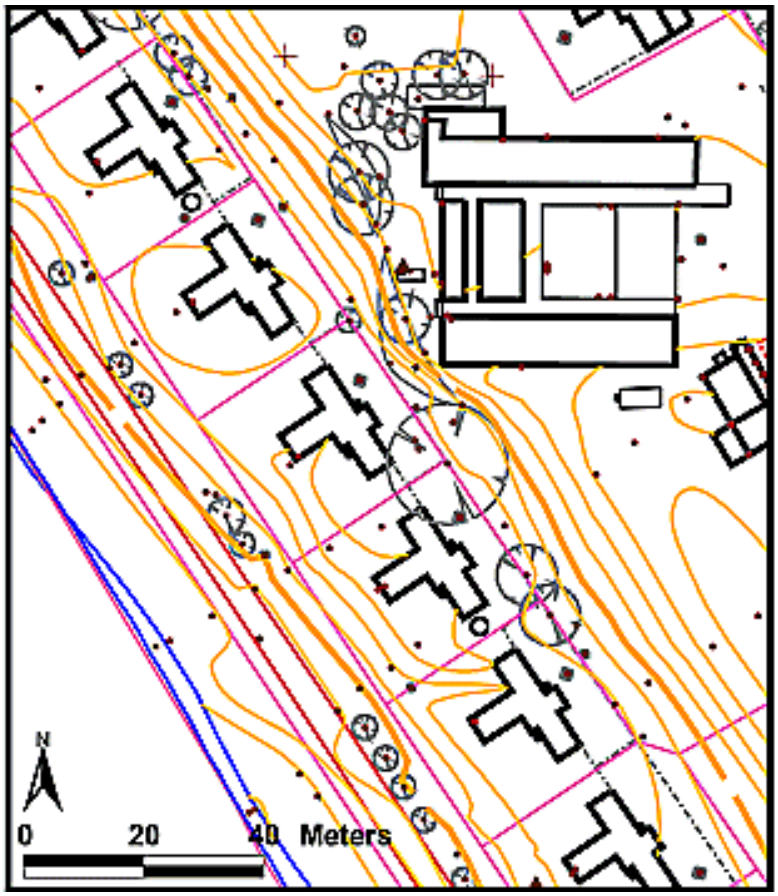


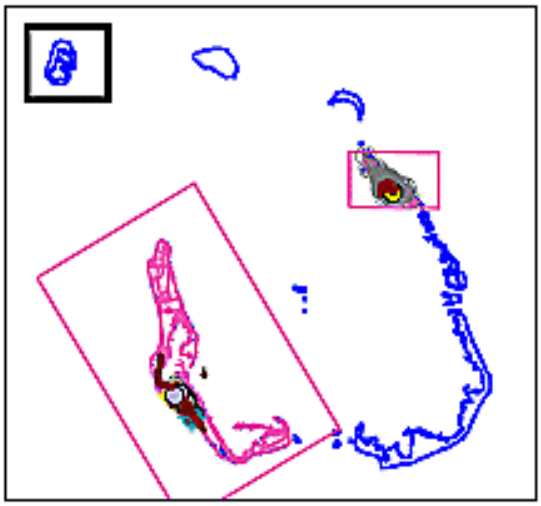
Dataset	
Title	Topography
Custodian	Australian Geological Survey Organisation (AGSO)
Jurisdiction	Australia
Description	
Abstract	This dataset contains point, line and polygon topographic and cultural data for the Cocos (Keeling) Islands. Coverage is of Home and West Islands. To view a sample of the data showing the ArcView legend click here.
Search Word(s)	LAND Topography
Geographic Extent Name(s)	Cocos (Keeling) Islands
Data Currency	
Beginning Date	not known
Ending Date	not known
Dataset Status	
Progress	complete

Maintenance and Update Frequency	not known
Access	
Stored Data Format	ESRI Shapefile, DGN
Available Format Type	ESRI Shapefile
Access Constraint	not known
Data Quality	
Lineage	Obtained from LandInfo (Sinclair Knight Mertz) 8/12/99 who retained the data from a project previously undertaken by the Australian Surveying and Land Information Group (AUSLIG) for the Territories Office earlier in the decade. Lineage is not known prior to receipt by AGSO as no metadata was received. AGSO converted the DGN files received into ESRI Shapefiles and projected the files to CKIG92. The files were renamed to reflect their content. Some features which were illogical were deleted (eg. Polygon contours, Runway lights labeled as golf tees).
Positional Accuracy	In this GIS system the Cadastre was taken as the reference dataset. For West Island the position of features is accurate. For other islands the position of features is up to 5 metres displaced from the Cadastre. The accuracy of features in the third dimension is questionable (their are spikes in the data that are probably not real).
Attribute Accuracy	Height attributes are incomplete. Polygon runway lights were labeled as golf tees. Otherwise attributes appear to be accurate.
Logical Consistency	Appears consistent.
Completeness	Appears complete.
Contact Information	
Contact Organisation	Department of Transport and Regional Services (DoTRS)
Contact Position	Assistant Director Policy, Non self governing Territories
Mail Address	GPO Box 594, Canberra, A.C.T 2601
Locality	111 Alinga St, Canberra
State	A.C.T
Country	Australia
Postcode	2601
Telephone	(02) 6274 8023
Facsimile	(02) 6274 8065
Electronic Mail Address	peter.lawler@dotrs.gov.au

Metadata Date	24-07-2000
Additional Metadata	
Projection	Cocos (Keeling) Islands Grid 1992 (CKIG92) - originally supplied as UTM (WGS72)

Cocos (Keeling) Islands GIS
Detailed Survey





Dataset	
Title	Detailed Survey
Custodian	Australian Geological Survey Organisation (AGSO)
Jurisdiction	Australia
Description	
Abstract	This dataset contains points, lines and polygon data of topographical, cultural and infrastructual features. A sample of the Arc View legend that accompanies the above view can be seen here. This dataset covers all of Home Island and most of West Island however the detail is lost outside of the built up areas. The other islands and North Keeling Atoll are not included in this dataset.
Search Word(s)	HUMAN ENVIRONMENT Planning LAND Survey LAND Use
Geographic Extent Name(s)	Cocos (Keeling) Islands
Data Currency	
Beginning Date	not known

Ending Date	not known
Dataset Status	
Progress	Complete
Maintenance and Update Frequency	not known
Access	
Stored Data Format	DIGITAL - ESRI Shapefile, DGN files
Available Format Type	DIGITAL - ESRI Shapefile
Access Constraint	See contact details below.
Data Quality	
Lineage	Not known prior to receipt by AGSO. AGSO converted the DGN files to shapefile format (annotation to coverage). AGSO projected the data to CKIG92, split the data into logical divisions for ease of use, deleted or corrected some erroneous features, and improved the attribution.
Positional Accuracy	Appears to match orthophotography quite well. General accuracy over populated areas is good; other areas are much lower resolution. Specifically, many housing features do not appear to match actual ground features, and may have been derived from a conceptual plan not actually implemented.
Attribute Accuracy	Many features do not appear to be correctly attributed (eg. map tic marks attributed as pipes). Many features are not attributed (eg. trees). Most features appear correctly attributed.
Logical Consistency	This data seems to be a compilation of data from a variety of scales and sources. It is not consistently accurate and contains apparent duplication of features attributed differently.
Completeness	Data collection appears complete for the islands but as specified in the abstract, does not include the islands other than Home Island and West Isand, and only contains detailed data over populated areas.
Contact Information	
Contact Organisation	Department of Transport and Regional Services (DoTRS)
Contact Position	Assistant Director Policy, Non self governing Territories
Mail Address	GPO Box 594, Canberra, A.C.T 2601
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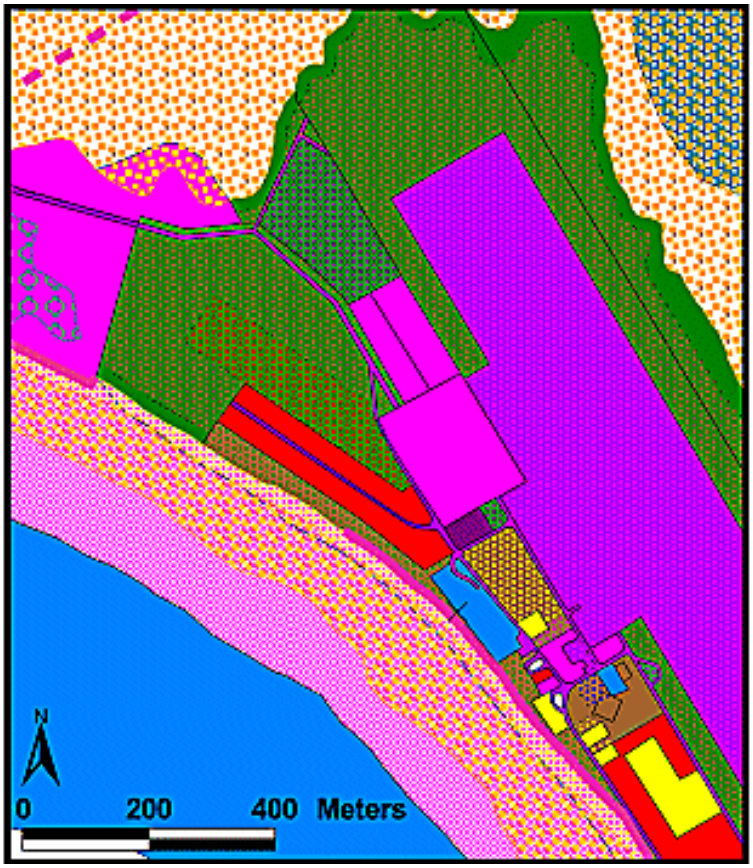
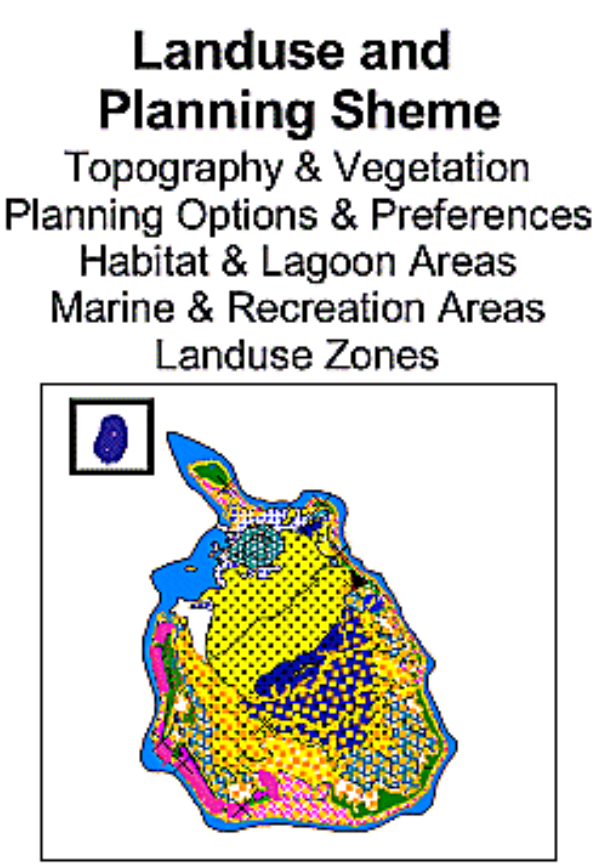
State	A.C.T
Country	Australia
Postcode	2601

Telephone	(02) 6274 8023
Facsimile	(02) 6274 8065
Electronic Mail Address	peter.lawler@dotrs.gov.au
Metadata Date	24-07-2000
Additional Metadata	
Projection	Cocos (Keeling) Islands Grid 1992 (CKIG92) - originally supplied UTM.

Cocos (Keeling) Islands GIS
Land Use Plan & Planning Scheme





Dataset	
Title	Cocos (Keeling) Islands Land Use Plan and Planning Scheme 1992 GIS Database
Custodian	Cocos (Keeling) Islands Council
Jurisdiction	Cocos (Keeling) Islands
Description	
Abstract	This dataset contains planning related cultural and environmental layers. Source data is of variable resolution as outlined in the original documentation. Standard attributes such as UFI, AREA and PERIMETER, LENGTH will be in addition to those in the following table. UFI is a unique feature identifier. Layers include:

SHAPEFILE NAME	FEATURES	EXTENT	FEATURE CLASS	ATTRIBUTES
airport.shp	Runway and parking area	West Island	Polygon	FEATURE; DESC
erosion.shp	Erosion prone coastline; Potential breach areas	West Island	Line	CODE; FEATURE; DESC
habitat.shp	Migratory bird habitats	Southern Atoll	Polygon	TYPE; FEATURE; DESC; SPECIES

islands.shp	Coastline	Southern Atoll	Polygon	FEATURE; DESC; HECTARES
lagoon.shp	Reef outline; Coastline	Southern Atoll	Polygon	ZONE; FEATURE; DESC
landuse.shp	Coastline; Cadastral boundaries; Existing land use	Southern Atoll	Polygon	USE; FEATURE; DESC
marine.shp	Coastline; Marine habitats	Southern Atoll	Polygon	CODE; FEATURE; DESC; HABITAT; HABITATG
marres.shp	Coastline; Important marine areas	Southern Atoll	Polygon	TYPE; FEATURE; DESC
nklagoon.shp	Reef outline; Coastline	North Keeling Island	Polygon	ZONE; FEATURE; DESC
nksites.shp	Heritage sites	North Keeling Island	Point	TYPE; FEATURE; DESC
nkuse.shp	Coastline; Cadastral boundaries; Existing land use	North Keeling Island	Polygon	USE; FEATURE; DESC
northk.shp	Coastline	North Keeling Island	Polygon	FEATURE; DESC; HECTARES
option.shp	Coastline; Planning options	Southern Atoll	Polygon	OPT; FEATURE; DESC
pref.shp	Coastline; Preferred planning options	Southern Atoll	Polygon	OPT; FEATURE; DESC
recres.shp	Coastline; Recreation facilities and water-based activities	Southern Atoll	Polygon	TYPE; FEATURE; DESC
reef.shp	Reef outline	Southern Atoll	Polygon	None
roads.shp	Sealed and unsealed roads; Cycle path	Southern Atoll	Line	TYPE; FEATURE; DESC
rubbish.shp	Coastline; Rubbish problem areas	Southern Atoll	Polygon	DUMP; FEATURE; DESC
sites.shp	Heritage sites	Southern Atoll	Point	TYPE; FEATURE; DESC
sites2.shp	Heritage sites	Southern Atoll	Polygon	TYPE; FEATURE; DESC
topo.shp	Coastline; Reef flat; Lagoon; Beaches; Swamps	Southern Atoll	Polygon	FEAT; FEATURE; DESC
tourist.shp	Proposed tourist development areas	Southern Atoll	Polygon	None
utilslin.shp	Public utilities and services infrastructure	Southern Atoll	Line	TYPE; FEATURE; DESC; LABEL
utilspnt.shp	Public utilities and services infrastructure	Southern Atoll	Point	TYPE; FEATURE; DESC; LABEL
veg.shp	Coastline; Native vegetation communities	Southern Atoll	Polygon	TYPE; FEATURE; DESC
veg2.shp	Coastline; Vegetation structure	Southern Atoll	Polygon	STRUC; FEATURE; DESC

	water.shp	Known and potential groundwater lenses	Southern Atoll	Polygon	LENS; FEATURE; DESC
	zone.shp	Coastline; Statutory land use plan	Southern Atoll	Polygon	ZONE; FEATURE; DESC
	psm.shp	Survey marks	West Island; Home Island	Point	PSM; DESC; AS2482; HEIGHT

Search Word(s)	HUMAN ENVIRONMENT Planning HUMAN ENVIRONMENT Structures and Facilities HUMAN ENVIRONMENT Urban Design
Geographic Extent Name(s)	Cocos (Keeling) Islands
Data Currency	
Beginning Date	not known
Ending Date	1 Jan 1992
Dataset Status	
Progress	Complete
Maintenance and Update Frequency	Not Known
Access	
Stored Data Format	ESRI Shapefile
Available Format Type	ESRI Shapefile
Access Constraint	Not Known
Data Quality	
Lineage	For lineage prior to receipt by AGSO, see original documentation (PDF). AGSO merged southern atoll layers where islands were separate layers, added FEATURE and DESC fields to shapefiles (description sourced from documentation and/or look-up tables). The FEATURE field contains short, upper case entries without spaces (facilitating portability). AGSO added UFI (Unique Feature Identifier) fields to all attribute tables. For the marine.shp shapefile, the original TYPE field was used to populate the new FEATURE and DESC fields. HABITAT is a description of the CODE field. HABITATG is a grouping of the CODE field as outlined in the original documentation for the *marres2* coverage.
Positional Accuracy	Variable. For descripions of accuracy see the original documentation.
Attribute Accuracy	not known
Logical Consistency	not known
Completeness	Appears complete for areas other than Horsburgh and North Keeling Islands.

Contact Information	
Contact Organisation	Department of Transport and Regional Services (DoTRS)
Contact Position	Assistant Director Policy, Non self governing Territories
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Country	Australia
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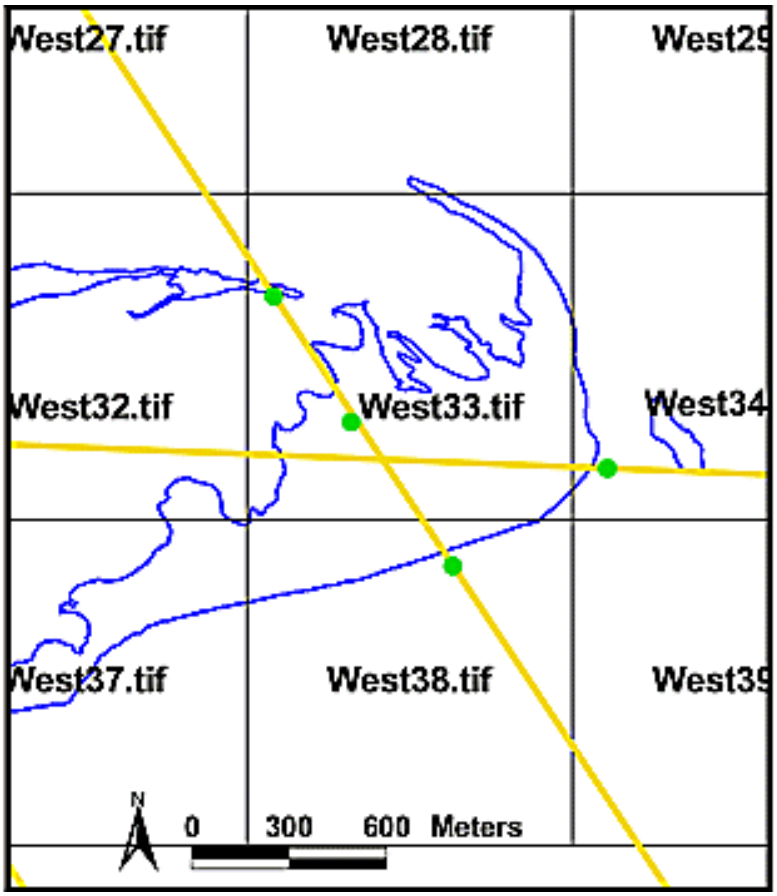
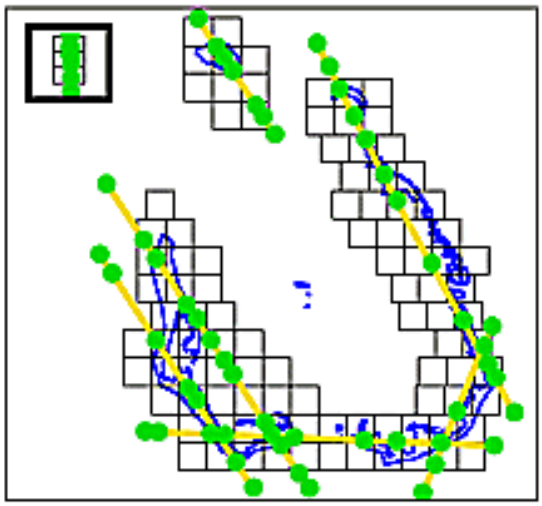
Telephone	(02) 6274 8023
Facsimile	(02) 6274 8065
Electronic Mail Address	peter.lawler@dotrs.gov.au
Metadata Date	25-09-2000
Additional Metadata	
Projection	Cocos (Keeling) Islands Grid 1992 (CKIG92) - originally supplied as Universal Transverse Mercator (UTM) Zone 47S (WGS72) projection.

Cocos (Keeling) Islands GIS
Flight Lines & Photo Centres

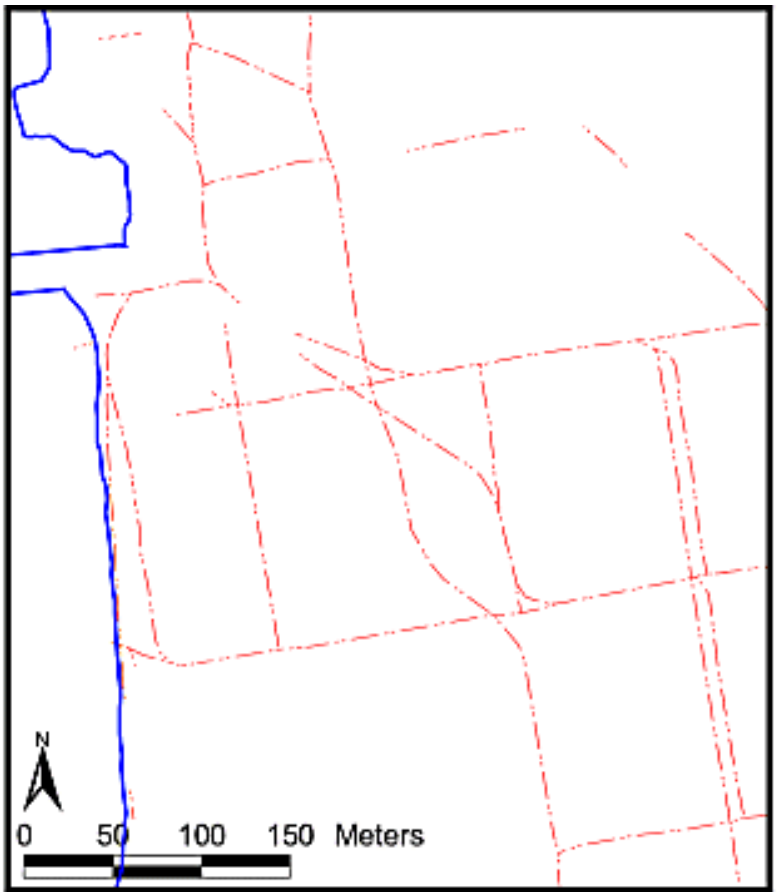


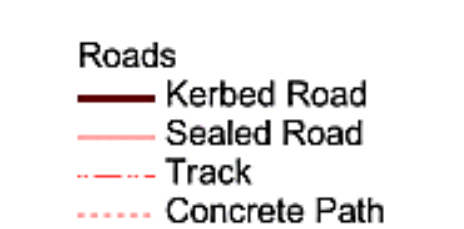


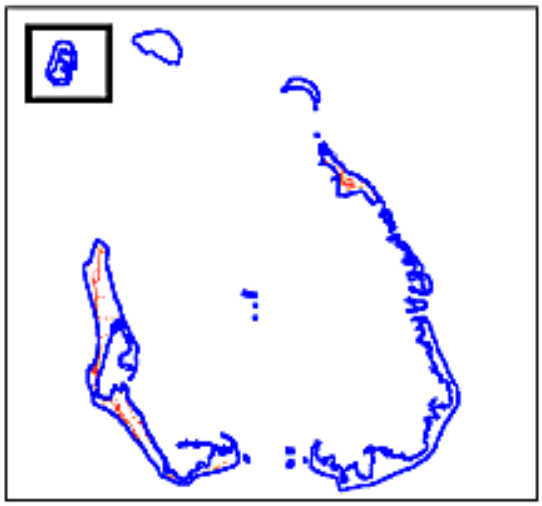
Dataset	
Title	Flight Lines and Photo Centers
Custodian	Australian Geological Survey Organisation (AGSO)
Jurisdiction	Australia
Description	
Abstract	This dataset shows the approximate flight paths (lines) and centres of the aerial photography in relation to the Cocos Islands. This data is used to establish and map the approximate coverage and location of orthophotos over the island. Two shape files were created, one to describe the flight lines the other to describe the photo centers.
Search Word(s)	PHOTOGRAPHY AND IMAGERY Aerial PHOTOGRAPHY AND IMAGERY Plan
Geographic Extent Name(s)	Cocos (Keeling) Islands
Data Currency	
Beginning Date	09MAY2000
Ending Date	11MAY2000
Dataset Status	

Progress	Complete
Maintenance and Update Frequency	not planned
Access	
Stored Data Format	DIGITAL - ESRI Shapefile
Available Format Type	DIGITAL - ESRI Shapefile
Access Constraint	See contact details below.
Data Quality	
Lineage	This data was originally provided as a flight diagram on a paper hard copy map. This was then digitised from the flight line diagram using an on-screen based scanned version of the hard copy map as polylines and points respectively.
Positional Accuracy	This data set has been produced by AGSO to locate the approximate flight paths and photo centers for the orthophotography. AGSO has found this level of accuracy to be adequate for the purpose intended.
Attribute Accuracy	The table attributes describe the photograph number and the corresponding flight run number.
Logical Consistency	The themes are used to describe the flight paths and the photo centers of the aerial photography.
Completeness	Appears complete for areas other than Horsburgh and North Keeling Islands.
Contact Information	
Contact Organisation	Department of Transport and Regional Services (DoTRS)
Contact Position	Assistant Director Policy, Non self governing Territories
Mail Address	GPO Box 594, Canberra, A.C.T 2601
Locality	111 Alinga St, Canberra
State	A.C.T
Country	Australia
Postcode	2601
Telephone	(02) 6274 8023
Facsimile	(02) 6274 8065
Electronic Mail Address	peter.lawler@dotrs.gov.au
Metadata Date	24-09-2000
Additional Metadata	
Projection	Cocos (Keeling) Islands Grid 1992 (CKIG92) - originally supplied as Geographic (WGS84) projection.

Cocos (Keeling) Islands GIS
Road Centerlines





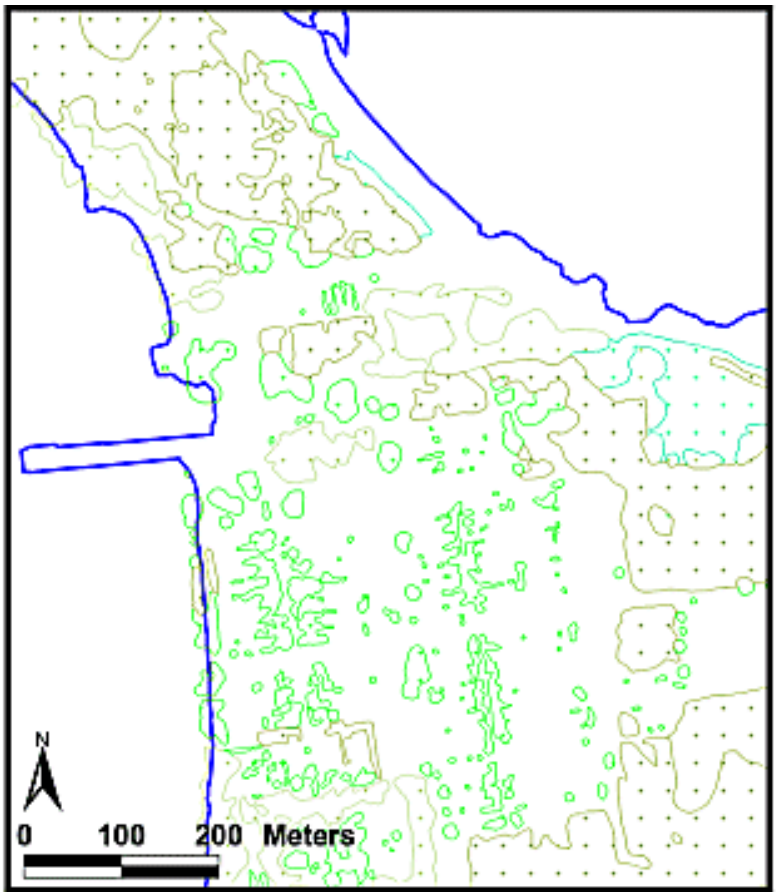


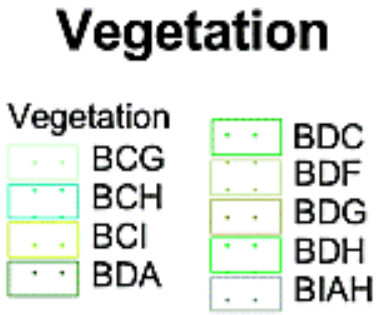
Dataset	
Title	Road Centerlines
Custodian	Australian Geological Survey Organisation (AGSO)
Jurisdiction	Australia
Description	
Abstract	This dataset contains road centrelines for the Cocos (Keeling) Islands derived from topography. The coverage is the same as for the road edges in the source data (incomplete).
Search Word(s)	HUMAN ENVIRONMENT Urban Design TRANSPORTATION Land
Geographic Extent Name(s)	Cocos (Keeling) Islands
Data Currency	
Beginning Date	not known
Ending Date	not known
Dataset Status	
Progress	Complete

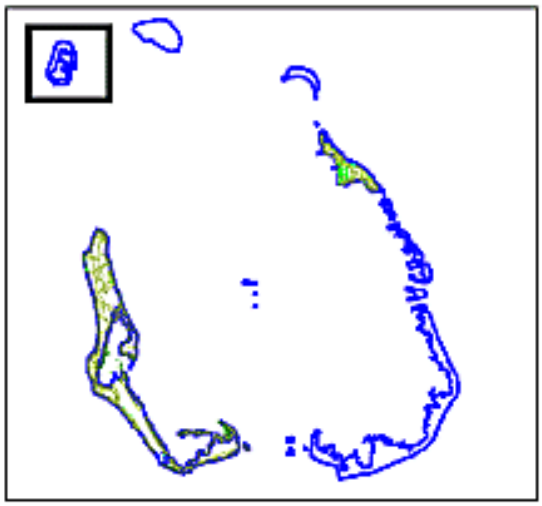
Maintenance and Update Frequency	not known
Access	
Stored Data Format	DIGITAL - ESRI Shapefile, ArcInfo Coverage
Available Format Type	DIGITAL - ESRI Shapefile
Access Constraint	See contact details below
Data Quality	
Lineage	The road centerlines have been generated from the topography theme using the ArcInfo 8.0.2 command CENTERLINE. Road intersections and other errors were manually edited/corrected in ArcEdit. The final version was opened, checked and attributed in ArcView 3.2 and saved as an ESRI shapefile. Roads were only extended to form obvious intersections and no missing road sections were added (for consistency and due to the age of the orthophotography).
Positional Accuracy	The road centrelines have a positional accuracy comparable to that of the road edges in the topography.
Attribute Accuracy	Attribute descriptions appear to match the feature types as visible on the orthophotography (1987).
Logical Consistency	This theme is a derivative of the infrastructure theme and thus all attributes are associated with this.
Completeness	Incomplete. The original feature data.
Contact Information	
Contact Organisation	Department of Transport and Regional Services (DoTRS)
Contact Position	Assistant Director Policy, Non self governing Territories
Mail Address	GPO Box 594, Canberra, A.C.T 2601
Locality	111 Alinga St, Canberra
State	A.C.T
Country	Australia
Postcode	2601
Telephone	(02) 6274 8023
Facsimile	(02) 6274 8065
Electronic Mail Address	peter.lawler@dotrs.gov.au
Metadata Date	24-07-2000
Additional Metadata	

Projection	Cocos (Keeling) Islands Grid 1992 (CKIG92) - originally supplied as assumed Universal Transverse Mercator (UTM) Zone 47S (WGS72) projection. Some Islands are wrongly warped when this projection is used, but West Island matches other known data.

Cocos (Keeling) Islands GIS
Vegetation





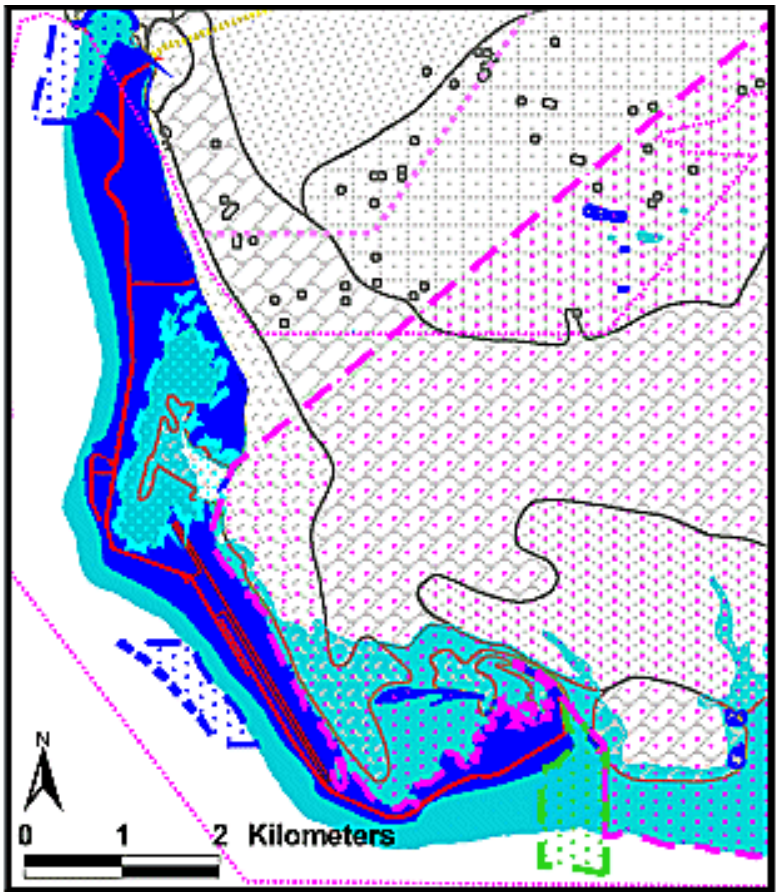


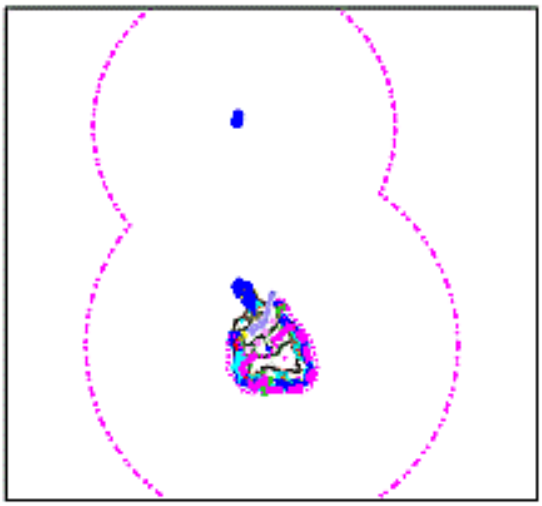
Dataset	
Title	Vegetation
Custodian	Australian Geological Survey Organisation (AGSO)
Jurisdiction	Australia
Description	
Abstract	This dataset is a polygon theme of vegetation types or structures of the Cocos (Keeling) Islands. It is derived from topography data (possibly 1:1000 scale) created by AUSLIG. The attributes are probably meaningless. Re-coding according to actual vegetation types is recommended if this layer is to be used for analysis. The vegetation appears to match the 1987 orthophotography, and would therefore be out of date in some areas (the 1992 planning data documentation reveals that areas have been cleared since the 1987 air photos). Coverage is over West and Home Islands.
Search Word(s)	ECOLOGY Ecosystem HERITAGE Natural

Geographic Extent Name(s)	Cocos (Keeling) Islands
Data Currency	
Beginning Date	not known
Ending Date	not known
Dataset Status	
Progress	Complete
Maintenance and Update Frequency	not known
Access	
Stored Data Format	DIGITAL - ESRI Shapefile, ArcInfo Coverage
Available Format Type	DIGITAL - ESRI Shapefile
Access Constraint	See contact details below
Data Quality	
Lineage	The vegetation theme was derived by AGSO from the topography data supplied by AUSLIG Canberra (via Landinfo). There are a number of features in the original topography data that do not have valid AUSLIG codes. Comparison with the orthophotography indicates that all these codes represent vegetation. AGSO has extracted these codes and created a polygon layer (in ArcInfo 8.1 Workstation) by including common lines as well as those coded as a particular type. The resulting layer is coded according to the erroneous codes in the original data. Because the level of detail is different from the vegetation layers in the planning data, correlation was not conclusive. Re-coding according to actual vegetation types is recommended if this layer is to be used for analysis.
Positional Accuracy	The positional accuracy of this dataset is the same as the topography dataset that it was extracted from (its nominal scale is probably 1:1000). The vegetation appears to match the 1987 orthophotography, and would therefore be out of date in some areas (the 1992 planning data documentation reveals that areas have been cleared since the 1987 air photos)

Attribute Accuracy	Attributes are probably meaningless, as original codes were not according to the AUSLIG standards and no decoding sheet was available. Correlation with other vegetation coverages was not possible due to scale differences. Recoding according to actual vegetation types is recommended if this layer is to be used for analysis.
Logical Consistency	All themes are concerned with the vegetation on Cocos Islands.
Completeness	Appears complete for specified scale and extent.
Contact Information	
Contact Organisation	Department of Transport and Regional Services (DoTRS)
Contact Position	Assistant Director Policy, Non self governing Territories
Mail Address	GPO Box 594, Canberra, A.C.T 2601
Locality	111 Alinga St, Canberra
State	A.C.T
Country	Australia
Postcode	2601
Telephone	(02) 6274 8023
Facsimile	(02) 6274 8065
Electronic Mail Address	peter.lawler@dotrs.gov.au
Metadata Date	24-07-2000
Additional Metadata	
Projection	Cocos (Keeling) Islands Grid 1992 (CKIG92) - originally supplied as assumed Universal Transverse Mercator (UTM) Zone 47S (WGS72) projection.

Cocos (Keeling) Islands GIS
Marine Environment





Dataset	
Title	Marine Environment
Custodian	Environmental Resources Information Network (ERIN)
Jurisdiction	Australia
Description	
Abstract	This dataset contains point, line and polygon data of the marine environment surrounding the Cocos (Keeling) Islands. It includes coastlines, bathymetric contours, coral outcrops and other features. Coverage extends to the whole of Cocos Keeling Isalnds. The themes have been grouped so as to increase the ease of use of the data. The individual themes have been grouped into the following shapefiles: • Infralin.shp - Infrastructure lines • Boundlin.shp - Boundary lines • Marinelin.shp - Marine lines • Surveylin.shp - Survey lines • Islandlin.shp - Island outlines • Marineply.shp - Marine polygon • Islandply.shp - Island polygon

	• Boundply.shp - Boundary polygon These shapefiles retain all spatial and non spatial data as supplied to AGSO. To view the sample of the marine environment with the legend click here.
Search Word(s)	ECOLOGY Habitat HERITAGE Natural MARINE Coasts MARINE Reefs
Geographic Extent Name(s)	Cocos (Keeling) Islands and surrounding marine environment
Data Currency	
Beginning Date	not known
Ending Date	05OCT1998
Dataset Status	
Progress	Complete
Maintenance and Update Frequency	not known
Access	
Stored Data Format	DIGITAL - ESRI Shapefile, ArcInfo Coverage
Available Format Type	DIGITAL - ESRI Shapefile
Access Constraint	See contact details below
Data Quality	
Lineage	Not known prior to AGSO's receipt of the data (no metadata is available). Data was received as ArcInfo Export files. AGSO converted the data to Shapefile format. AGSO projected the data to CKIG92 with a coordinate shift to match the Cadastre (assuming it was received as UTM Zone 47 WGS72). The multitude of individual shapefiles were checked and those of similar themes were then grouped to provide a smaller set of shapefiles, thus making them more usable. The North Keeling atoll was translated and warped to more accurately match the orthophotography. The amount of translation and compression required can be found in the Cocos GIS documentation. Line themes were built into polygons to allow areas to be queried.

Positional Accuracy	Comparison with other datasets indicates that the positional accuracy of this dataset is variable. For West Island features match other datasets accurately. For other islands features may be displaced by up to 30 metres from matching features in other datasets. The North Keeling atoll was displaced about 130m to the east prior to the adjustment. After the adjustment the displacement (compared to the orthophotography) was less then 2m.
Attribute Accuracy	Attribute descriptions visually appear to match the associated spatial features. Accuracy details of the attributes are not known.
Logical Consistency	Values assigned to spatial features appear to match the description. All themes are concerned with the marine environment and have been placed into subgroups (as described in the Abstract) to more accurately describe specific aspects of the marine environment.
Completeness	Appears complete.
Contact Information	
Contact Organisation	Department of Transport and Regional Services (DoTRS)
Contact Position	Assistant Director Policy, Non self governing Territories
Mail Address	GPO Box 594, Canberra, A.C.T 2601
Locality	111 Alinga St, Canberra
State	A.C.T
Country	Australia
Postcode	2601
Telephone	(02) 6274 8023
Facsimile	(02) 6274 8065
Electronic Mail Address	peter.lawler@dotrs.gov.au
Metadata Date	24-07-2000
Additional Metadata	
Projection	Cocos (Keeling) Islands Grid 1992 (CKIG92) - originally supplied as assumed Universal Transverse Mercator (UTM) Zone 47S (WGS72) projection. Some Islands are wrongly warped when this projection is used, but West Island matches other known data.

Chapter 5

Appendix 2: CD-ROM HTML documentation

Hard copy print of the HTML pages comprising the autorun content for CD-ROM # 1.

Welcome to the Cocos (Keeling) Islands GIS

This CD-ROM contains the Cocos Islands GIS and associated documentation.
Please note; if you intend to use the GIS on this CD-ROM you will at some stage need to install ArcExplorer (freeware) from Getting Started.

This page will automatically update. To enter the CD-ROM without waiting, please click here or on the above image.

Cocos (Keeling) Islands GIS
Home

Main Links

Cocos Islands GIS System Documentation
View the system documentation for the Cocos Islands.

Metadata
View the metadata associated with the Cocos Islands GIS.

View Data
View the shapefile data using the ArcExplorer GIS freeware package. Note: You need to have ArcExplorer already installed, click here to install.

An online version of the GIS is available at http://www.agso.gov.au/map/cocos

Department of Transport and Regional Services (DoTRS) Cocos Islands website (On CD)

The Cocos GIS is copyright of the Commonwealth. View license and a generic covering letter.

Specific Links

The following drop down menu links to specific pages, just click on the arrow and select from the list.

Metadata:

Select Metadata

ArcExplorer Projects:

View data

Documents:

All Documents

Getting Started
In order to view the data a version of ArcExplorer may need to be installed on your computer. This link will guide you through the necessary steps.

The date for this version of the CD-ROM is: 26 June 2001

Cocos (Keeling) Islands GIS
Getting Started

Link To:

DoTRS Cocos (Keeling) Islands Web Site

AGSO Web Site

In order to have this product fully functional you will need be using a suitable computer running a Microsoft Windows Operating System (Windows 95 or greater) and the following:-

- ESRI ArcExplorer GIS v2 (Environmental Systems Research Institute Inc),
- Microsoft Internet Explorer v3.0 or greater (or an alternative web browser),
- Adobe Acrobat Reader v4.05 or greater.

Items 2 and 3 are likely to be already installed on your computer. Any of the three can be installed now by following these instructions.

Step 1. Install Software

- ESRI ArcExplorer GIS v2
- Microsoft Internet Explorer v5.5 Service Pack 1
- Adobe Acrobat Reader v5

Step 2. View Data

- View Cocos (Keeling) Islands Data using ArcExplorer

NOTE: Installation of software may require administrative privileges for Windows NT or 2000. Users of Windows NT 4.0 or 2000 may need to contact their system administrator for installation.
NT users will also require Service Pack 3 or greater.

Installation of ESRI's ArcExplorer

ArcExplorer software is a lightweight GIS data explorer developed by ESRI.
ArcExplorer version 2 has been supplied on this CD-ROM, it is also available as a free download from ESRI's ArcExplorer Web site. Navigate to the /util/aexplore directory and double click the "ae2setup.exe" or select this hyperlink to begin installation and follow prompts. Install ArcExplorer v2.

Read ArcExplorer's documentation.

If you have Internet access the latest version can be obtained from here.

"The GIS by ESRI emblem is a trademark provided under license from Environmental Systems Research Institute, Inc."

Back to Install list

Installation of Microsoft's Internet Explorer

Microsoft Internet Explorer v5.5 has been supplied on this CD-ROM. Either navigate to the /util/ie5sp1 directory and double click the "ie5setup.exe" or select this hyperlink to begin installation (follow the prompts). Install Internet Explorer v5.5 Service Pack 1.

If you have Internet access the latest version can be obtained from here.

microsoft.com Download Center

Back to Install list

Installation of Adobe's Acrobat Reader

Adobe® Acrobat® Reader is free, and freely distributable software that lets you view and print Adobe Portable Document Format (PDF) files on all major computer platforms. Adobe Acrobat Reader provides a standard for reading documents and images regardless of word processor, spreadsheet or graphics package origin. Version 5 has been supplied on this CD-ROM. Either navigate to the /util/adobe directory and double click the "rp500enu.exe" or select this hyperlink to begin installation and follow prompts. Install Acrobat Reader v5.

If you have Internet access the latest version can be obtained from here.

Adobe Get Acrobat Reader

Back to Install list

Cocos (Keeling) Islands GIS
Introduction

Link To:

DoTRS Cocos (Keeling) Islands Web Site (local copy)

AGSO Web Site

The Cocos (Keeling) Islands Geographic Information System (Cocos GIS) was compiled by the Australian Geological Survey Organisation (AGSO) on behalf of the Australian Commonwealth Department of Transport and Regional Services (DoTRS).

Orthophotography has been created to resolution standards better than those in the Christmas Island GIS.

Data covering Cocos (Keeling) Islands have been obtained from the Australian Surveying and Land Information Group (AUSLIG), the Western Australian Department of Land Administration (DOLA), the National Capital Planning Authority (NCPA), and the Commonwealth Environmental Resource Information Network (ERIN). These dtasets have been integrated into the Cocos GIS and may be viewed using ESRI ArcExplorer or ESRI ArcView.

Cocos (Keeling) Islands GIS
View Data

Note: The links below start ArcExplorer projects (providing ArcExplorer is installed on the computer - if it is not please see Getting Started). The ability to zoom, pan, identify etc is available in all projects. These projects have been created with themes loaded and the view zoomed to an appropriate area. Projects that use orthophotography will take longer to load on slower computers.

ArcExplorer Projects: (clicking on the title opens each project)

Home Island (Vector)

This view is located over Home Island and shows the vector data of houses in cadastral blocks. Individual cadastre parcels can be queryed by using the "i"nformation tool.

Home Island (Orthophoto)

This view is located just inland of the jetty and has the orthophoto, infrastructure and cadastre layers turned on. Because the orthophoto is turned on the page may load slowly, so please be patient.

Airport (Vector)

This view shows airport infrastructure cadastre and topographic contours near the middle of the airport.

Airport (Orthophoto)

This view is as above but has the orthophoto turned on.

Marine Plan

This view is of the Cocos Southern atoll and shows the distribution of coral habitat.

Water Resources and Heritage

This view is zoomed in over Home Island. The themes present in the view are taken from the Ecowise Water Resources directory and also from the National Estate Heritage directory.

Tile Plan with Spot Imagery

This view is zoomed in over the southern islands. The themes present are infrastructure, cadastre, tile plan, heritage items from National Estate, and the spot image. The tile plan theme has been included so that higher resolution photos can be added to the view.

Home Island Land Use and Planning

This view is over Home Island and uses the planing data as the themes in the view. The themes used in the project show the marine environment and the current land use of Home Island.

West Island Land Use and Planning

This view has much the same content as Home Island Land Use and Planning but is located over West Island.

Cocos Southern Islands Marine Plan

This view is over the southern atoll and describes the current marine environment usage and plan. Vegetation is included and the roads theme has been added for orientation.

Cocos Southern Islands Land Use Plan

This project is of the southern atoll and includes themes directly related to land use planning. They include: land zones, prefered land use, land use options, and current land use.

Cocos Southern Islands Plan

This view is of the southern atoll and describes the planned environment of the southern islands.

West Island Planning

This is a basic project that has been made over the West Island and includes the land use theme.

Land Tenure

This is an early version of how tenure might look based on the Groud audit field "Mgr_name".

North Keeling Island Plan

This view has been created for the North Keeling atoll. Orthophotos can be added to the view once saved on hard drive (North Keeling photos available on CD#3).

All Planning Themes

This project is the master project for all the other projects that include planning. All themes are contained but are turned off to reduce ArcExplorer loading time.

All Themes

This project has all the themes used in the above projects (except for the planning projects) and has been used as a master for them. All themes are turned off to decrease the time taken to load ArcExplorer.

Cocos (Keeling) Islands GIS
Metadata

Important! In attempting to supply metadata according to the ANZLIC Core Metadata Elements, many elements are filled according to AGSO's understanding. Metadata was not available for a large number of datasets, or was informal and incomplete.

Imagery

- Orthophotography
- Spot Imagery

Vector Data

- Cadastre
- Topography/Culture
- Detailed Survey
- Planning
- Flight Lines and Photograph Centers
- Road Centerlines
- Vegetation
- Marine Environment

Cocos (Keeling)Islands GIS
Documents

Note! The documents listed below are included on this CD-ROM and are intended to provide supplementary information regarding the Cocos (Keeling) Islands GIS. Included in the document list is a short description of the linked document. Some of the documents are in PDF format and require Adobe Acrobat Reader to view them (included on this CD-ROM, see Getting Started).

Documents relating to the Cocos (Keeling) Islands GIS:

Cocos Islands GIS 2001 System Documentation (General Release)

Report and product documentation for the Cocos (Keeling) Islands Geographic Information System (CocosGIS). This is a Portable Document Format (PDF) version, updated June 2001, mainly to include new datasets (water resources and national estate).

1992 NCPA Planning Data Documentation

This document was produced by the NCPA following the completetion of a draft plan for the Cocos (Keeling) Islands concluding in 1992. The report describes the covers produced by the Arc/Info database that was created.

Water Resources Component, Cocos (Keeling) Islands GIS

This document was produced by ECOWISE Environmental Ltd for Cocos Island Administration, Department of Transport and Regional Services & the Australian Geological Survey Organisation. It includes metadata for the associated data.

Cocos (Keeling) Islands GIS - Stage 1 Report

This report was produced by AGSO summarising the progress of the Cocos (Keeling) Islands GIS (Cocos GIS) on completetion of Stage 1.

Supporting Documents:

ANZLIC Metadata Guidelines (Version 1)

This is the metadata standard used in construction of the Cocos GIS metadata sheets. Metadata created after the release of *ANZLIC Metadata Guidelines: Core metadata elements for geographic data in Australia Version 2, February 2001* (ANZLIC web pages - link to offline (PDF) copy here) will comply with the newer standard. Older metadata will be gradually updated.

Register of the National Estate

Online, searchable register of more than 12,000 places of natural, historic or indigeneous significance. Use the search to find details and photographs of sites in the national estate dataset.

DoTRS Cocos (Keeling) Islands page

Department of Transport and Regional Services Cocos (Keeling) Islands web page (Link to an offline copy here)
DoTRS Cocos (Keeling) Islands Photo Collection
This is a link to the DoTRS Cocos photo library page (Link to an offline copy here).
The Cocos (Keeling) Islands (http://www.cocos-tourism.cc)
This *Cocos Island Tourism Commission* page contains tourist information for the islands. Link to an offline copy here.

Chapter 6

Appendix 3: Ground Audit and Cadastre Tables

Table 2: Ground audit duplicate records or records without corresponding cadastre polygons.

PIN	*LOC_NO*	*LOT_NO*	*CURRENT_US*	*DESC*
222	222		Memmorial	
318	318		Telecommunication	Television Tower
319	319		Communication	
320	320		Recreation	RIFLE RANG AIRFORCE ROAD
321	321		Unknown or Not Used	
322	322		Airport operations	Airport Complex, Alexander Street
2001		100	AMMUNITION STORAGE	AMMUNITION STORE, AIRPORT
2002	200		Airport operations	AIRPORT TERMINAL BUILDING, ALEXANDER STREET
2003	200		Airport operations	SHELL FUEL STORAGE TANKS, AIRPORT, ALEXANDER STREET
2004		102	Recreation	Direction Island Propsed Recreation reserve
2005		102	Recreation	Direction Island Proposed Nature Conservation Reserve
2006		101	Unknown or Not Used	Proposed Reserve For Nature Conservation
5005		105	Nature Conservation	NORTH KEELING ISLAND
1113617		197	Local community facilities	Fire station, Jalan Masjid
1113640		150	Residential	House Jalan Kembang Molok
1113693		252	Unknown or Not Used	
1113696		247	Storage	Co-op Timber Store. JALAN MELATI/JALAN SEMPIT
1113697		248	Public Utility	NEW POWER STATION
1113700		249	Light industrial	Plant shed / workshop. JALAN MELATI
1113703		241	Shops	Co-op Bulk Rice Store. JALAN MELATAI/JALAN JUKON
1113705		243	Shops	Co-op hardware store. JALAN MELATI
1113710		211	Residential	Nurses house, JALAN MASJID
1113725		237	Horticulture	HORTICULTURAL BLOCK, POULTRY FARM
1113741		256	Copra Production	COPRA DRYING SHED
1113742		242	Port operations	Marine centre. JALAN REL. PART OF MARINE SERVICES BUILDING
1115053		32	Vacant industrial land	VACANT LAND
1115057	204		Navigation	Compass Locator Site
1115058	201		Communication	RECEIVER SITE Civil Aviation Authority (CAA), Sydney Hwy
1115060	205		Quarantine Station	Australian Quarantine Inspection Service, Quarantine Station
1115070		220	Horticulture	Horticulture block, Mahoon Road, West Island
1115081		100	Unknown or Not Used	
1115136	301		Vacant residential land	Vacant Land, Buffet Close, Beacon Heights
1115137	302		Vacant residential land	Vacant Land, Buffet Close, Beacon Heights
1115138	303		Vacant residential land	Vacant Land, Buffet Close, Beacon Heights
1115139	304		Vacant residential land	Vacant Land, Buffet Close, Beacon Heights
1115140	305		Vacant residential land	Vacant Land, Buffet Close, Beacon Heights
1115141	306		Vacant residential land	Vacant Land, Buffet Close, Beacon Heights
1115142	307		Vacant residential land	Vacant Land, Buffet Close, Beacon Heights
1115143	308		Vacant residential land	Vacant Land, Buffet Close, Beacon Heights
1115144	309		Vacant residential land	Vacant Land, Buffet Close, Beacon Heights
1115145	310		Vacant residential land	Vacant Land, Buffet Close, Beacon Heights
1115146	311		Vacant residential land	Vacant Land, Buffet Close, Beacon Heights
1115147	312		Vacant residential land	Vacant Land, Buffet Close, Beacon Heights
1115155	316		Vacant residential land	Vacant Land, LOC 316? Sydney Highway
1115155	316		Vacant residential land	Vacant Land, LOC 316? Sydney Highway
1115155	316		Vacant residential land	Vacant Land, LOC 316? Sydney Highway
1115155	316		Vacant residential land	Vacant Land, LOC 314? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 316? Sydney Highway
1115155	316		Vacant residential land	Vacant Land, LOC 318? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 318? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 314? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 314? Sydney Highway. Status uncertain.

1115155	316		Vacant residential land	Vacant Land, LOC 318? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 314? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 318? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 314? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 317? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 317? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 317? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 317? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 317? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 317? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 316? Sydney Highway
1115155	316		Vacant residential land	Vacant Land, LOC 314? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 320? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 320? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 318? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 320? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 318? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 320? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 320? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 319? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 319? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 319? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 319? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 319? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 319? Sydney Highway. Status uncertain.
1115155	316		Vacant residential land	Vacant Land, LOC 320? Sydney Highway. Status uncertain.
1115199	200		Unknown or Not Used	
1115200		218	Unknown or Not Used	
1128477		239	Storage	JALAN JUKONG

Table 3: Polygons in the cadastre shapefile which do not have matching Ground Audit records

A_pin	B_piparcel
1115590	P018500 102
1115592	P018500 102
1189457	R 44525
1194332	COCOSL 00323
1199121	COCOSL 00325
1199123	V CROWN LAND
1215182	COCOSL 00328
1215186	COCOSL 00326
1215187	COCOSL 00327
1290328	L 338 20062
1291303	
1291304	V CROWN LAND

Table 4: Ground Audit records that successfully match polygons in the cadastre are listed on the following 90 pages. Page order for columns is 'Down, then over'.

Chapter 7

Appendix 4: Memorandum of Arrangement – Particulars of Services

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

Chapter 8

Appendix 5: Data Licensing and Agreements

Data Licensing and Agreements

The collection of nearly all the data sets on the four CD-ROMs comprising the Cocos GIS was commissioned by the Territories Office (Commonwealth Government) under a series of consultancy arrangements with various data suppliers over the past thirteen years. An exception is the Environment Australia Marine Environment data layer. The Cocos GIS is an assembly of multiple data collections (each of which may comprise some man-years of work) into a single easy-to-use integrated system and so represents a valuable Commonwealth asset.

Commonwealth Cocos GIS data licence

The copyright for all the data in the Cocos GIS resides with the Commonwealth (see data acknowledgments on page 5). A key purpose of the Cocos GIS licensing is that the user organisation signifies their acceptance that the data is not error free. This licence relates to all the data except the original content of the Environment Australia (EA) marine data for which a separate EA licence must be used. To simplify usage of the Cocos GIS, the EA data has been moved to CD-ROM 4, which is is not included in the standard Cocos GIS distribution.

On receipt, this data should have been received with two copies of the license agreement. One original signed copy of the Commonwealth Cocos GIS data licence is to be retained by the licensee and one original signed copy is to be posted back. An electronic copy of the Commonwealth Cocos GIS data licence (for reference) is stored on the Cocos GIS CD-Rom #1 at directory '\document\licenses' in file 'cocosgis_license.doc '.

COMMONWEALTH DEPARTMENT OF
TRANSPORT AND REGIONAL SERVICES

1901-2001
Centenary of Federation

Our Reference: COCOS2001
Contact: Mr. Peter Lawler

Wednesday, 11 July 2001.

Organisation name:
Organisation address:

Dear Sir/Madam,

Thank you for your request for Territories Office to supply *Organisation name* with a copy of the Cocos (Keeling) Islands GIS ('Licensed Data'), which is in the package accompanying this letter.

Territories Office offers *Organisation name* a right to use the Data in accordance with the Licence Terms enclosed with this letter. A copy of the Licence Terms is also inside the package.

BEFORE OPENING THE PACKAGE, all of the Licence Terms should be read and accepted by the User, or an authorised representative of the User. Acceptance of the Licence Terms is indicated by the User's authorised signature in the space provided below on both copies of this letter, and returning one copy to Territories Office. A fee waiver is granted for Use by *Private Organisation*, however such Use is limited to work for the Commonwealth. Use of the data by *Private Organisation* for other clients requires a separate negotiation. *OR* A fee waiver is granted for Use by *Government Organisation*, however provision of new data back to the Cocos GIS pool by *Government Organisation* is expected in return.

If the Data is used, then acceptance of the Licence Terms is deemed to have occurred even if the acceptance procedure described in the preceding paragraph has not been followed.

If the Licence Terms are unacceptable, then the package, together with both copies of this letter should be immediately returned to Territories Office and the Data must not be Used by any person for any purpose. This data licence is not intended to affect the terms of, or any obligation of the parties under any separate services agreement already in place between DoTRS and *Organisation name*.

Yours Faithfully

Mr. Keith Porritt
Australian Geological Survey Organisation
representing the Commonwealth of Australia
for Territories Office
Date:

……
User / User's Authorised Representative
Name:

Position in User's Organisation:

Date:

LINKING AUSTRALIA

GPO Box 594 Canberra ACT 2601 Telephone: (02) 6274 7111 Facsimile: (02) 6257 2505
www.dotrs.gov.au ABN 86 267 354 017

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from
the Territories Office of the Commonwealth Department of Transport and Regional Services
('Licence')

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'Fee' means the fee payable to Territories Office for the right to use the data in accordance with this Licence.

'including' is not a word of limitation.

'Licensed Data' means Territories Office's data, including metadata and documentation, supplied by Territories Office under the letter from Territories Office to which these Licence Terms are attached.

'Use' as a noun means any use or disclosure, and, as a verb, has an equivalent meaning.

'User' means any person who Uses the Data, or, if the Use is in connection with the person's employment, the person's employer.

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(b) may, on a non-exclusive basis, use and disclose the Data only for the User's internal business purposes carried out in person by its employees, or by the User's consultants exclusively for work on the User's internal business, or, if the User is an individual, the User's personal use ('**Purpose**');
(c) may make back-up copies of the Data; and
(d) must not, except as provided under **paragraph (b)**, distribute or transmit the whole or any part of the Data, whether alone or in combination with any other data or information in any form, to any person.

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When this Licence ends the User must return or destroy all copies of the Data in its possession or under its control.

APPLICABLE LAW

This Licence will be interpreted according to the laws of the Australian Capital Territory, Australia.

ALTERATION

This Licence be altered only in writing signed by Territories Office and an authorised representative of the User.

WAIVER

Waiver of any provision or right under this Licence:

(a) must be in writing signed by the party entitled to the benefit of that provision or right; and
(b) is effective only to the extent set out in the written waiver.

ENTIRE AGREEMENT

This Licence:
(a) constitutes the entire agreement between Territories Office and the User as to its subject matter; and
(b) in relation to that subject matter, supersedes any prior understanding or agreement between Territories Office and the User and any prior condition, warranty, indemnity or representation imposed, given or made by Territories Office or the User.

UN CONVENTION

Territories Office and the User agree that the provisions of the United Nations Convention on Contracts for the International Sale of Goods are expressly excluded from this Agreement.

DISPUTE RESOLUTION

The parties (meaning Territories Office and the User) must attempt to resolve any dispute or difference that may arise between them in relation to this Agreement (**'Dispute'**) through amicable consultation, based on principles of mutual benefit, equality, cooperation and trust. Accordingly, a party must not start arbitration or court proceedings (except proceedings seeking interlocutory relief) about a Dispute unless it has complied with the following **paragraphs (a) - (e)**:

(a) A party claiming that a Dispute has arisen must notify the other party to the Dispute giving details of the Dispute (**'Notification'**);
(b) On receipt of a Notification each party must negotiate in good faith to resolve the Dispute and, if necessary to resolve the Dispute, involve the Chief Executive Officers

or other senior officers of the parties directly in those negotiations;

(c) If the Dispute involves technical matters and has not been resolved by negotiations under paragraph (b) within a reasonable time, then the parties will refer the Dispute for determination by an independent expert agreed by the parties in the technical field the subject of the Dispute;

(d) If the Dispute is not resolved under **paragraph (b) or (c)** within thirty days (or longer period agreed between the parties), and if the User's principal address is in Australia, then the parties must refer the Dispute for mediation by the Australian Commercial Dispute Centre Limited ('ACDC') for resolution in accordance with the Mediation Rules of the ACDC;

(e) If the Dispute is not resolved under **paragraph (b) or (c)** within thirty days (or longer period agreed between the parties), and if the User's principal address is not in Australia, then the parties must refer the Dispute to arbitration for resolution in accordance with the UNCITRAL Model Law on International Commercial Arbitration. Notwithstanding any provision of the UNCITRAL rules to the contrary, the parties agree that:

(i) the number if arbitrators shall be one;
(ii) the place of arbitration will be Canberra, Australian Capital Territory, Australia;
(iii) all proceedings will be conducted in the English Language;
(iv) the applicable law is the law of the Australian Capital Territory; and
(v) the determination of the arbitrator shall be final and binding on the parties and the costs of the arbitration shall be borne and paid for as the arbitrator directs.

(f) If the Dispute is not resolved under **paragraph (d) or (e)** within sixty days after referral (or longer period agreed between the parties) either party may initiate proceedings in a court

FURTHER INFORMATION

Historical information may be contained in the Data, metadata or documentation of the Data. If the User requires further information about the Data or it's history, then contact

Mr. Peter Lawler,
Policy - Indian Ocean Territories,
Department of Transport and Regional Services.
Ph: 02 6274 8023
Fax: 02 62748065
Email: peter.lawler@dotrs.gov.au

Environment Australia Marine Data licence.

For each organisation the current Cocos GIS CD-ROM 4 is to be passed to, the following licence agreement with Environment Australia (EA) need first be signed by a representative of the organisiation. This license specifically relates to the marine data sourced from EA. The EA system refers to this data set as the ' Whelans Cocos GIS (1998)'.

An electronic copy of the EA data licence is stored on the Cocos GIS CD-Rom #1 at directory '\document\licenses' in file 'ea_marine_data_licence.doc'. Details for the licensee organisation need be entered in the following fields on the document:-

Name/Title:	[enter your – Name]
Company/Organisation:	[enter your – Organisation]
Address:	[enter your – Address]
Telephone:	[enter your – Telephone]
Facsimile:	[enter your – Fax]
E-mail Address:	[enter your – Email]
The Data will be used by the Licensee for:	[enter your – Data Use]

Licensees would generally need to fill the 'Data Use' item themselves. However, all the other items in the document could be edited in advance to correctly describe the particular proposed licensee and two copies printed for packaging with the data as per the advice in the covering letter.

One original signed copy of the EA agreement is to be retained by the licensee and one original signed copy is to be posted to:-

Mr. Keith Porritt
Australian Geological Survey Organisation
GPO Box 378,
CANBERRA ACT 2601

in accordance with the current dispensation by Environment Australia for AGSO to distribute the revised Cocos GIS data on behalf of the Department of Transport and Regional Services, including the data for which Environment Australia is custodian.

Environment Australia
Department of the Environment and Heritage

Agreement for the Supply of Data

Important: The completed Schedule and Licence Conditions set out below will constitute a legal agreement between the Commonwealth of Australia ("the Commonwealth") and you ("the Licensee") in relation to the data. If you agree with the Conditions, please tick the 'Agreed' box, sign and date beside it and ensure your licensee details are filled out below.

If you are entering into this agreement on behalf of a company or organisation, you warrant that you have the authority to do so.

Agreed

Not Agreed

The Schedule

Date:

Commonwealth

The Commonwealth of Australia is represented by the Department of the Environment and Heritage. The contact details are:

Name/Title: Gavan Thomas, Project Officer

Address: Environmental Resource Information Network (ERIN)
Environment Australia
GPO Box 787 Canberra ACT 2601

Telephone: 02 6274 2736
Facsimile: 02 6274 1333

Email Address: gavan.thomas@ea.gov.au

Licensee

Name/Title: *[enter your – Name]*

Company/Organisation: *[enter your – Organisation]*

Address: *[enter your – Address]*

Telephone: *[enter your – Telephone]*

Facsimile: *[enter your – Fax]*

Email Address: *[enter your – Email]*

The Data

The data is referred to as the 'Marine Environment' data in the AGSO-DoTRS Cocos GIS. The ERIN system refers to the data as the ' Whelans Cocos GIS (1998)'.

This dataset contains point, line and polygon data of the marine environment surrounding the Cocos (Keeling) Islands. It includes coastlines, bathymetric contours, coral outcrops and other features. Coverage extends to the whole of Cocos Keeling Isalnds. The themes have been grouped by AGSO into the following shapefiles so as to increase the ease of use of the data:

Infralin.shp - Infrastructure lines
Boundlin.shp - Boundary lines
Marinelin.shp - Marine lines
Surveylin.shp - Survey lines
Islandlin.shp - Island outlines
Marineply.shp - Marine polygon
Islandply.shp - Island polygon
Boundply.shp - Boundary polygon

These shapefiles retain all spatial and non spatial data as supplied to AGSO.

Data are provided in shape file format and also as ERIN originally supplied in a zip of ARC export files. Both formats are supplied on CD-ROM No.1 of the Cocos GIS produced in 2000 by AGSO for Territories Office. Accompanying metadata for the data is also supplied.

Contributors

Item: 'Marine Environment' data referred to by ERIN as the ' Whelans Cocos GIS (1998)'.

Contributor: AGSO
Data was received by AGSO from ERIN as ArcInfo Export files. AGSO converted the data to shape file format. AGSO projected the data to CKIG92 with a coordinate shift to match the Cadastre (assuming it was received as UTM Zone 47 WGS72).
The many individual layers were checked and those of similar themes were then grouped to provide a smaller set of layers, thus making the data more useable.
The North Keeling atoll was translated and warped to more accurately match the orthophotography. Line themes were built into polygons to allow areas to be queried.

Additional Conditions: The I.P. for work done on the data by AGSO is not covered in this licence agreement between your organisation and EA. A separate agreement with

the Commonwealth may apply to this particular component of I.P. in conjunction with the remainder of the AGSO-DoTRS Cocos GIS data.

Use

The Data will be used by the Licensee for:

[enter your – Data Use]

Licence Conditions

1 Interpretation

1.1 In these Conditions, unless the contrary intention appears:

"Commercialise" in respect of the Data or a product or service derived from the Data, includes distributing, giving away, selling, letting for hire, or by way of trade, offering or exposing for sale or hire any article embodying the Data or any product or service derived from or incorporating the Data;

"Contributor" means:

I. (in relation to the Commonwealth) an agency of the Commonwealth which is custodian of a particular item of Data on behalf of the Commonwealth; or

II. third party contributors

identified in the Schedule to this Agreement as having provided particular items of Data which are the subject of this Licence Agreement;

"Data" means the data to which access is made available, and which is listed in the Schedule and includes any Enhancements to the Data;

"Enhancement", in relation to the Data, includes any modification, adaptation or redevelopment of the Data, any work derived from the Data, machine readable representations of any of the foregoing and any associated material intended at the time of its creation to be used primarily in conjunction with the Data;

"Intellectual Property" includes all copyright, and all rights in relation to registered and unregistered trademarks (including service marks), registered designs and confidential information (including trade secrets and know-how), and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields;

"Licence" means the licence referred to in Condition 3.

2 Duration

2.1 The Licence commences on the date of the Agreement as set out in the Schedule, and continues in force for a period of five (5) years unless terminated in accordance with Condition 10.1.

3 Licence Conditions

3.1 The Commonwealth grants to the Licensee, a royalty-free, non-exclusive, non-transferable licence to use, reproduce, make Enhancements to and print the Data, and combine it with other data held by the Licensee.

3.2 The Licence is limited to personal use of the Data or use within the Licensee's organisation only.

3.3 The Licensee shall not Commercialise the Data or any product or service derived from the Data.

3.4 The Commonwealth warrants that the grant of the Licence does not infringe the Intellectual Property rights of any person and that it is entitled to grant the licence in relation to the data of third party Contributors.

3.5 Data items identified in the Schedule as having been provided by individual Contributors are subject to the additional conditions (if any) set out in the Schedule. In the event of any conflict between the terms of the Licence Conditions and any additional condition set out in the Schedule, the terms of the Licence Conditions shall take precedence.

4 Intellectual Property Rights Reserved

4.1 All rights not expressly granted to the Licensee under Condition 3 are reserved.

4.2 The Licensee acknowledges that the Data is a special, unique and valuable product in which the copyright and other applicable Intellectual Property rights vest in the Contributors as listed in the Schedule.

4.3 The Contributors of items of Data retain ownership of that Data, whether in its original form or as modified by the Licensee and of the Intellectual Property rights therein.

4.4 Intellectual Property in any Enhancement to the Data vests, upon its creation, in the Contributor named in the Schedule in relation to the relevant item of Data.

5 Custody of the Data

5.1 The Licensee shall maintain the Data in safe custody.

5.2 The Licensee shall take all reasonable steps to ensure that any person given access to the Data is aware of these Conditions and uses the Data only in accordance with this Agreement.

6 Precautions

6.1 THE COMMONWEALTH CANNOT GUARANTEE THAT THE DATA, INCLUDING ANY THIRD PARTY DATA, IS FREE FROM ERRORS, AND DOES NOT WARRANT THE QUALITY, PERFORMANCE OR SUITABILITY OF THE DATA FOR ANY PURPOSE.

6.2 THE LICENSEE ASSUMES RESPONSIBILITY FOR SELECTION OF THE DATA TO ACHIEVE ANY INTENDED RESULTS, AND FOR ITS USE.

6.3 THE LICENSEE ASSUMES RESPONSIBILITY FOR THE INTERPRETATION OF ANY RESULTS OBTAINED FROM USE OF THE DATA, AND MUST EXERCISE ALL APPROPRIATE PRECAUTIONS BEFORE PLACING RELIANCE ON THOSE RESULTS.

7 Release and Indemnity

7.1 THE LICENSEE:

A) RELEASES THE COMMONWEALTH, ITS OFFICERS, EMPLOYEES AND AGENTS AND ALL CONTRIBUTORS IN RESPECT OF ALL LIABILITY FOR LOSS, DAMAGE OR INJURY, WHICH MAY BE SUFFERED BY THE LICENSEE OR ARISING FROM THE LICENSEE'S USE OF THE DATA; AND

B) INDEMNIFIES THE COMMONWEALTH, ITS OFFICERS, EMPLOYEES AND AGENTS AND ALL CONTRIBUTORS IN RESPECT OF ALL LIABILITY FOR LOSS, DAMAGE OR INJURY, WHICH MAY BE SUFFERED BY ANY PERSON ARISING FROM THAT PERSON'S USE OF THE DATA.

8 Retention of Notices

8.1 The Licensee shall not remove, obscure or interfere with any copyright notice, trademark, warning or disclaimer incorporated in the Data.

9. Commercial Exploitation

9.1 The licensee shall not Commercialise the Data or any product or service derived from incorporating the Data without the prior written consent of the relevant Contributor(s).

9.2 A Contributor may grant or refuse consent in their absolute discretion and subject to any condition whatsoever, including payment of royalties.

9.3 Any of the Data or any product or service derived from incorporating the Data which is Commercialised in accordance with this clause, must be accompanied by or incorporate an appropriate acknowledgment of the Contributor as the source of the Data in the terms specified in the Schedule.

10 Termination

10.1 If the Licensee breaches any of these Conditions, the Commonwealth may terminate the Agreement immediately by notice in writing to the Licensee.

10.2 The termination of the Agreement under Condition 10.1 shall be without prejudice to the rights of either party accrued under the Agreement prior to termination.

10.3 The Licensee shall cease using the Data for any purpose from the date of termination of the Agreement and shall return the Data and any copies made of it to the Commonwealth within 30 days of the date of termination.

11 Entire Agreement

11.1 The Agreement supersedes all prior agreements and understandings between the parties relating to the Data and Data Products and constitutes the entire agreement between the parties.

12 Variation

12.1 No addition to or modification of any provision of the Agreement shall be binding unless in writing signed by both parties.

13 Assignment

13.1 The rights granted under the Licence are restricted solely to the Licensee and may not be assigned, transferred or sublicenced without the prior written consent of the Commonwealth.

13.2 The Commonwealth may grant or refuse consent in its absolute discretion and subject to any condition whatsoever.

14 Law

14.1 The Agreement shall be governed by and construed in accordance with the laws of the Australian Capital Territory.

15 Waiver

15.1 No forbearance, delay or indulgence by a party in enforcing the provisions of the Agreement shall prejudice or restrict the rights of that party, nor shall waiver of those rights operate as a waiver of any subsequent breach.

16 Severance

16.1 Any reading down or severance of a particular provision does not affect the remaining provisions of the Agreement.

17 Application

17.1 Where the Licensee is an agency of the Commonwealth of Australia, such that it is not permitted to enter into a binding legal agreement except as the Commonwealth, then the conditions shall be read as merely giving rise to an arrangement between the Department of the Environment and Heritage and the Licensee.

Territories Office—DOLA Arrangement for cadastre

Through Territories Office, the Commonwealth pays the Western Australian Department of Lands Administration (DOLA) to maintain the cadastre as passed from Australian Land Information Group (AUSLIG) in 1992. Following is a copy of the Arrangement under which Territories Office contract DOLA to do this work.

Chapter 9

Appendix 6: Land Use Plan 1992 Data Documentation

Note: This land use plan was converted to digital form by AGSO by a scan/OCR process from a hard copy original: formatting will vary slightly and some errors may exist.

Cocos (Keeling) Islands

Geographic Information System Database
Accompanying Documentation

Cocos (Keeling) Islands

Geographic Information System Database
Accompanying Documentation

Prepared by P. Kendall

Environmental Planning Unit
National Capital Planning Authority

February 1992

BACKGROUND

The National Capital Planning Authority, between November 1991 and March 1992, assisted the Commonwealth Department of Arts, Sport, Environment, Tourism and Territories in preparing a draft plan for the Cocos (Keeling) Islands. As part of the planning study, a geographic information system (GIS) database was established in order to prepare base and thematic maps and to enable the production of high quality figures to illustrate the planning report and to present the plans for public consultation.

The database contains many layers of environmental and planning information and has a range of potential uses beyond the planning exercise. DASETT subsequently briefed the NCPA to carry out some additional work to adapt the database for its ongoing purposes and to make the database available through the Department's ERIN computer network.

The GIS database was created using the software package pc ARC/INFO and can be readily translated for use on other ARC/INFO hardware platforms and under other GIS software systems. The brief required the provision of files in ARC/INFO export format and in 20 metre grid format, both on floppy disk media.

It is currently proposed that data layers will be added to the database when these become available from the Australian Survey and Land Information Group (AUSLIG). In particular, this additional data will include cadastral information which can replace the temporary cadastral covers prepared for the planning study. Other data layers should complement those currently in the database.

This documentation explains the general features of and structure and content of the database, together with some notes to assist in its future use through ERIN.

GENERAL FEATURES OF THE DATABASE

The database consists of 48 covers, 11 of which are simple base covers used for building more complex thematic maps and for defining map extents when using ARCPLOT. A further 6 covers are used mainly as the foundations for adding details such as topography, cadastral boundaries, roads and utilities to thematic maps. The remaining covers comprise 14 covers providing 11 resource map layers and 17 covers providing four land use and planning layers.

So as to provide flexibility in the preparation of map compositions at different scales and showing different features, the land use and planning layers each consist of separate covers for each of the main islands or island groups (ie West Island, Home Island, South Island, the small islands between South and Home Islands, Direction/Horsburgh Islands and North Keeling). Not all islands are represented in each data layer. This was so particularly where there were no features to show on particular islands or an alternative cover from a different layer could be used in a map composition to complete the full atoll coverage. Most of the remaining coverages include all of the southern Cocos atoll.

North Keeling, because of its geographic isolation is always included as a separate cover and represented in map compositions as an inset rather than in its correct location. Only a few of the thematic layers have been compiled for North Keeling. There is little mapped information available for this island and no air photo or field mapping was undertaken during the planning study.

All of the covers are topologically structured and checked for correct polygon closure and labelling. However, in some instances not all polygons have attribute information, where this was found to be unnecessary.

The accuracy of the data are sufficient for planning purposes and are largely governed by the accuracy of existing map sources. Only limited field checking had been undertaken during a one week visit to the islands. Detailed mapping would need to be undertaken for management purposes particularly related to public utilities and services infrastructure, using detailed plans (in non-digital form) held by ACS in Perth.

STRUCTURE AND CONTENT OF THE DATABASE

The information is summarised in two parts in the accompanying attachments. The first is a tabular description of the ARC/INFO coverages which includes details on map extent and coverage features. The second is a description of the map layers by theme, which includes details on covers and feature included, where the information was obtained and its accuracy, attribute classifications and lists of associated lookup tables, key files and macro files for generating the map compositions for the report figures and presentation maps.

USE OF THE DATABASE

Use of the database in its basic form will require a working knowledge of ARC/INFO, particularly for complex queries, preparation of catographic output, updating and further development. Simple automated queries by non-skilled operators using ARC/INFO would require the development of a set of macros designed for user-friendly operation. However, this would require identification of the types of standard queries by users. The use of the new ESRI product ARCVIEW should enable easy use of the database for some queries, without the need for a detailed knowledge of ARC/INFO.

All coverages should function correctly without modification on ARC/INFO platforms once imported. However, there are a number of enhancements which could be made to make better use of the additional features and capabilities of the full ARC/INFO package.

It may be simpler for the user, if some of the covers were combined (by MAPJOIN) to create full atoll coverages for each theme, particularly for use on more powerful hardware platforms where display speed and storage space are less critical than is the case on a pc. This would achieve the same result without having to specify multiple coverages to create a map composition for the whole atoll.

Since the annotation for specific islands was sized to suit the map compositions required, there will be incompatibility in the sizing when covers are joined. This can be fixed easily by using the select and calculate commands in **ARCEDIT.**

Some macros (SML's) are included in the set of files. These have been developed specifically for producing plot files (these were developed to produce the figures in the planning report or the presentation maps). They are included to provide examples of map compositions. Several modification would be required to convert them to workable AML's, including changes to pc SML lines not recognised by ARC/INFO, changes to textfonts, textsets, shadesets, etc and commands for creating plot files. However, most ARCPLOT commands would not need to be changed.

The lookup tables and key files are specifically set up to use the 100 shades in the COLOR shadeset in pc ARC/INFO. They would need to be amended for other shadesets. A few lookup and key files have been included which were developed for use with the CMYK shadeset on the NRIC computer system. They apply only to the land use and planning map covers.

In some instances a parallel set of SML's, key files and coverage annotation levels have been prepared using the Cocos-Malay language. The annotation levels are normally on or two levels higher than the English version and the SML and Key files contain an M at the end of the file name to distinguish them.

Attached are some sample SML's and AML's used for creating map compositions for the planning scheme maps. The full set of SML's is included on the disks provided.

SUMMARY OF COVERS IN DATABASE

COVER NAME	EXTENT	FEATURES	FEATURE CLASS	ATTRIBUTES	ANNOTATION
ISLANDS	Southern atoll	Coastlines	Polygons	None	Island names Level 1 - English Level 2 - Malay
NORTHK	North Keeling	Coastline	Polygon	None	Island name (as above)
WEST	West Island	Coastline	Polygons	None	None
SOUTH	South Island	Coastline	Polygons	None	None
HOME	Home Island	Coastline	Polygons	None	None
NORTH	Horsburgh and Direction Isl.	Coastlines	Polygons	None	None
OTHER	Small islands south of Home Island	Coastlines	Polygons	None	None
REEF	Southern atoll	Reef edge	Polygons	None	Identifying label - level 1 - English - level 2 - Malay
NKREEF	North Keeling	Reef edge	Polygons	None	None
LAGOON	Southern atoll	Reef edge, coastlines and lagoon	Polygons	ZONE	None
NKLAGOON	North Keeling	Reef edge, coastline and lagoon	Polygons	ZONE	None
TOPO	Southern atoll	Coastlines, reef flat, lagoon, beaches, swamps	Polygons	FEAT (feature)	None
WESTCAD	West Island	Coastline, lot boundaries and numbers	Polygons	LOTNO (lot number) TENURE	Level 1 - Lot descriptions Level 2 - Lot numbers
HOMECAD	Home Island	As above	Polygons	LOTNO (lot number)	Level 1 - Lot numbers Level 2 - House/Lot numbers

COVER NAME	EXTENT	FEATURES	FEATURE CLASS	ATTRIBUTES	ANNOTATION
ROADS	Southern atoll	Sealed and unsealed roads, cycle path	Lines	TYPE	None
UTILS	Southern atoll	Public utilities and services infrastructure	Points and lines	TYPE LABEL	None
AIRPORT	West Island	Runway and parking area	Polygons	None	None
WATER	West, Home, South and Horsburgh	Known groundwater lenses	Polygons	None	None
EROSION	West Island	Erosion prone coastline Potential breach areas	Lines	CODE	None
VEG	Southern atoll	Coastlines, Native vegetation communities	Polygons	TYPE	None
VEG2	Southern atoll	Coastlines, Vegetation structure	Polygons	STRUC	None
HABITAT	Southern atoll	Migratory bird habitats	Polygons	TYPE	Species information and notes
MARINE	Southern atoll	Coastlines, Marine habitats	Polygons	TYPE CODE	Polygon codes
MARRES	Southern atoll	Coastlines, important marine areas	Polygons	TYPE	Identifying labels
MARRES2	Southern atoll	Coastlines, marine habitats (similar to MARRES)	Polygons	TYPE CODE	None
RECRES	Southern atoll	Coastlines, recreation facilities and water-based activities	Polygons	TYPE	Identifying labels
SITES	Southern atoll	Heritage sites	Points	TYPE	Identifying labels
NKSITES	North Keeling	Heritage site	Points	TYPE	Identifying label
SITES2	Home Island	Heritage sites	Polygons	TYPE	None
TOURIST	Southern atoll	Proposed tourist development areas	Polygons	None	Identifying labels

COVER NAME	EXTENT	FEATURES	FEATURE CLASS	ATTRIBUTES	ANNOTATION
RUBBISH	Southern atoll	Coastlines, rubbish problem areas	Polygons	DUMP	None
WESTUSE2	West Island	Coastline, cadastral boundaries existing land use	Polygons	USE (land use category)	Identifying labels
HOMEUSE2	Home Island	as above	Polygons	as above	as above
NORTHUSE	Horsburgh and Direction Islands	as above	Polygons	as above	as above
SOUTHUSE	South Island	as above	Polygons	as above	Legend symbols
OTHERUSE	Islands south of Home Island	as above	Polygons	as above	None
NKUSE	North Keeling	as above	Polygons	as above	None
WESTOPT	West Island	Coastline, planning options	Polygons	OPT (options category)	Level 1 - English notes Level 2 - English legend symbols Level 3 - Malay notes Level 4 - Malay legend symbols
HOMEOPT	Home Island	as above	Polygons	as above	Level 1 - English notes Level 2 - Malay notes
NORTHOPT	Horsburgh and Direction Islands	as above	Polygons	as above	Level 1 - English notes Level 2 - English legend symbols Level 3 - Malay notes Level 4 - Malay legend symbols
WESTPREF	West Island	Coastline, preferred planning options	Polygons	OPT (options category)	as above
HOMEPREF	Home Island	as above	Polygons	as above	Level 1 - English notes Level 2 - Malay notes
NORPREF	Horsburgh and Direction Islands	as above	Polygons	as above	Level 1 - English notes Level 2 - English legend symbols Level 3 - Malay notes Level 4 - Malay legend symbols

COVER NAME	EXTENT	FEATURES	FEATURE CLASS	ATTRIBUTES	ANNOTATION
WESTZONE	West Island	Coastline, statutory land use plan	Polygons	ZONE (zone and reserve categories)	as above
HOMEZONE	Home Island	as above	Polygons	as above	Level 1 - English legend symbols Level 2 - Malay legend symbols
NORZONE	Horsburgh and Direction Island	as above	Polygons	as above	as above
OTHZONE	Islands south of Home Island	as above	Polygons	as above	None
SOUZONE	South Island	as above	Polygons	as above	Level 1 - English legend symbols Level 2 - Malay legend symbols

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DESCRIPTION OF RESOURCE AND LAND USE MAP LAYERS

TOPOGRAPHY

COVER: **TOPO**

FEATURES: Island coastlines, semi-saline swamps, beaches (sand or coral rubble below high water mark), edge of reef flat and lagoon with attributes to identify features

SOURCES AND ACCURACY: 1:10,000 cadastral maps for coastlines of all islands except South Island and North Keeling other features from 1:25,000 topo maps and air photos. Note - constant coastline changes mean that the current coastline may not be accurately represented in published maps. Some minor changes have been made to reflect the effects of recent lagoon filling on West and Home Island. The 1:10,000 cadastral maps show the coastline above HWM while the1:25,000 topo maps show the coastline at LWM. Only the South Island coastline was digitized from the 1:25,000 maps.

ATTRIBUTES: FEAT (topographic features)

1 Reef flat and lagoon
2 Islands above HWM
3 Beach
4 Semi-saline swamp
5 Deep hole in lagoon

LOOKUP TABLE: TOPO.LUT (pc ARC/INFO - shadeset COLOR)

CADASTRAL

COVERS: **WESTCAD, HOMECAD**

FEATURES: Lot boundaries and lot numbers with attributes to identify lot numbers and land ownership

SOURCES AND ACCURACY: 1:10,000 cadastral maps of West and Home Islands supplemented by survey plans for individual lots and 1:1000 detail map of Home Island settlement. Note: Cadastral mapping is being undertaken by AUSLIG and will replace these temporary covers when available

ATTRIBUTES: LOTNO – as defined on cadastral plans

TENURE

1 Commonwealth Owned
2 Council land licenced to Commonwealth
3 Council Land

LOOKUP TABLE: CAD.LUT (pc ARC/INFO - shadeset COLOR)

KEY FILE: CAD.KEY

SML: WESTTEN.SML (creates plot file used in report)

ROADS

COVER: **ROADS**

FEATURES: Sealed and unsealed roads and cycle path with attributes to identify type

SOURCES AND ACCURACY: Detailed maps of settlement areas on West and Home Islands, 1: 10,000 cadastral map for Sydney Highway and 1:25,000 topo maps for other roads and tracks. Cyclepath was field mapped.

ATTRIBUTES: TYPE (road type) - line features

1 Sydney Highway
2 Other sealed roads
3 Other roads and tracks
4 Cycle path

LOOKUP TABLE: ROADS.LUT

UTILITIES AND SERVICES

COVER: **UTILS**

FEATURES: Line features - jettys, boat ramps, seawalls and breakwaters, sewer outfalls and fuel pipeline

Point features - power stations, radio masts, navigation beacons, bores, sand and gravel pits and associated services buildings

Both are identified in attribute tables by type code and text label.

SOURCES AND ACCURACY: Detailed maps of settlement areas on West and Home Islands and 1:25,000 topo maps for other areas plus some air photo and field mapping

ATTRIBUTES: TYPE - Line features

1 Boat ramps and jettys
2 Breakwaters and seawalls
3 Pipelines

TYPE - Point features

1 Power supply facility
2 Communication facility
3 Navigation facility
4 Navigation buoy
5 Water supply facility
6 Services building
7 Fuel storage tanks
8 Sand or gravel pit

LABEL - text descriptions of both line and point features

LOOKUP TABLES: UTIL.LUT, UTIL2.LUT (pc ARC/INFO)

KEY FILES: UTIL.KEY, UTIL2.KEY

COVER: AIRPORT

FEATURES: Runway and aircraft parking area

SOURCES AND ACCURACY: 1:4000 survey map of West Island settlement area

ATTRIBUTES: None.

WATER RESOURCES

COVER: WATER

FEATURES: Extent of known groundwater lenses

SOURCES AND ACCURACY: Boundaries as mapped by T. Falkland in reports to DASETT
Note - many boundaries are based on predicted extent rather than precise location.

ATTRIBUTES: None (Note - bores and wells are mapped as point features in the cover UTILS).

KEY FILE: WATER.KEY

SML: WATER.SML (creates plot file used in report)

EROSION

COVER: EROSION

FEATURES: Erosion prone coastline and potential breach areas on West Island (Note - no major erosion problems on other islands have been noted)

SOURCES AND ACCURACY: Generalised areas based on advice from ANPWS Conservator (P. Stevenson) and field inspection of some locations

ATTRIBUTES: CODE (Erosion category)

1 Erosion prone coastline
2 Potential breach zones

LOOKUP TABLE: EROSION.LUT (pc ARC/INFO - shadeset COLOR)

KEY FILE: EROSION.KEY

SML: WESTDUMP.SML (creates plot file used in report, combined with cover RUBBISH, for West Island only)

VEGETATION

COVER: VEG

FEATURES: Remnant native vegetation and stands of *Pemphis* on sandbanks in lagoon

SOURCES AND ACCURACY: 1:25,000 maps by D. Williams showing *Pemphis* community on one map and 14 classes of remnant vegetation on another. Both maps were corrected for distortion when digitized by refererence to AUSLIG 1:25,000 topo maps. Note - North Keeling is assumed to have mainly native vegetation but information on types was not available during the planning study.

ATTRIBUTES: TYPE (vegetation classification) - see D. Williams report for explanation of types A to N

0	Other vegetation
1	Pemphis
2	Remnant veg type A
3	Remnant veg type B
4	Remnant veg type C
5	Remnant veg type D
6	Remmant veg type E
7	Remnant veg type F
8	Remnant veg type G
9	Remnant veg type H
10	Remnant veg type 1
11	Remnant veg type J
12	Remnant veg type K
13	Remnant veg type L
14	Remnant veg type M
15	Remnant veg type N

LOOKUP TABLE: VEG.LUT (pc ARC/INFO - shadeset COLOR)

KEY FILE: VEG.KEY

SML: VEG.SMI (creates plot file used in report, which includes VEG2 cover)

COVER: VEG2

FEATURES: Simplified vegetation structure including cleared areas which are predominantly grassed or built up, sparsely treed areas (mostly coconut palms), densely treed areas (coconut plantations) and semisaline swamp communities (mostly unvegetated mudflats with dense fringing shrub cover)

SOURCES AND ACCURACY: Mostly generalised boundaries derived from interpretation of air photographs and field inspection (some areas have been cleared since the 1987 air photos and are not shown on previous maps hence boundaries are only approximate - based on brief field inspection). Note - a more detailed mapping of vegetation structure would be required for detailed planning and management purposes.

ATTRIBUTES: STRUC (vegetation structure)

1	Cleared land
2	Sparse coconut trees & grass
3	Coconut plantations
4	Shrub cover
5	Settlement area
6	Swamp vegetation
7	Unvegetated beach

LOOKUP TABLE: VEG2.LUT (pc ARC/INFO - shadeset COLOR)

KEY FILE: VEG2.KEY

SML: VEG.SML (creates plot file used in report, which includes VEG cover)

BIRD HABITATS

COVER: **HABITAT**

FEATURES: Habitat areas used by migratory water birds together with some notes on species which are found in certain locations

SOURCES AND ACCURACY: Generalised boundaries based on the advice of ANPWS Conservator (P. Stevenson).

ATTRIBUTES: TYPE (habitat type)

1 Migratory birds

SML: HABITAT.SML (creates a plot file)

MARINE HABITATS

COVER: **MARINE**

FEATURES: Marine habitat classification as mapped and classified by D. Williams with a generalised grouping into reef slope, reef flat and lagoon. Note - no marine habitats classificiation was available for North Keeling, however, the edge of the reef was digitized from the AUSLIG 1:5000 topographic map of North Keeling and is included in the cover NKREEF.

SOURCES AND ACCURACY: 1:25,000 map by D. Williams, based on a classified SPOT satellite image. The map was corrected for distortion when digitized by refererence to AUSLIG 1:25,000 topo maps.

ATTRIBUTES: TYPE (generalised grouping of habitats)

1 Islands
2 Reef slope
3 Reef flat
4 Lagoon

CODE (habitat classification)

A Outer reef
B Coral and algal flat
C Coral flat

D	Aligned coral flat
E	Seagrass flat
F	Prograding sand sheet
G	Intertidal sand & silt flat
H	Seagrass sand & silt flat
I	Seagrass flat
J	Coral and algal flat
K	Blue hole mosaic 1
L	Blue hole mosaic 2
M	Blue hole mosaic 3
N	Algal covered staghorn
O	Massive coral outcrops
P	Emergent reef
Q	Sandy lagoon floor
R	Sand shoal
S	Sandy with seagrass
T	Seagrass bed
U	Seagrass bed - Syringodium
V	Mixed seagrass and algal bed
Y	Unidentified (code missing in original map)
Z	Islands

LOOKUP TABLE: MARTYPE.LUT (for TYPE) (pc ARC/INFO - shadeset COLOR)
MARINE.LUT (for CODE) (pc ARC/INFO – shadeset COLOR)

MARINE RESOURCES

COVER: **MARRES**

FEATURES: Important marine features including the navigation channels, 'The Rip', reef flat replenishment zone and fish nursery, which combine with the features in MARRES2 cover to produce the MARINE RESOURCES map used in the planning report

SOURCES AND ACCURACY: Generalised areas based on advice from ANPWS Conservator (P. Stevenson)

ATTRIBUTES: TYPE

0	Islands
1	The rip
2	Boat channel
3	Reef flat replenishment zone

LOOKUP TABLE: MARRES.LUT (pc ARC/INFO - shadeset COLOR)

SML: MARRES.SML (creates plot file for map used in report - combined with cover MARRES2)

COVER: MARRES2

FEATURES: As for MARINE cover, however, the cover was modified to overcome the polygon size limitation of pc ARC/INFO by subdividing large polygons. This cover is not needed for use in other ARC/INFO systems since the cover MARINE can be used. For the purposes of preparing a simplified map for the MARINE RESORCES map in the planning report, some habitat codes were grouped as indicated in the attributes section below.

SOURCES AND ACCURACY: As for MARINE cover.

ATTRIBUTES: TYPE AND CODE as for MARINE cover with grouping of codes as follows:

Seaward Reef Slope (A)
Coral and Algal Reef Flat (B, C, D, E)
Prograding Sand Sheet (F)
Intertidal Sand and Silt Flat (G)
Seagrass Flats (H,I,S,T,U, V)
Coral Flat and Patch Reefs (J,N,O,P)
Blue Holes (K,L,M)
Sandy Lagoon Floor (Q R)

LOOKUP TABLE: MARTYPE.LUT (for TYPE) (pc ARC/INFO - shadeset COLOR)
MARRES2.LUT (for CODE) (pc ARC/INFO - shadeset COLOR)

KEY FILE: MARRES2.KEY

SML: MARRES.SML (creates plot file for map used in report - combined with cover MARRES)

RECREATION RESOURCES

COVER: **RECRES**

FEATURES: Major locations of recreation activities including picnic and swimming areas, sailing, surfing, diving, reef walking, sports facilities, and other recreation areas such as the golf course and recreation spaces around West Island settlement. Other open space areas are areas with no specific facilities which are available for informal recreation.

SOURCES AND ACCURACY: Generalised boundaries based on advice from ANPWS Conservator (P. Stevenson) and others and field observations

ATTRIBUTES: TYPE (recreation resource type)

0 Open space
1 Picnic and swimming areas
2 Sports facilities
3 Other recreation space
4 Marine recreation

LOOKUP TABLE: RECRES.LUT (pc ARC/INFO - shadeset COLOR)

KEY FILE: RECRES.KEY

SML: RECRES.SML (creates plot file for map used in report)

HERITAGE SITES

COVERS: **SITES, SITES2, NKSITES**

FEATURES: Sites on the Register of the National Estate (polygons in SITES2 coverage) and other sites of heritage interest (points in SITES coverage) including cemeteries, ship wrecks, monuments and war relics. NKSITES cover includes the wreck of the 'EMDEN'.

SOURCES AND ACCURACY: Generalised locations based on advice of ANPWS Conservator (P. Stevenson) and field inspection of some sites.

ATTRIBUTES: TYPE (heritage site type) - point features in SITES and NKSITES covers

1 Oceania House

2 Cemeterys
3 Memorials
4 Ship wrecks
5 Other sites (guns, cable stn etc)

Note - site names are identified in annotation

TYPE - polygon features in SITES2 cover

1 Sites on the RNE

LOOKUP TABLE: SITES.LUT (pc ARC/INFO)

KEY FILE: SITES2.KEY

SML: SITES.SML (creates plot file for map report, using combination of these covers)

TOURIST RESORT PROPOSALS

COVER: TOURIST

FEATURES: Areas in which tourist resorts have been proposed and studies have been carried out

SOURCES AND ACCURACY: Notional boundaries suggested by proponents but not surveyed in detail

ATTRIBUTES: None

SML: TOURIST.SML (creates plot file for map used in report)

RUBBISH PROBLEM AREAS

COVER: RUBBISH

FEATURES: Areas in which dumped rubbish is a problem, mostly on beaches and in the lagoon

SOURCES AND ACCURACY: Generalised areas based on advice from ANPWS Conservator (P. Stevenson), mostly field inspected but not accurately mapped

ATTRIBUTES: DUMP

1 Rubbish problem areas

KEY FILE: RUBBISH.KEY

SML'S: RUBBISH.SMI, WESTDUMP.SW, HOMEDUMP.SML (createplot files for maps used in report)

EXISTING LAND USE

COVERS: **WESTUSE2, HOMEUSE2, NORTHUSE, SOUTHUSE, OTHERUSE, NKUSE**

FEATURES: Areas classified according to their existing use in the planning study

SOURCES AND ACCURACY: Based on 1:10,000 cadastral map boundaries and detalled maps of settlement areas. Many boundaries were defined during the planning study.

ATTRIBUTES: USE (land use category)

1 Airport
2 Residential
3 Community facilities
4 Commercial
5 Admin. and utility services
6 Industrial and extractive
7 Tourism
8 Recreation facilities
9 Horticulture
10 Open space
11 Roads and carparks
12 Vacant urban land

LOOKUP TABLE: LANDUSE.LUT (pc ARC/INFO - shadeset COLOR)
USE5.LUT (ARC/INFO Rev. 6 - shadeset CMYK)

KEY FILES: LANDUSE.KEY, LANDUSE2.KEY, WESTUSE.KEY, HOMEUSE.KEY (pc ARC/INFO)
USE5.KEY (ARC/INFO Rev. 6)

SML'S: LANDUSE.SML, WESTUSE.SML, HOMEUSE.SML, (create plot files for maps used in report)

AML: LANDUSE5.AML

LAND USE PLANNING OPTIONS

COVERS: **WESTOPT, HOMEOPT, NORTHOPT**

FEATURES: Areas identified in planning study as having potential for particular future uses

SOURCES AND ACCURACY: Based on existing land use covers - boundaries defined during the planning study

ATTRIBUTES: OPT (planning options categories - an extension of the existing land use categories)

1 Airport
2 Housing
4 Commercial Development
6 Industrial Area
7 Tourism Development
11 Roads
12 No specific Use
13 Foreshore Protection
14 Rural/Nature Conservation
15 Commonwealth Sites
16 Existing Settlements

LOOKUP TABLE: OPT.LUT (pc ARC/INFO - shadeset COLOR)
OPT2.LUT (ARC/INFO Rev. 6 - shadeset CMYK)

KEY FILES: OPTIONS.KEY, OPTIONS2.KEY, WESTOPT.KEY, HOMEOPT.KEY (pc ARC/INFO)
OPTIONSM.KEY, OPTIONS2M.KEY, WESTOPTM.KEY, HOMEOPTM.KEY (pc ARC/INFO - Cocos-Malay version)
OPT5.KEY (ARC/INFO Rev. 6)
OPT5M.KEY (ARC/INFO Rev. 6 - Cocos-Malay version)

SML'S: OPTIONS.SML, WESTOPT.SML, HOMEOPT.SML, OPTIONSM.SML, WESTOPM.SML, HOMEOPTMSML (create plot files for maps used in report - last letter ‘M’ of filename indicates Cocos-Malay version)

AML: OPTIONS2.AML

DRAFT LAND USE PLAN

COVERS: **WESTPREF, HOMEPREF, NORPREF**

FEATURES: Areas identified in planning study as being part of the preferred short to medium term planning strategy and included in the Draft Land Use Plan

SOURCES AND ACCURACY: Based on planning options covers - boundaries defined during the planning study

ATTRIBUTES: OPT (planning options categories - an extension of the existing land use categories and the same as used in the planning options covers)

1	Airport
2	Housing
4	Commercial Development
6	Industrial Area
7	Tourism Development
11	Roads
12	No specific Use
13	Foreshore Protection
14	Rural/Nature Conservation
15	Commonwealth Sites
16	Existing Settlements

LOOKUP TABLE: OPT.LUT (pc ARC/INFO - shadeset COLOR)
OPT2.LUT (ARC/INFO Rev. 6 - shadeset CMYK)

KEY FILES: OPTIONS.KEY, OPTIONS2.KEY, WESTOPT.KEY, HOMEPREF.KEY (pc ARC/INFO)
OPTIONSM.KEY, OPTION2M.KEY, WESTOTTM.KEY, HOMEPREM.KEY (pc ARC/INFO - Cocos-Malay version)

OPT5.KEY (ARC/INFO Rev. 6)

SML'S: PREF.SML, WESTPREF.SML, HOMEPREF.SML, PREM.SML, WESTPREM.SML, HOMEPREM.SML (create plot files for maps used in report - last letter M of filename indicates Cocos-Malay version)

AML: PREF2.AML

DRAFT PLANNING SCHEME

COVERS: WESTZONE, HOMEZONE, NORZONE, SOUZONE, OTHZONE

FEATURES: Areas identified in planning study as the statutory planning scheme zone and reserved land areas

SOURCES AND ACCURACY: Based on planning options covers - boundaries defined during the planning study

ATTRIBUTES: ZONE (planning scheme classification)

1	Nature Conservation
2	Foreshore Protection
3	Marine Protection
4	Common
5	Administrative Purposes
6	Housing
7	Community
8	Recreation
9	Commercial
10	Tourist
11	Industrial
12	Rural
13	Vacant
14	Roads

LOOKUP TABLE: ZONE.LUT (pc ARC/INFO - shadeset COLOR)
ZONE2.LUT (ARC/INFO Rev. 6 - shadeset CMYK)

KEY FILES: ZONE.KEY, RESERVE.KEY, WESTZONE.KEY, WESTRES.KEY, HOMEZONE.KEY, HOMERES.KEY (pc ARC/INFO)
ZONEM.KEY, RESERVEM.KEY, WESTZM.KEY, WESTRESM.KEY, HOMEZM.KEY, HOMERESM.KEY (pc ARC/INFO - Cocos-Malay version)
ZONE3.KEY, RESERVE3.KEY (ARC/INFO, Rev. 6)
ZONE3M.KEY, RES3M.KEY (ARC/INFO, Rev. 6 - Cocos-Malay version)

SML'S: ZONE.SML, WESTZONE.SML, WIINSET.SML, HOMEZONE.SML, ZONEM.SML, WESTZM.SML, WIINSETM.SML, HOMEZM.SMI, (create plot files used for maps in report - last letter M of filename indicates Cocos-Malay version)

AML: ZONE2.AML

SAMPLE SML'S AND AML'S

ZONE.SML - USED TO CREATE A PLOT FILE USING PC ARC/INFO FOR OUTPUT TO EITHER A HP 8 PEN PLOTTER OR A TEKTRONIX COLOUR PRINTER FOR THE PLANNING SCHEME MAP OF COCOS ISLANDS

(Note - the colour printer produces best fit on an A4 page rather than drawing to scale dimensions are set for an A1 page for plotter output)

```
&rem Produces a plot of Cocos islands (all)

&label start
&type
&type "Producing a colour plot of Cocos Islands"
&type
&ask 1 "Type <RETURN> to continue"
&type
&type "Enter cover required:"
&type
&ask 1 "> [ISLANDS] " ISLANDS
&type

&label dudname

&type
&type "Plot file will be named ZONEx.PLT"
&ask 6 "Enter file name [ZONE]: "ZONE
&sv 6 %6.PLT
&goto okname &if &nf %6
dialogclear
&type "%6 already exists..."
&goto dudname

&label okname

dialogclear
&type
&query 5 "Continue " &Y
&goto end &if &eq %5 N
dialogclear

&label makemap
```

```
map %6
mapext %1
mapunits meters
pageunits inches
pagesize 22 32
mapscale 25000
mappos cen cen

textfont 1
textcolor 1
textquality proportional
shadeset color

maplimits 0 0 22 26
polygonshades lagoon zone zone.lut
polygonshades westzone zone zone.lut
polygonshades souzone zone zone.lut
polygonshades homezone zone zone.lut
polygonshades othzone zone zone.lut
polygonshades norzone zone zone.lut

arclines reef 4
arclines westzone
arclines west 4
arclines home 4
arclines roads 2
arclines south 4
arclines north 4

annotext islands
annotext reef
annotext westzone 2
annotext homezone
annotext southuse
annotext norzone

maplimits 126.5 7 31
mapext nkuse
polygonshades nklagoon zone zone.lut
polygonshades nkuse use landuse.lut
arclines northk 4
arclines nkreef 4
annotext northk
annotext nkuse

maplimits page
```

```
textsize .6
move 9 31
text 'DRAFT SCHEME MAP,
textsize .25
move .5 1
text 'See Figures 19 and 20'
move .5 .5
text 'for details of West, Direction and Home Islands'


keybox .5 .5
keyseparation .75 .25

move 9 30
text 'RESERVED LAND'
keyposition 9 29.5
keyshade reserve.key
move 9.75 29.25
text 'NC'
move 9.75 27
text 'C'

move 17 30
text 'ZONES'
keyposition 17 29.5
keyshade zone.key
move 17.75 26.25
text 'T'

linesym 13
box 0 0 22 32
box 126.5 7 31

map end

&label end
```

ZONEM.SML - SIMILAR TO ZONE.SML, BUT USED TO CREATE A PLOT FILE OF THE PLANNING SCHEME IN THE COCOS-MALAY LANGUAGE

```
&rem Produces a plot of Cocos islands (all)

&label start
&type
&type "Producing a colour plot of Cocos Islands

&type
&ask 1 "Type <RETURN> to continue"
&type
&type "Enter cover required:"
&type
&ask 1 "> [ISLANDS] " ISLANDS
&type

&label dudname,

&type
&type "Plot file will be named ZONEx.PLT"
&ask 6 "Enter file name [ZONE]: "ZONE

&sv 6 %6.PLT
&goto okname &if &nf %6
dialogclear
&type "%6 already exists..."
&goto dudname

&label okname

dialogclear
&type
&query 5 "Continue " &Y
&goto end &if &eq %5 N
dialogclear

&label makemap

map %6
mapext %1
mapunits meters
pageunits inches
pagesize 22 32
mapscale 25000
mappos cen cen
```

```
textfont 1
textcolor 1
textquality proportional
shadeset color

maplimits 0 0 22 26
polygonshades lagoon2 zone zone.lut
polygonshades westzone zone zone.lut
polygonshades souzone zone zone.lut
polygonshades homezone zone zone.lut
polygonshades othzone zone zone.lut
polygonshades norzone zone zone.lut

arclines lagoon 4
arclines westzone 1
arclines west 4
arclines home 4
arclines roads 2
arclines south 4
arclines north 4

annotext islands 2
annotext lagoon 2
annotext westzone 4
annotext homezone 2
annotext southuse 2
annotext norzone 3 4

maplimits 126.5 7 31
mapext nkuse
polygonshades nklagoon zone zone.lut
polygonshades nkuse use landuse.lut
arclines northk 4
arclines nkreef 4

annotext northk 2
annotext nkuse 2

maplimits page,

textsize .6
move 9 31
text 'CONTOH KAR SKEMA'
textsize .25
move .5 1
text 'Lihat gambar 19 dan 20'
move .5 .5
text 'di mana ada keterangan pasal Pulu Tikus, Pulu Panjang dan Home Island.'
```

```
keybox .5 .5
keyseparation .75 .25

move 9 30
text 'TANAH LINDUNGAN'
keyposition 9 29.5
keyshade reservem.key
move 9.75 29.25
text 'PA'
move 9.75 27
text TU

move 17 30
text 'VATASAN-WATASAN'
keyposition 17 29.5
keyshade zonem.key
move 17.75 26.25
text 'P'


linesym 13
box 0 0 22 32
box 126.5 7 31

map end

&label end
```

ZONE2.AML - USED TO CREATE A PLOT FILE USING ARC/INFO REV. 6 AND A CALCOMP ELECTROSTATIC PLOTTER TO PRODUCE AN AO PRESENTATION MAP OF THE PLANNING SCHEME

```
ap
disp 1040
zone2.gra

mapext islands
mapunits meters
pageunits inches
pagesize 32 46
mapscale 18000
mappos cen cen

textfont 92534
textcolor 1
textquality proportional
shadeset cmyk
textset /esrimods/symbols/ncarto.txt

maplimits 0 0 32 36

polygonshades lagoon zone zone2.lut
polygonshades westzone zone zone2.lut
polygonshades souzone zone zone2.lut
polygonshades homezone zone zone2.lut
polygonshades othzone zone zone2.lut
polygonshades norzone zone zone2.lut

arclines reef 4
arclines westzone 1
arclines homezone 1
arclines norzone 1
arclines islands 4
arclines roads 2
arclines utils 3
arclines airport 3

annotext islands
annotext reef
annotext westzone 12
annotext homezone 1
annotext souzone 1
annotext norzone 1

maplimits 2 37 10 43
mapext tics nkuse
```

Chapter 10

Appendix 7: ECOWISE Environmental Report of Water Resources Component, Cocos (Keeling) Islands GIS.

Note: Includes maps supplied with the report and data.

EHYD2000/10

Report
on

Water Resources Component
Cocos (Keeling) Islands GIS

by
Tanya Whiteway and Tony Falkland
Ecowise Environmental

prepared for
Cocos Island Administration,
Department of Transport and Regional Services
&
the Australian Geological Survey Organisation

April 2001

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Abbreviations

AGSO Australian Geological Survey Organisation
DTRS Department of Transport and Regional Services

Executive Summary

Introduction

As outlined in the "Proposal for developing water resources 'layers' for the Cocos GIS", water resources data has been collated and entered into digital format for the following islands on the South Keeling atoll of the Cocos (Keeling) Islands;

- Home Island,
- West Island, and
- South Island.

The following data layers have been collated on a CD in ArcView shapefile format:

- Locations of freshwater lenses showing boundaries as best current information will allow.
- Locations of salinity monitoring and pollution monitoring boreholes, including co-ordinates.

Additional data and information on the CD includes:

- Tabular and graphical data showing variation of salinity (expressed in electrical conductivity units) monitoring borehole data. Data collected covers the full period of record from commencement of monitoring to late 2000.
- Tabular water quality data have been obtained from the pollution monitoring boreholes between 1998 and early 2001.
- Locations of pumping wells and manholes at the Settlement and galleries on Home Island and in the northern part of West Island (for former Quarantine Station and horticultural block), as best current information will allow.
- List of relevant reports and additional reference information.

Outputs

As required, outputs of this project include:

- Water resources layers with spatial data and attribute data on a CD (entitled Cocos Water Resources CD). This CD will be made available to the Australian Geological Survey Organisation for incorporation into the overall Cocos GIS and for subsequent distribution to the Cocos Island Administration, the Department of Transport and Regional Services and other authorised users. Separate copies of the CD can be made available, on request, to the Cocos Island Administration and the Department of Transport and Regional Services.
- This report summarising the data layers on the accompanying CD.

Recommendations

<u>(a) Need for greater accuracy of some locations</u>

While this project has mapped boreholes and water supply pumping infrastructure as accurately as possible, it is recommended that the location of boreholes and pumping wells be obtained more accurately in the field. In particular, boreholes and pump wells in the northern part of West Island should be more accurately located with differential GPS or surveyed by standard procedures. In addition, the position of gallery 8 in the northern part of Home island should be more accurately located once as-constructed drawings are finalised by others.

<u>(b) Need for updating of water quality data at 2 year intervals</u>

The water quality data obtained from boreholes and other sites (e.g. gallery pump wells) is obtained at regular intervals and databases are updated as part of regular monitoring program. It is recommended that the water resources information contained in this GIS be updated at appropriate intervals (e.g. every 2 years).

Data Location and CD Structure

The Cocos Water Resources CD consists of the following files and directories:

- Cocos.apr file

- Data directory
- Documentation directory

Details of each of these are described below:

Cocos.apr

"Cocos.apr" is an Arcview project which includes base data from "Cocos (Keeling) Islands GIS Stage 1 Report" CD data, and rectified aerial photography, as obtained from AGSO.
The project is in the same projection as the base data using Cocos (Keeling) Islands Grid 1992 (CKIG92) projection.
The project is set up with six Views:

(a) Cocos Islands Working View. (Views the entire Cocos Island water resources data set including all data sets.)
(b) West Island South View. (Detailed View of southern part of West Island including the airfield and Settlement showing boreholes, pumping wells and the approximate boundary of the "Airfield" freshwater lens.)
(c) West Island North View. (Detailed View of northern part of West Island showing boreholes, galleries for former Quarantine Station and horticultural block and the approximate boundary of the "West Island Northern" freshwater lens.)
(d) Home Island View (Detailed View of Home Island showing boreholes and approximate boundary of "Home Island Main" and "Home Island Northern" freshwater lenses.)
(e) South Island View. (Detailed View of South Island showing boreholes and approximate boundary of freshwater lenses.)
(f) Home Island Infiltration Galleries View. (Detailed View of Home Island, including boreholes and Infiltration Gallery Layouts.).

The hotlink tool (in all views of Cocos.apr) has been set up to connect salinity monitoring borehole locations with graphs showing the change in salinity from 1987 through to 2000 at each borehole. To access the hotlink, click on the hotlink button and then click on a borehole point. This will bring up an image of the graph in Internet Explorer.
There are also six layout windows (A4 paper size), one per view.

Documentation Directory

The contents of the Documentation Directory are summarised in the table below.

Contents of the Documentation Directory

File Name and Type	Properties/Description
Report.doc	• Summary of Data collection process, and data collected • Outlines the type and location of data on the CD • Outlines the metadata for all shapefiles on the CD • Lists other references to the data, and includes other sources of information for Cocos Islands water resources
Cocos Gallery Cross section (from Woodroffe and Falkland, 1997).bmp	Cross sectional Diagram of a buried infiltration gallery (Home island type)
Salinity_monitoring_bore.bmp	Cross sectional Diagram of a Salinity Monitoring Borehole
Pollution_monitoring_bore.bmp	Cross sectional Diagram of a Pollution Monitoring Borehole

Data Directory

The Data Directory consists of the following sub-directories:

- Shapefiles sub-directory
- Images sub-directory
- Excel&dbf sub-directory

Shapefiles Sub-Directory

The contents of the shapefiles sub-directory are summarised in the table below. Additional metadata for each shapefile, has been recorded in the metadata section of this report.

Contents of the Shapefiles sub-directory

Shapefile Name	Description
Bores.shp	Point location of salinity and pollution monitoring boreholes on all islands
Homeis_Galleries.shp	Line location of buried infiltration galleries on Home Island on Home Island
Homeis_Saline_testpts.shp	Point location of salinity testing sites situated on an infiltration gallery on Home Island
Homeis_Pumpst.shp	Point location of pump stations, pumping from an infiltration gallery on Home Island
Homeis_Manholes.shp	Point location of manholes providing access to infiltration galleries on Home Island
Homeis_lens.shp	Polygon shapefile, delineating the approximate location of the freshwater lens on Home Island
Homeislens_line.shp	Line shapefile, outlining the approximate boundary of the freshwater lens on Home Island
Westis_lens.shp	Polygon shapefile, delineating the approximate location of the freshwater lens on West Island
Westislens_line.shp	Line shapefile, outlining the approximate boundary of the freshwater lens on West Island
Westis_pumpst.shp	Point location of pump stations, pumping from an infiltration gallery on West Island
Westis_manholes.shp	Point location of manholes providing access to infiltration galleries on West Island
Westis_galleries.shp	Line location of buried infiltration galleries on West Island
Southis_lens.shp	Polygon shapefile, delineating the approximate location of the freshwater lens on South Island
Southis_lensli.shp	Line shapefile, outlining the approximate boundary of the freshwater lens on South Island
Possiblelens_extent.shp	Line shapefile indicating the possible further extent of the freshwater lens on Home Island.
Cocos_line.shp, Cocos_land.shp, and Cocos.shp	Base data collected in the initial data collection and stored on the “Cocos Stage 1 CD.

Images Sub-Directory

There are 89 Mr Sid rectified images for the whole of South Keeling atoll in the images sub-directory. Mr Sid files can only be read in ArcView if the Mr Sid Image Support extension tool has been selected via the files/extension menu.

Excel&dbf Sub-Directory

The contents of the Excel&dbf sub-directory are summarised in the table below.

Contents of the Excel&dbf sub-directory

File Name and Type	Properties/Description
AGAL_test_results_environmental_galleries&borholes.xls	Water quality data from both galleries and pollution monitoring boreholes. Data has been recorded for June 1998, April 1999, May 1999, June 2000, April 2000, October 2000 and January 2001.
Cocos_bore_data.xls	Cocos borehole salinity data from 1987 to 2000, at approximately 3 month intervals.
Graphs_Images sub-Directory	This sub-directory contains 82 files in wmf and jpg format showing graphs of salinity (electrical conductivity or EC) variations for each salinity monitoring borehole over the full period of monitoring. The monitoring periods vary according to the year of drilling, the earliest being 1987. The graphs show the depth below ground surface to the following salinity (EC) values: 1000, 2500, 10,000, 25,000 and 40,000 µS/cm, based on linear interpolation from measurements at specific depths. These EC values correspond to salinities of 2%, 5%, 20%, 50%

	and 80% of seawater.

Shapefiles Metadata

All shapefiles collected on the CD have been converted to Cocos (Keeling) Islands Grid 1992 (CKIG92) projection, World Geodetic System 1984 (WGS 84) Datum. Metadata and a description of each shapefile is provided below.

Bores.shp

The 'bores' shapefile contains point locations of salinity monitoring and pollution monitoring boreholes.

Accuracy: Data was originally digitised from points surveyed by Nolan and Partners Surveyors, Perth. Points have been modified based on data collected from hand drawn maps, reports and local island knowledge (see references). Accuracy is within ± 20m for 80% of the points. 20% of the points, especially some of those situated on the northern part of West Island and Home Island have an accuracy of ± 50m.

Field	Properties/Description
Shape	Shapefile type (points)
Label	Borehole Labels (Excluding Island Prefix)
Borehole	Borehole Name (Including Island Prefix)
Bore Type	Salinity or Pollution Monitoring Borehole
Graph_link	Hotlink to Graphs of salinity (EC) v's time for each borehole
x-coord	X coordinates of boreholes in CKIG92, WGS 84 projection
y-coord	Y coordinates of boreholes in CKIG92, WGS 84 projection

Homeis_Galleries.shp

Homeis_Galleries.shp is a line shapefile showing location of infiltration galleries.

Accuracy: Lines have been recorded based on data collected from hand drawn maps and reports and local knowledge (see references). Location of Galleries should fall within ± 20m accuracy.

Field	Properties/Description
Shape	Shapefile type (line)
ID	Identifier
Name	Gallery Name and Number

Homeis_Pumpst.shp

The 'Homeis_Pumpst' shapefile contains point locations of water pumping wells, either as part of an infiltration gallery (Home Island and northern West Island) or as wells with short lateral pipes (West Island Settlement).

Accuracy: Points have been recorded based on data collected from hand drawn maps and reports (see references). Location of pumping wells should fall within ± 20m accuracy.

Field	Properties/Description
Shape	Shapefile type (points)
Id	Identifier
Code	Name and number of Pump station

Homeis_Manholes.shp

The 'Homeis_Manholes' shapefile contains point locations of manholes providing access to infiltration galleries shown in "homeis_galleries.shp".
Accuracy: Points have been recorded based on data collected from hand drawn maps and reports (see references). Location of manholes has been based on the location of infiltration galleries, therefore the location of manholes should fall within ± 20m accuracy.

Field	Properties/Description
Shape	Shapefile type (points)
Id	Identifier

Homeis_Saline_testpts.shp

The 'Homeis_saline_testpts' shapefile contains point locations of salinity testing sites located along Home Island infiltration galleries.
Accuracy: Points have been recorded based on data collected from hand drawn maps and reports (see references). Location of salinity testing points has been based on the location of infiltration galleries. Therefore, the location of salinity testing points should fall within ± 20m accuracy.

Field	Properties/Description
Shape	Shapefile type (points)
ID	Identifier
Name	Gallery Name and Number of the test point

Homeis_lens.shp

The 'Homeis_lens' shapefile contains polygon data indicating the approximate boundary of the Home Island freshwater lenses.
Accuracy: See comments under Westis_lens.shp.

Field	Properties/Description
Shape	Shapefile type (polygons)
Fid	Identifier
Perimeter	Total lens perimeter
Area	Total lens area

Homeislens_line.shp

The 'Homeislens_line' shapefile contains line data indicating the approximate boundary of the Home Island freshwater lenses.
Accuracy: See comments under Westis_lens.shp.

Field	Properties/Description
Shape	Shapefile type (line)
Id	Identifier
Fid	Identifier
Length	Line length

Westis_Galleries.shp

Westisis_Galleries.shp is a line shapefile showing location of infiltration galleries.
Accuracy: Lines have been recorded based on data collected from hand drawn maps and reports and local knowledge (see references). Location of Galleries should fall within ± 20m accuracy.

Field	Properties/Description
Shape	Shapefile type (line)
ID	Identifier
FID	Identifier
Name	Gallery Name and Number

Westis_Pumpst.shp

The 'Westis_Pumpst' shapefile contains point locations of water pumping wells, either as part of an infiltration gallery (Home Island and northern West Island) or as wells with short lateral pipes (West Island Settlement).
Accuracy: Points have been recorded based on data collected from hand drawn maps and reports (see references). Location of pumping wells should fall within ± 20m accuracy.

Field	Properties/Description
Shape	Shapefile type (points)
Id	Identifier
FID	Identifier
Code	Name and number of Pump station

Westis_Manholes.shp

The 'Westis_Manholes' shapefile contains point locations of manholes providing access to infiltration galleries shown in "homeis_galleries.shp".
Accuracy: Points have been recorded based on data collected from hand drawn maps and reports (see references). Location of manholes has been based on the location of infiltration galleries, therefore the location of manholes should fall within ± 20m accuracy.

Field	Properties/Description
Shape	Shapefile type (points)
FID	Identifier
Id	Identifier

Westis_lens.shp

The 'Westis_lens' shapefile contains polygon data indicating the approximate boundary of the West Island freshwater lenses.
Accuracy: Estimated extent of the freshwater boundary is based on information from salinity monitoring boreholes and some estimation based on knowledge of freshwater lens behaviour near the edges of coral islands. The boundaries are somewhat subjective and in fact are not fixed as they will move according to wet and dry periods. Hence, it is difficult to provide a general accuracy estimate. It could be said that the freshwater lens boundary would normally be within ± 30m of the boundary shown, but that this could be greater during very dry or very wet periods

Field	Properties/Description
Shape	Shapefile type (polygons)
Fid	Identifier
Perimeter	Total lens perimeter
Area	Total lens area

Westislens_line.shp

The 'Westislens_line' shapefile contains line data indicating the approximate boundary of the West Island freshwater lenses.
Accuracy: See comments under Westis_lens.shp.

Field	Properties/Description
Shape	Shapefile type (line)
Id	Identifier
Fid	Identifier
Length	Line length

Possiblelens_extent.shp

The 'Possiblelens_extent' shapefile contains line data indicating possible further extent of the freshwater lenses on Home Island.
Accuracy: See comments under Westis_lens.shp.

Field	Properties/Description
Shape	Shapefile type (line)
Id	Identifier

Southis_lens.shp

The 'Southis_lens' shapefile contains polygon data indicating the approximate boundary of the South Island freshwater lenses.
Accuracy: See comments under Westis_lens.shp.

Field	Properties/Description
Shape	Shapefile type (polygons)
Fid	Identifier
Area	Total lens area
Perimeter	Total lens perimeter

Southis_lensli.shp

The 'Southis_lensli' shapefile contains line data indicating the approximate boundary of the South Island freshwater lens.
Accuracy: See comments under Westis_lens.shp.

Field	Properties/Description
Shape	Shapefile type (line)
Id	Identifier
Length	Line length

Cocos_line.shp, Cocos_land.shp and cocos.shp

These shapefiles have been used as base data, from the original Cocos stage 1 CD. Data type and accuracy relates directly to initial data collection, carried out by AGSO. This has been reported in: **'Cocos (Keeling) Islands GIS Stage 1 Report' for Territories Office, DTRS, K Porritt, B McKay and A Lucas, AGSO, 10/2/2000.**

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Chapter

11

Appendix 8: Cocos GIS Data CD-ROMs, Jewel Case Inserts and orthophotography coverage diagrams for each CD-ROM.

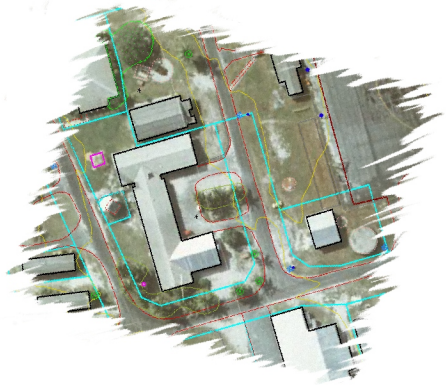
cd-rom

1

Installation, documentation, vector data, West & Home Is. 256 colour orthophotography

Territories Office, DoTRS, and the
Australian Geological Survey Organisation

Cocos GIS



AGSO CATALOGUE #35120

Installation information:

In order to have this product fully functional you will need to be using a suitable computer running a Microsoft Windows Operating System (Windows 95/NT 4.0 SP3 or greater) and the following:
ESRI ArcExplorer GIS v2,
Microsoft Internet Explorer v3.0 or greater,
Adobe Acrobat Reader v4.05 or greater.
Internet access will be useful for downloading later versions of the above software and to access some links in the web documents on the CD-ROM. For installation details see index.htm on the CD-ROM and navigate to "Getting Started".

Higher level use will require a licence of ESRI ArcView 3.x installed. Internet Explorer and Adobe Acrobat Reader are likely to be already installed on your computer.

NOTE: Installation of software may require administrative privileges for Windows NT or Windows 2000. Users may need to contact their system administrator for installation.

Disclaimer:

The data in this GIS were assembled by the Mineral Resources and Advice project of the Australian Geological Survey Organisation (AGSO). In compiling the product, AGSO has translated and integrated data as received from many other sources. AGSO has undertaken initial checks as to the accuracy or completeness of these externally supplied datasets and the result of these examinations are reported throughout the system documentation manual. It should be noted that the Cocos GIS datasets may contain information that is not totally accurate or complete. Therefore you should not rely solely on the information in this GIS when making a commercial decision.

Contact information:

Please read the accompanying documentation and where further information is required please contact:

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Policy - Indian Ocean Territories,
Department of Territories and Regional Services.
Email: peter.lawler@dotrs.gov.au
Ph: 02 62748023
Fax: 02 62748065

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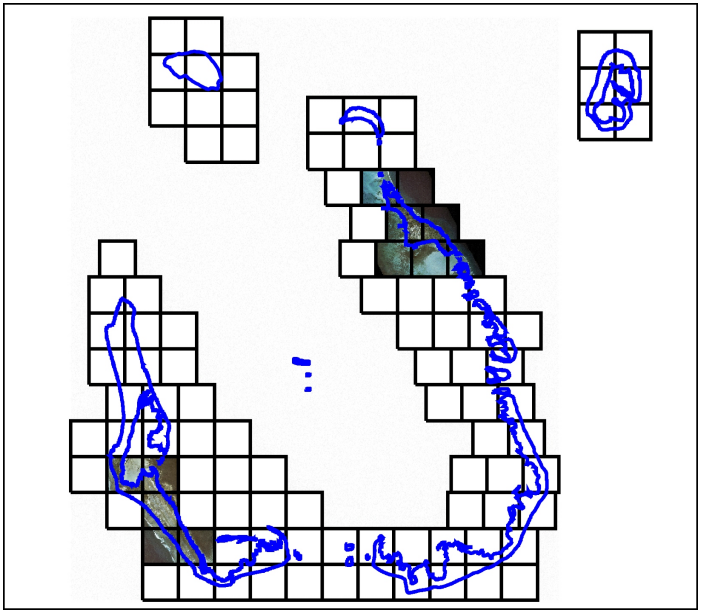
CD-ROMs in this series:

CD-ROM 1 - Installation, documentation, vector data, West & Home Is 256 colour orthophotography
CD-ROM 2 - West & Direction Is 256 colour orthophotography
CD-ROM 3 - South, North Keeling Is & other 256 colour orthophotography
CD-ROM 4 - Home & Horsburgh Is 256 colour orthophotography, miscellaneous files

Extent of orthophotography included on this CD-ROM:



CocosGIS CD-ROM 1: System and Documentation

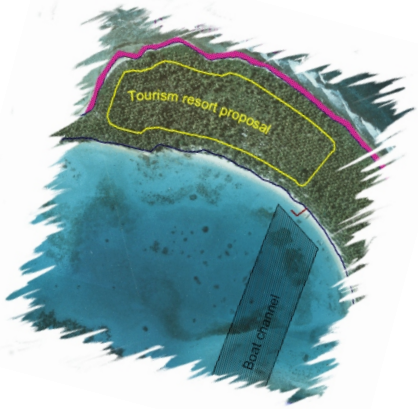
cd-rom

2

West & Direction Is.
256 colour orthophotography

Territories Office, DoTRS, and the
Australian Geological Survey Organisation

Cocos GIS



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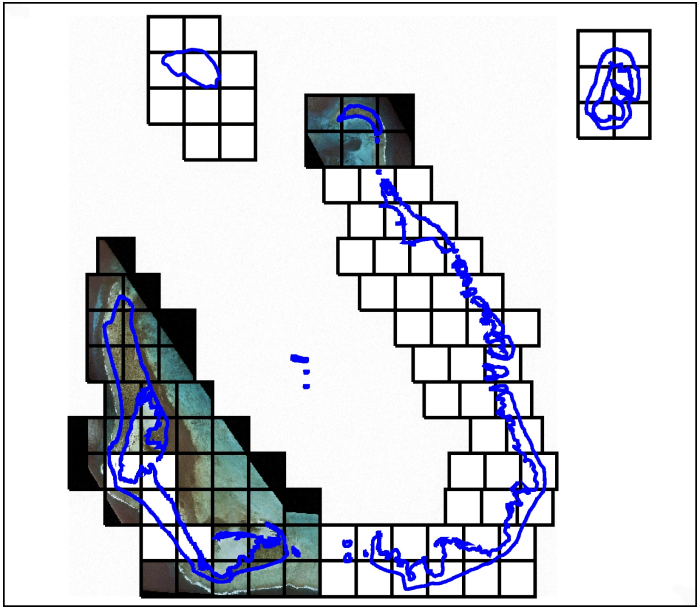
CD-ROM 4 - Home & Horsburgh Is 256 colour orthophotography, miscellaneous files

Extent of orthophotography included on this CD-ROM:



CocosGIS CD-ROM 2: Additional orthophotography

CocosGIS CD-ROM 2: Additional orthophotography

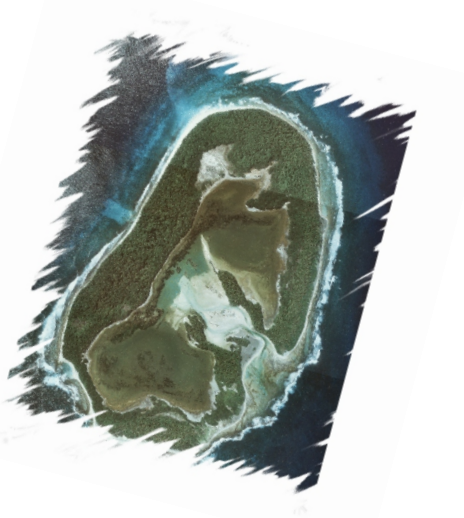
cd-rom

3

South & North Keeling Is.
And other 256 colour orthophotography

Territories Office, DoTRS, and the
Australian Geological Survey Organisation

Cocos GIS



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Disclaimer:

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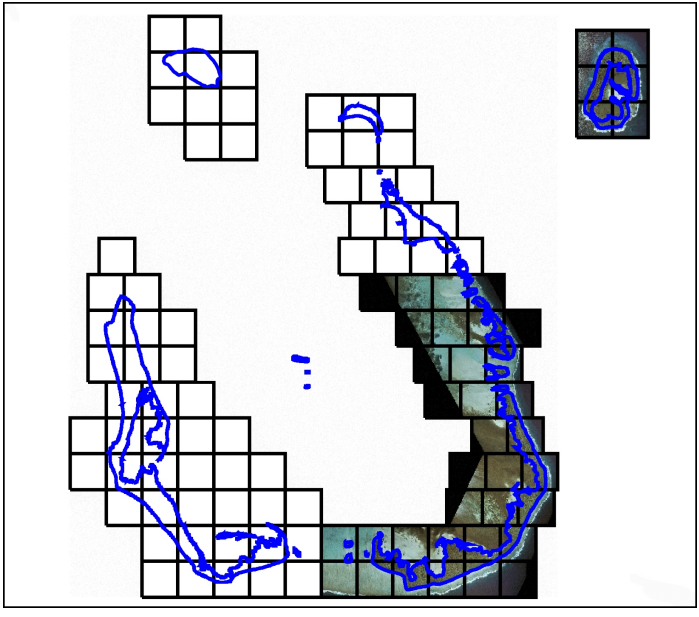
Extent of orthophotography included on this CD-ROM:



CocosGIS CD-ROM 3: Additional Orthophotography

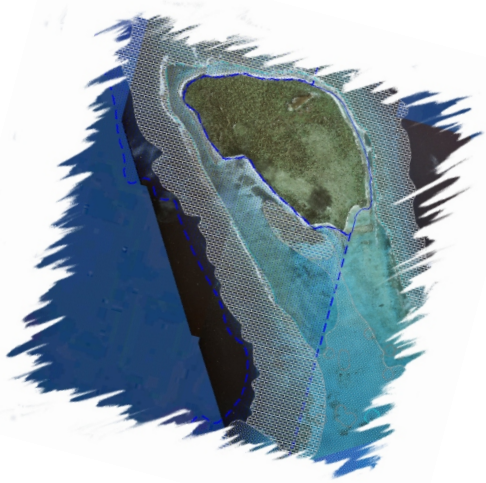
cd-rom

4

Home & Horsburgh Is. 256 colour orthophotography, miscellaneous files.

Territories Office, DoTRS, and the
Australian Geological Survey Organisation

Cocos GIS



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Internet access will be useful for downloading later versions of the above software and to access some links in the web documents on the CD-ROM. For installation details see index.htm on the CD-ROM and navigate to "Getting Started".

Higher level use will require a licence of ESRI ArcView 3.x installed. Internet Explorer and Adobe Acrobat Reader are likely to be already installed on your computer.

NOTE: Installation of software may require administrative privileges for Windows NT or Windows 2000. Users may need to contact their system administrator for installation.

Disclaimer:

The data in this GIS were assembled by the Mineral Resources and Advice project of the Australian Geological Survey Organisation (AGSO). In compiling the product, AGSO has translated and integrated data as received from many other sources. AGSO has undertaken initial checks as to the accuracy or completeness of these externally supplied datasets and the result of these examinations are reported throughout the system documentation manual. It should be noted that the Cocos GIS datasets may contain information that is not totally accurate or complete. Therefore you should not rely solely on the information in this GIS when making a commercial decision.

Contact information:

Please read the accompanying documentation and where further information is required please contact:

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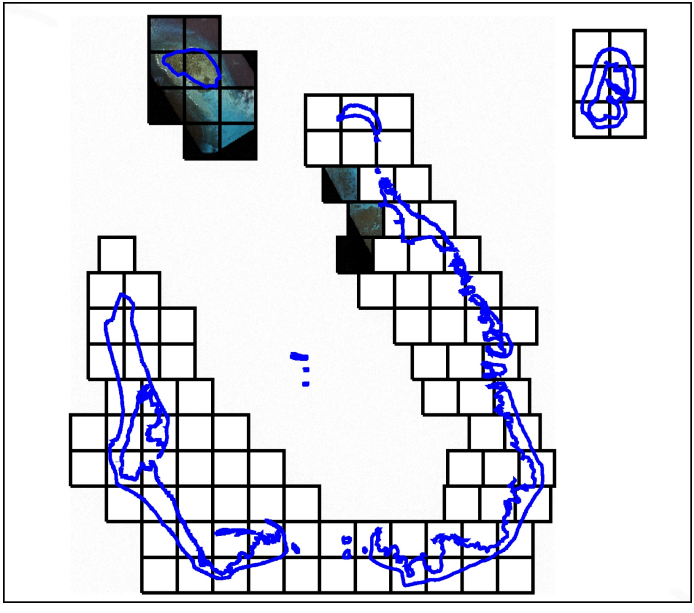
CD-ROMs in this series:

CD-ROM 1 - Installation, documentation, vector data, West & Home Is 256 colour orthophotography
CD-ROM 2 - West & Direction Is 256 colour orthophotography
CD-ROM 3 - South, North Keeling Is & other 256 colour orthophotography
CD-ROM 4 - Home & Horsburgh Is 256 colour orthophotography, miscellaneous files

Extent of orthophotography included on this CD-ROM:



CocosGIS CD-ROM 4: Additional Orthophotography