MARINE RESERVE IMPLEMENTATION

DEVELOPMENT OF A GENERIC OPERATIONAL FRAMEWORK FOR MARINE RESERVE IMPLEMENTATION IN WESTERN AUSTRALIA. FINAL REPORT YEAR 1

Final Report: MRI - 14/1998

A collaborative project between the Great Barrier Reef Marine Park Authority and CALM Marine Conservation Branch

A project funded through Ocean Rescue 2000: Marine Protected Area Program
Project No: G021/96

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OCEAN RESCUE 2000

MARINE PROTECTED AREA PROGRAM

Project No: G021/96

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Executive Summary

This report summarises the major activities and outcomes of the first year of a two year project entitled *Development of a Generic Operational Framework for Marine Reserve Implementation in Western Australia*. The progress made against the specific action items detailed in the project specifications are reported on.

A Senior Information Officer was appointed early in the 1996/97 financial year from CALM's Information Management Branch to develop a marine Geographic Information System (GIS) to service CALM's marine reserve implementation program. Significant progress has been made in developing the marine GIS within the Marine Conservation Branch of CALM. The information requirements (coverages) for the establishment and management of marine reserves in Western Australia have been largely developed, existing data have been captured and consolidated within the GIS and the on-going process of establishing access to the many relevant data sets held by other agencies and organisations in Western Australia and Australia is well established.

Introduction

In May 1996 the Great Barrier Reef Marine Park Authority (GBRMPA) entered into a cooperative project with the Western Australian Department of Conservation and Land Management (CALM) entitled *Development of a Generic Operational Framework for Marine Reserve Implementation in Western Australia*. This was the first year of a proposed two year project which would:

- identify the information requirements to implement marine reserves in Western Australia, as outlined in the Government's *New Horizons in Marine Management* policy, and under the proposed amendments to the CALM Act
- incorporate and adapt CALM's existing GIS capabilities into the marine reserve implementation program
- review, consolidate, gain access to and, if necessary, acquire existing relevant marine information into a dedicated marine GIS

The project details are outlined in the Project Specifications (see Appendix I) and include four specific action items:

- **Action 1:**
  Advertise and appoint a Senior Information Systems Officer with GIS expertise for a 12 month period
- **Action 2:**
  Development of a marine GIS by adapting CALM's current GIS to the marine reserve implementation program
- **Action 3:**
  Identify specific information requirements for marine reserve implementation under the CALM Act
- **Action 4:**
  Review, acquire and consolidate existing information, convert data to digital format and install on a GIS

This report summarises the activities and outcomes of the first year of this project.

Major Activities and outcomes

Action 1:

Advertise and appoint a Senior Information Systems Officer with GIS expertise for a 12 month period

A duty statement for the above position was developed and the position was advertised internally within CALM in July 1996 as the preferred option was to contract someone who was already familiar with CALM's information management system and had the internal contacts that would be required to undertake the duties of the position. Four applications were received and two of the applicants were interviewed. An officer from CALM's Information Management Branch was subsequently appointed to the position in mid-August and began work with the Marine Conservation Branch on 12 August 1996.

Action 2:

Development of a marine GIS by adapting CALM's current GIS to the marine reserve implementation program

The Geographic Information Section of CALM's Information Management Branch (IMB) is responsible for servicing the spatial information requirements for management of the 20 million hectares of lands and waters the department is currently responsible for (Figure 1). It is important to note that at the time of this appointment the corporate GIS area of CALM was in the review stage of moving from CAD (MicroStation) based mapping organisation with some GIS (Arcinfo) capability to becoming the provider of a corporate GIS that would service all of CALM's GIS requirements across Western Australia. A strategic plan for this development is currently being produced.

In describing the development of the marine GIS it must be stated at the outset that it has not been a case of adapting CALM's existing GIS, rather designing a GIS that would in the first instance support the marine reserve implementation program and at the same time be suitable for integration into an emerging CALM corporate GIS.

Whilst the development of the marine GIS capability will, in the short term, be a stand-alone facility, support has been established, via a service level agreement, with IMB GIS Section (see Figure 2) in the following areas:

- Remote sensing
- Software development and support
- System/network support
- Archiving
- Photogrammetry
- Data acquisition
- Product generation
- Metadata

Under this arrangement, an agreed level of support is provided at no cost to the Marine Conservation Branch. Services outside or in excess of this agreement must be funded separately.

Marine Conservation Branch GIS

Following discussion on possible future directions for the corporate GIS area of IMB a decision was made to take an ArcInfo/Arcview approach to assembly and dissemination of the Marine Conservation Branch (MCB) spatial database. Access to ArcInfo and dedicated hard disk space on a Sun Ultra work station was established via an X terminal emulation for data assembly, complex analysis and modelling. Arcview was selected for product generation and user access within MCB. This approach has allowed product generation and analysis within weeks of setting up the system and establishing network links. The ongoing strategy will be to convert datasets to shape file format for use from the Banyan Vines server over the local area network in the Marine Conservation Branch.

At present the GIS position has been responsible for all facets of GIS within the MCB including system development, data acquisition, analysis and product generation. However testing of Arcview software on the Banyan Vines server across the MCB Lan has recently been completed and after training of staff within the Branch it is anticipated that some of the day to day GIS requirements will be increasingly handled by individual staff.

Action 3:

Identify specific information requirements for marine reserve implementation under the CALM Act

Paralleling the development of the mechanics of the marine GIS has been the preparation of the internal Marine Conservation Branch report entitled A *Spatial Analysis Model for CALM's Marine Reserve Implementation Program* (see Appendix II). This report identifies the information requirements for marine reserve implementation under the proposed changes to the CALM Act, outlines a conceptual model for establishing the boundaries and management zones of marine reserves, reviews existing approaches for the establishment and zoning of marine reserves, examines the potential for incorporating existing decision-support software to facilitate model development and provides recommendations for future directions in relation to creating marine reserves in Western Australia. A further draft internal report entitled *Generic Information Requirements for Marine Reserve Management in Western Australia* (Appendix III) is included as much of the information in this report is also relevant. These reports are included in relation to satisfying the requirements of Action Item 3.

Action 4:

Review, acquire and consolidate existing information, convert data to digital format and install on a GIS

Existing data

Identification of useable data has been a primary task in the first year of operation and in general it should noted that whilst some digital data exists at State and regional scales very little exists at scales suitable for marine reserve implementation, planning, zoning and management. On line (ftp) access to relevant spatial databases within Western Australia has been established via the Western Australian Land Information System (WALIS). Evaluation and uptake of data from agencies within this system is ongoing. A list of the data sets currently held by MCB is enclosed (Appendix IV).
Contact has also been established with the private sector (eg petroleum industry) with various data sets identified for acquisition.

Data capture

Marine habitat mapping

Marine habitat information at both regional and local scales over areas proposed for reservation is considered to be a primary dataset. Capture over the Central West Coast are of WA has been by heads up digitising from Landsat TM imagery after significant ground truthing and interpretation using aerial photography, bathymetric data and manipulation of the satellite data. Methods for auto classification from scanned aerial photography and satellite data are currently being developed with work being planned for Rowley shoals and Ningaloo marine parks.

Bathymetry

Although digital bathymetry exists over most of the WA waters (ie 5, 10, 20, 50 metre contours) digitising of the more detailed 1:10000 coastal waters hard copy compilation sheets held by the WA Department of Transport is currently in the planning stage.

Aerial Photography

Some suitable aerial photography exists over marine reserve areas (proposed and existing). Existing coastal photography has not always been flown at optimal conditions to facilitate water penetration. Application has successfully been made to the State Land Information Capture Program(SLICP) to fly selected marine areas with appropriate equipment and at suitable times for water penetration.

Digital Photogrammetric Capture

A project is under way with Curtain University and CALM's GIS section to use scanned aerial photos on an Intergraph Image Station to produce :-

- ortho-rectified high spatial resolution images over study areas
- high spectral resolution that will allow fine-scale mapping
- generation of digital elevation model
- bathymetry contour maps
- development of bottom roughness models as surrogates for species diversity

Flying of suitable photography for this project has been completed and triangulation to establish spatial control is currently being carried out prior to scanning the images.

Remote Sensing

Recognising the potential importance of remotely sensed data to the management and sustainable use of Western Australia's marine environment, CALM's Marine Conservation Branch initiated and chairs a Marine Working Group to the State Liaison Committee on Remote Sensing (SCLORS). This group, which has representatives from all relevant State and Commonwealth government organisations, has produced a draft Issues Paper with the aim of providing the basis for a strategic plan for the development of remote sensing applications for the management and sustainable use of Western Australia's marine environment.

The marine GIS will link across to this program.

Point Source (GPS) data

Data from biological and oceanographic field surveys has been included in the spatial database. In the case of oceanographic data software development has been successfully undertaken to process and graphically represent the path, speed and direction of drifter drogues that are deployed and have their path recorded spatially with GPS. A user manual for this process has also been produced.

Metadata

A version of the Blue Pages metadata tool is to be installed on the CALM intranet in September 97 and if successful will be the vehicle for recording marine metadata within CALM. In addition the GIS section of CALM is currently developing the use of the ANZLIC compliant metadata tool developed by WALIS. This tool is currently set up primarily for terrestrial data sets, however after recent discussions agreement has been reached with regard to making it more suitable for marine metadata. The results of this collection method will be available from WALIS on CD ROM in the short term although they also plan to move to an internet approach in the next 6-12 months.

PRODUCT GENERATION

Generation of products for operational, planning and management purposes has been a requirement from day one. Most of this work is done in-house although some of this work is being covered under the service level agreement with CALM's corporate GIS area. It is intended in future to divert, where appropriate, this work to the map publishing areas of the corporate GIS section and, as has been previously stated, to train users of the system within MCB in basic product generation techniques. Marine biological, physical oceanographic, land use and marine use coverages have been developed. Samples of some of the GIS products produced, via this project, are enclosed with this report.

These include the following items:

1. **CALM-managed lands and waters (see Figure 1)**

2. **'Wilson' Report candidate areas for marine reservation**

3. **Western Australian (State Territorial Waters) Meso - scale Bioregions**

4. **Jurien Bay Marine Reserve Proposal**

- Central Coast Major Marine Habitats and Coastal Tenure
- Oceanography (maps from field data Jan - Feb '97)

5. **Whale shark encounters by commercial tour operators off Ningaloo**

Statement of Expenditure

Commonwealth Funds

Professional officer salary + salary on-costs (35%) - (0.85 fte x L5 year 2)	$52,723
Software	$12,187
Materials	$67
Training	$700
Contract support staff salary + on-costs [0.5 fte x L2 Year 3]	$24,323
Total	**$90,000**

CALM Resources

Infrastructure (office, etc) on-costs for Professional Officer - (1.35 x salary)	$52,723
Hardware and materials purchase	$42,000
CALM Information Management Branch (in-kind support)	$23,000
Infrastructure (office, etc) on-costs for Technical Officer - (1.35 x salary)	$24,323
Total	**$142,046**

APPENDIX I

Project Specifications

APPENDIX II

Spatial Analysis Model for CALM's Marine Reserve Implementation Program

APPENDIX III

Generic Information Requirements for Marine Reserves in Western Australia (Draft)

APPENDIX IV

Marine Conservation Branch Datasets